Physical activity behaviour change: supporting cancer survivors to move more

by

Justin Webb

Thesis submitted to the University of Surrey for the award of

Doctor of Philosophy

School of Psychology

Faculty of Health and Medical Sciences

University of Surrey

December, 2018
DECLARATION OF ORIGINALITY

This thesis and the work to which it refers are the results of my own efforts. Any ideas, data, images or text resulting from the work of others (whether published or unpublished) are fully identified as such within the work and attributed to their originator in the text, bibliography or in footnotes. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification. I agree that the University has the right to submit my work to the plagiarism detection service TurnitinUK for originality checks. Whether or not drafts have been so-assessed, the University reserves the right to require an electronic version of the final document (as submitted) for assessment as above

Signed: 

Date: 5th December 2018
ACKNOWLEDGEMENTS

I am thankful to many people for their help and support in the completion of this thesis.

For providing guidance, stimulating discussion, and for so much more, my thanks go to my supervisors Chris Fife-Schaw and Jane Ogden. I have very much enjoyed working with you and hope that we can collaborate in the future.

My thanks go to Macmillan Cancer Support for making this research possible and in particular to Jo Foster for supporting this research.

I would like to thank Tamzin Marsh for her support with recruitment and Emma Hook for her assistance in the production of the intervention under investigation in study two and study three of this thesis. For providing assistance with the thematic analysis in study three of this thesis, my thanks go to Jenna Stockwell. I also have a debt of gratitude to the cancer specialist physiotherapists that volunteered their time in support of this research, Clare Lait and Catherine Neck.

To the cancer survivors that took part in this research, I thank you for your time and for sharing your experiences.

I would like to offer special thanks to Ted Poulter, who, although no longer with us, continues to inspire me to find ways to support cancer survivors to feel the benefits of physical activity.

To my family, without your love and support the completion of this PhD would not have been possible. To my mum, Mary, your support and encouragement over the course of this PhD, especially as it is in an area that is all too close to home, will never be forgotten. To my wife, Ash, thank you for your love, patience, and for believing in me. To my kids, Bob and Aoife, thank you for allowing me the time to work on ‘Daddy’s book’. I hope that this will inspire you to follow your dreams, no matter your age.

To you all, thank you.
# TABLE OF CONTENTS

Declaration of Originality ................................................................................................. ii

Acknowledgements ............................................................................................................ iii

Abbreviations .................................................................................................................. viii

List of Tables .................................................................................................................. ix

List of Figures ................................................................................................................ xi

List of Appendices ......................................................................................................... xii

List of Supplementary Files ......................................................................................... xiii

Publications .................................................................................................................... xv

Author’s Introduction ...................................................................................................... 1

CHAPTER ONE ..................................................................................................................... 3

A review of the literature

**Understanding Cancer** ............................................................................................... 4

The biology of cancer ...................................................................................................... 4

Cancer incidence ............................................................................................................ 5

Cancer prevalence ......................................................................................................... 5

Cancer treatment and side-effects ............................................................................... 7

Section summary ........................................................................................................... 12

**Physical Activity and Cancer** .................................................................................... 13

Physical activity and cancer prevention ....................................................................... 14

Physical activity and preparing for cancer treatment .............................................. 16

Physical activity during treatment ............................................................................. 17

Physical activity to attenuate the consequences of cancer and its treatments ...... 18

Physical activity and cancer mortality and recurrence ........................................... 20

Physical activity and palliation ................................................................................... 21

The safety of physical activity for cancer survivors ............................................... 22

The physical activity levels of cancer survivors ....................................................... 22

Section summary ........................................................................................................ 24

**The Determinants of Physical Activity in Cancer Survivors** ................................. 26

Individual barriers and facilitators of physical activity .......................................... 30
Interpersonal influences on physical activity ............................................................. 39
Community influences on physical activity ............................................................ 43
Organisational influences on physical activity ....................................................... 47
Policy influences on physical activity ....................................................................... 50
Section summary ....................................................................................................... 52

Opportunities to Intervene ....................................................................................... 56
Influencing healthcare professionals ......................................................................... 56
Remote support to support behaviour change ........................................................ 57
Section summary ....................................................................................................... 59

The Scope and Relevance of this Research ............................................................... 61
Research scope ........................................................................................................ 61
Relevance of this research ........................................................................................ 61

Chapter Summary ..................................................................................................... 64

CHAPTER TWO ........................................................................................................... 66

Study One: Understanding the reach, adoption, and impact of a training intervention to
influence healthcare professionals to give advice on physical activity to cancer survivors

Introduction ............................................................................................................... 67
Development of a training intervention using the Behaviour Change Wheel ............ 68
Feasibility, evaluation, and implementation .............................................................. 73
Service evaluation aims ............................................................................................ 75

Method ....................................................................................................................... 76
Study design .............................................................................................................. 76
Participant journey through the service .................................................................... 76
Service evaluation data ............................................................................................. 83
Data analysis .............................................................................................................. 84

Results ....................................................................................................................... 87
Reach ......................................................................................................................... 87
Adoption ................................................................................................................... 88
Impact ....................................................................................................................... 92
COM-B analysis ..................................................................................................... 97

Discussion ................................................................................................................. 100
The main outcomes ................................................................................................. 100
Impacts on, and predictive value of the COM-B components................................. 105
Strengths and limitations ................................................................. 106
Conclusion ...................................................................................... 107

CHAPTER THREE ........................................................................... 108

Study Two: A randomised waiting list control trial and cost-consequence analysis to examine the effects of the Move More Pack on the physical activity, self-efficacy, and health-related quality of life of UK cancer survivors

Introduction ..................................................................................... 109
Redevelopment of the Move More Pack ........................................... 109
Self-efficacy and self-identity ......................................................... 120
Study aims ....................................................................................... 120

Method ............................................................................................ 122
Design ............................................................................................ 122
Intervention .................................................................................... 122
Sample size .................................................................................... 126
Recruitment and randomisation ..................................................... 131
Procedures and assessment tools .................................................. 133
Data analysis .................................................................................. 136
Data management ......................................................................... 138
Ethical considerations .................................................................... 138

Results ............................................................................................. 140
Flow of participants ........................................................................ 140
Baseline characteristics ................................................................ 142
Sample representativeness .............................................................. 145
Outcomes ....................................................................................... 148
Cost-consequence analysis ............................................................ 157

Discussion ....................................................................................... 159
Representativeness ........................................................................ 159
The main outcomes ........................................................................ 160
Cost-consequence .......................................................................... 163
Predicting change .......................................................................... 163
Strengths and limitations .............................................................. 164
Conclusion ....................................................................................... 166
Study Three: A process evaluation of the Move More Pack

Introduction .............................................................................................................. 168
Study aims ................................................................................................................. 169
Method ......................................................................................................................... 170
Design ......................................................................................................................... 170
Procedures ................................................................................................................. 170
Data analysis ............................................................................................................ 172
Results ......................................................................................................................... 175
Quantitative analysis ............................................................................................... 175
Qualitative analysis ................................................................................................. 175
Discussion .................................................................................................................. 202
Contextualising the use of the Move More Pack .................................................. 202
Potential improvements to Pack design ............................................................... 206
Strengths and limitations ....................................................................................... 209
Conclusion ................................................................................................................ 209

Final Discussion

Influencing the Determinants of Physical Activity ........................................ 212
Practical Contributions ......................................................................................... 215
The training intervention ..................................................................................... 215
The Move More Pack ......................................................................................... 217
Theoretical Contributions .................................................................................... 219
Future Research Possibilities ............................................................................. 222
Summary ................................................................................................................. 223

References .............................................................................................................. 225
Appendices .............................................................................................................. 249
ABBREVIATIONS

AICR – American Institute for Cancer Research
ACSM – American College of Sports Medicine
ANCOVA - Analysis of Covariance
BASES – British Association of Sport and Exercise Sciences
BCT – Behaviour Change Technique
BCTTv1 – Behaviour Change Technique Taxonomy version 1
BMI – Body Mass Index
CI – Confidence Interval
COM-B – Capability, Opportunity, Motivation = Behaviour
DOH – Department of Health (UK)
GP – General Practitioner
HR – Hazard Ratio
HRQOL – Health-Related Quality of Life
MET – Metabolic Equivalent of Task
MRC – Medical Research Council
NICE – National Institute of Health and Care Excellence
NHS – National Health Service
RE-AIM – Reach, Effectiveness, Adoption, Implementation, Maintenance
SCT – Social Cognitive Theory
TTM – Transtheoretical Model
UK – United Kingdom
USA – United States of America
WCRF – World Cancer Research Fund
WHO – World Health Organisation
## LIST OF TABLES

Table 1. The incidence of cancer in the UK in 2014 by cancer type

Table 2. The prevalence of cancer in the UK in 2015 by cancer type

Table 3. The constructs of the SCT

Table 4. The constructs of the TPB that influence behavioural intentions

Table 5. The barriers and motivators to physical activity in cancer survivors

Table 6. Behavioural diagnosis using the COM-B model for the delivery of physical activity advice by healthcare professionals to cancer survivors

Table 7. Selected BCTs to bring about a change in the practice of healthcare professionals to give physical activity advice to cancer survivors

Table 8: Content of the training intervention to change the practice of healthcare professionals to deliver physical activity advice to cancer survivors

Table 9. Assessment of the COM-B components following the training intervention

Table 10. Registrations and completion of the online training seminar by professional group

Table 11. Completion of the face-to-face training seminar by professional group

Table 12. Completion of the training seminar by professional group by delivery mode and combined

Table 13. The frequency of discussions on physical activity at baseline and 12-weeks after delivery of the online training seminar

Table 14. The frequency of discussions on physical activity at baseline and 12-weeks after delivery of the face-to-face training seminar

Table 15. The frequency of discussions on physical activity at baseline and 12-weeks after training seminar delivery (face-to-face and online delivery combined)

Table 16. The frequency of discussions on physical activity by healthcare professionals at baseline by delivery mode

Table 17. The frequency of discussions on physical activity by healthcare professionals 12-weeks after training seminar delivery by delivery mode
Table 18. Post-training seminar COM-B analysis using a Likert scale from 1 (strongly disagree) to 5 (strongly agree)

Table 19. Additional BCTs to include within the revised Move More Pack

Table 20. Review of the original Move More Pack against the theoretical constructs of the SCT, the TPB, and identification of included BCTs

Table 21. The theme and BCTs used in the e-newsletters sent to users of the revised Move More Pack

Table 22. Components of the revised Move More Pack, the SCT and TPB constructs, and BCTs used

Table 23. Participant baseline characteristics

Table 24. Baseline mean scores for physical activity, self-efficacy, and HRQOL

Table 25. Age and gender standardised pre-diagnosis physical activity active classifications

Table 26. Age and gender standardised baseline physical activity active classifications

Table 27. Age of the trial sample compared to the UK population of cancer survivors

Table 28. Change in the mean physical activity scores

Table 29. Physical activity improvement ratio and number needed to treat

Table 30. Change in the mean self-efficacy scores

Table 31. Change in the mean HRQOL scores

Table 32. Intervention and control costs

Table 33. Physical activity, self-efficacy, and HRQOL outcomes at 12-weeks

Table 34. Use of the components of the revised Move More Pack

Table 35. Rating of the helpfulness of the e-newsletters in getting participants more active

Table 36. Characteristics of the participants taking part in a semi-structured telephone interview
LIST OF FIGURES

Figure 1. The cycle of fatigue (adapted from Campbell, Stevinson, & Crank, 2016)

Figure 2. The reach, adoption, and impact of an online training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors

Figure 3. The adoption and impact of a face-to-face training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors

Figure 4. The adoption and impact of a training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors (face-to-face and online delivery combined)

Figure 5. The printed component of the revised Move More Pack

Figure 6. Flow of participants through the trial

Figure 7. Mean physical activity score with 95% confidence interval at baseline, 12-weeks, and 24-weeks

Figure 8. Physical activity classification in the intervention arm at baseline, 12-weeks, and 24-weeks

Figure 9. Physical activity classification in the waiting list control arm at baseline, 12-weeks, and 24-weeks

Figure 10. Self-efficacy score with 95% confidence interval at baseline, 12-weeks, and 24-weeks

Figure 11. HRQOL score with 95% confidence interval at baseline, 12-weeks, and 24-weeks

Figure 12. The identified sub-themes within the capitalising on a teachable moment candidate theme and how they relate to context, use, and impact of the revised Move More Pack

Figure 13. The identified sub-themes for the not sure it’s for me, but it’s useful candidate theme and how they relate to context, use, and impact of the revised Move More Pack

Figure 14. The identified sub-themes for the thanks, but no thanks candidate theme and how they relate to context, use, and impact of the revised Move More Pack

Figure 15. The identified sub-themes for the physical activity is not for everybody candidate theme and how they relate to context, use, and impact of the revised Move More Pack

Figure 16. Adapted physical activity stage of change questionnaire to support the distribution of the revised Move More Pack by healthcare professionals
LIST OF APPENDICES

Appendix 1. Confidentiality agreement with Macmillan Cancer Support (Chapter Two)

Appendix 2. National Research Ethics Service guidance for Service Evaluations (Chapter Two)

Appendix 3. Participant Information Sheet (Chapter Three)

Appendix 4. Letter to the intervention arm participants (Chapter Three)

Appendix 5. Letter to the waiting list control arm participants (Chapter Three)

Appendix 6. Confirmation email for use of the FACT-G7 questionnaire (Chapter Three)

Appendix 7. Baseline and follow-up questionnaires (Chapter Three)

Appendix 8. Confirmation of ethical approval for the randomised waiting list control trial and process evaluation (Chapter Three)

Appendix 9. Interview topic guide (Chapter Four)

Appendix 10. Process evaluation qualitative data: Initial coding (Chapter Four)

Appendix 11. Additional data extracts to support the identified candidate themes (Chapter Four)
<table>
<thead>
<tr>
<th>Supplementary file</th>
<th>Description</th>
<th>Chapter/Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Training registration webpage</td>
<td>Two</td>
</tr>
<tr>
<td>2.</td>
<td>Training seminar one-week reminder email</td>
<td>Two</td>
</tr>
<tr>
<td>3.</td>
<td>Training seminar one-day reminder email</td>
<td>Two</td>
</tr>
<tr>
<td>4.</td>
<td>Presentation slides used in the training seminar</td>
<td>Two</td>
</tr>
<tr>
<td>5.</td>
<td>Reference list sent to participants</td>
<td>Two</td>
</tr>
<tr>
<td>6.</td>
<td>Coaster sent to participants</td>
<td>Two</td>
</tr>
<tr>
<td>7.</td>
<td>Script card sent to participants</td>
<td>Two</td>
</tr>
<tr>
<td>8.</td>
<td>Certificate of attendance</td>
<td>Two</td>
</tr>
<tr>
<td>9.</td>
<td>Follow-up email at eight-weeks with set goal</td>
<td>Two</td>
</tr>
<tr>
<td>10.</td>
<td>Follow-up email at eight-weeks for those who did not set a goal</td>
<td>Two</td>
</tr>
<tr>
<td>11.</td>
<td>Follow-up email at 12-weeks with a link to the final questionnaire</td>
<td>Two</td>
</tr>
<tr>
<td>12.</td>
<td>Online training promotional flyer</td>
<td>Two</td>
</tr>
<tr>
<td>13.</td>
<td>Revised Move More Pack printed component</td>
<td>Three</td>
</tr>
<tr>
<td>14.</td>
<td>Physical activity and cancer booklet</td>
<td>Three</td>
</tr>
<tr>
<td>15.</td>
<td>Pull-out 12-week activity wall chart</td>
<td>Three</td>
</tr>
<tr>
<td>16.</td>
<td>Five activity leaflets</td>
<td>Three</td>
</tr>
<tr>
<td>17.</td>
<td>Example e-newsletter</td>
<td>Three</td>
</tr>
<tr>
<td>18.</td>
<td>Screenshot of <a href="http://www.macmillan.org.uk/BeActive">www.macmillan.org.uk/BeActive</a></td>
<td>Three</td>
</tr>
<tr>
<td>19A</td>
<td>Becky – Initial transcript coding</td>
<td>Four</td>
</tr>
<tr>
<td>19B</td>
<td>Linda – Initial transcript coding</td>
<td>Four</td>
</tr>
<tr>
<td>19C</td>
<td>Katherine – Initial transcript coding</td>
<td>Four</td>
</tr>
</tbody>
</table>

^ Pseudonyms have been given to all interview participants
Supplementary file 19D². Hilary – Initial transcript coding (Chapter Four)
Supplementary file 19E². Ellen – Initial transcript coding (Chapter Four)
Supplementary file 19F². Helen – Initial transcript coding (Chapter Four)
Supplementary file 19G². Serena – Initial transcript coding (Chapter Four)
Supplementary file 19H². Lucy – Initial transcript coding (Chapter Four)
Supplementary file 19I². Penny – Initial transcript coding (Chapter Four)
Supplementary file 19J². Nigella – Initial transcript coding (Chapter Four)
Supplementary file 19K². Claire – Initial transcript coding (Chapter Four)
Supplementary file 19L². Carmen – Initial transcript coding (Chapter Four)
Supplementary file 19M². Anthony – Initial transcript coding (Chapter Four)
Supplementary file 19N². Zara – Initial transcript coding (Chapter Four)
Supplementary file 19O². David – Initial transcript coding (Chapter Four)
Supplementary file 19P². John – Initial transcript coding (Chapter Four)
Supplementary file 19Q². Danielle – Initial transcript coding (Chapter Four)
Supplementary file 20. Mapping of initial codes (Chapter Four)
Supplementary file 21. Thematic maps (Chapter Four)

² Pseudonyms have been given to all interview participants
The following peer reviewed publications and conference poster presentations highlight the previous work conducted by this author upon which this thesis was developed.


The following papers have been published as part of the body of work presented in this Thesis.


I have been working in the field of public health for 12-years with a research interest in lifestyle behaviour change in cancer care since 2014. The origins of this thesis are grounded in my previous research on physical activity behaviour change in cancer survivors, and my professional experience as a public health practitioner.

My interest is in understanding the behaviour of physical activity in cancer survivors and the barriers and motivators to becoming or staying physically active. I am interested in the identification of opportunities to intervene, to not just influence the physical activity behaviour of cancer survivors, but also the behaviour of other actors that determine the physical activity behaviour of cancer survivors.

My interest is in the application of behavioural science through a public health lens, thinking-through the individual, interpersonal, community, organisational and policy influences on physical activity in cancer survivors. I am interested in influencing large populations, understanding what works and for whom to inform the scaling up of interventions. The scaling up of interventions is described as the deliberate effort to increase the impact of health service innovations successfully tested in pilot or experimental projects to benefit more people, foster lasting policy and program development (Simmons, Fajans, & Ghiron, 2007).

The National Institute of Health and Care Excellence (NICE) state that interventions designed to change behaviour should adopt a relevant behavioural theory or theories and include a detailed inventory of the intervention content outlining intervention characteristics, and the behaviour change techniques (BCT) used (NICE, 2014a). However, Michie, Fixsen, Grimshaw, and Eccles, (2009) report that less than 30% of public health and healthcare interventions to bring about a change in behaviour describe the content, using behavioural science, in enough detail for replication and few report the impact in practice. I am interested in overcoming the know-do gap, the notion that what happens in a research setting fails to translate to real-world practices (World Health Organisation (WHO), 2006). Therefore, I endeavour to design evidence-based interventions applicable and scalable to real-world settings to improve physical activity in cancer survivors achieving the standards outlined by NICE. I have worked in a UK context throughout my career, and it is changing the physical activity behaviour of UK cancer survivors that is the focus of this thesis.
This thesis is presented in five chapters. Chapter one offers a review of the literature, divided into six sections. The first section of this chapter provides an understanding of cancer as a disease and a public health concern, including detail on its incidence and prevalence, the biology of cancer and its treatment. The second section of this chapter reviews the literature on physical activity and cancer across the cancer continuum, from prevention of cancer, through cancer treatment, living with or beyond cancer, advanced cancer, and detail on physical activity and cancer mortality and recurrence. The third section of this chapter discusses the determinants of physical activity in cancer survivors, framed within behavioural theories and models to support the identification of intervention opportunities. The identified intervention opportunities are covered in the fourth section. The fifth section of this chapter presents the scope and relevance of the research included in this thesis. The sixth section provides a summary of chapter one.

Chapter two presents the first study included within this thesis, a service evaluation investigating the reach, adoption, and impact of a training intervention to influence UK healthcare professionals to give very brief advice on physical activity to cancer survivors. This study also includes an assessment of the predictive value of the behavioural theory upon which the intervention is based, the COM-B model of behaviour (Michie, van Stralen, & West, 2011). Chapter two includes four sections covering an introduction, the method, results, and discussion.

Chapter three presents the second study within this thesis. The second study is a randomised waiting list control trial to investigate the impacts of a remote-print based intervention supported by Internet-based tools on the physical activity, self-efficacy, and health-related quality of life (HRQOL) of cancer survivors. The randomised waiting list control trial also includes a cost-consequence analysis.

Chapter four presents the third study of this thesis, a process evaluation of the remote-print based intervention supported by Internet-based tools. This process evaluation aimed to contextualise use and perceived usefulness of the intervention, supporting the identification of what works and for whom.

Chapter five then closes this thesis with a discussion on the theoretical and practical contributions of the body of research as a whole. This final chapter also includes discussion on how the interventions under assessment influence the identified determinants of physical activity in cancer survivors, and identification of future research possibilities.
CHAPTER ONE

A REVIEW OF THE LITERATURE

This chapter presents a review of the literature on physical activity and cancer, discusses opportunities to intervene to bring about a change in physical activity in cancer survivors, concluding with detail of the scope and relevance of this body of research.

CHAPTER ONE CONTENTS

Understanding Cancer 4

Physical Activity and Cancer 13

The Determinants of Physical Activity in Cancer Survivors 26

Opportunities to Intervene 56

The Scope and Importance of this Research 61

Chapter Summary 64
UNDERSTANDING CANCER

This section provides basic biology of cancer, cancer staging, and an overview of cancer incidence, prevalence and survival. In addition, this section will review cancer treatments and their side-effects.

THE BIOLOGY OF CANCER

Cancer cells do not follow normal growth-regulatory mechanisms, they rapidly grow and renew abnormally. In mature adults, cells die and recreate in balance in most organs keeping cell numbers constant. Cancerous cells no longer respond to growth-control mechanisms, giving rise to clones of cells that replicate and grow. These cells can invade other parts of the body metastasising in other organs. The rapid replication and growth of cells result in a tumour (or neoplasm), classified as either benign or malignant.

Benign tumours do not spread to other areas of the body; however, they can continue to grow at the original site and press against surrounding organs, causing issues with the working of these organs. Cells within a malignant tumour can spread from the primary site to the surrounding tissues and other areas of the body through the bloodstream or lymphatic system. These cancerous cells can spread to other sites in the body, continuing to divide in this secondary area, creating secondary cancer.

The term cancer refers to a wide-ranging group of diseases that can affect any part of the body. The major types or groups of cancer, are as follows: -

- Carcinoma - refers to malignant tumours which derive from epithetical tissue;
- Leukaemia - refers to cancers that usually originate in bone marrow and cause high numbers of abnormal white blood cells;
- Lymphoma - refers to cancers that originate within the cells of the immune system;
- Melanoma - refers to malignant neoplasms usually arising in the pigment of the skin;
- Myeloma - refers to cancers of specific white blood cells called plasma cells; and
- Sarcoma - refers to cancers within muscles, bones, connective tissue, fat and blood vessels.

Additional categories include tumours of the brain and spinal cord, germ cell tumours, neuroendocrine tumours, and carcinoid tumours. Developing cancer depends on many
factors. Cancers are caused, and change, by the interactions between a person’s genetic make-up, physical carcinogens, chemical carcinogens and biological carcinogens. Most mutations occur within individual cells. Some people may be predisposed to certain gene mutations which may be passed down from parent to child. However, as many as 40% of UK cancer cases are preventable through lifestyle changes (Parkin, 2010).

**CANCER INCIDENCE**

In the UK 356,860 new cases of cancer were diagnosed in 2014, with an even split between males and females, 51% and 49% respectively (Cancer statistics for the UK, 2015). During 2014, 163,444 people in the UK died from cancer. Incidence rates for all cancers combined in the UK have increased by 12% over the last 25-years, and more markedly in females (16% increase) than males (4% increase).

In 2014, breast, prostate, lung and bowel cancers accounted for 53% of all new cancers in the UK (Cancer statistics for the UK, 2015). Over half of all new cancer cases are in those age 70-years and older, peaking in those aged 85-years and older. Table 1 presents the incidence of cancer in the UK.

**CANCER PREVALENCE**

It is estimated that in 2015 there were 2.5-million cancer survivors in the UK (Maddams, Utley, & Moller, 2012), that is someone living with or after any form of cancer diagnosis (NCI dictionary of cancer terms, n.d.). The prevalence of cancer is expected to grow by 3.2% each year in the UK with the total number of cancer survivors expected to rise to nearly 3.8-million by 2030 (Maddams et al., 2012). By 2020 almost 1 in 2 people in the UK will develop some form of cancer during their lifetime (Macmillan Cancer Support, 2015b). Table 2 presents the prevalence of the UK’s four most commonly diagnosed cancers.
Table 1. The incidence of cancer in the UK in 2014 by cancer type

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Incidence – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>52,222 (15.5)</td>
</tr>
<tr>
<td>Prostate</td>
<td>46,690 (13.1)</td>
</tr>
<tr>
<td>Lung, Trachea and Bronchus</td>
<td>46,403 (13.0)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>41,265 (11.6)</td>
</tr>
<tr>
<td>Malignant Melanoma</td>
<td>15,419 (4.3)</td>
</tr>
<tr>
<td>Non-Hodgkin Lymphoma</td>
<td>13,605 (3.8)</td>
</tr>
<tr>
<td>Kidney</td>
<td>12,523 (3.5)</td>
</tr>
<tr>
<td>Head and Neck</td>
<td>11,449 (3.2)</td>
</tr>
<tr>
<td>Bladder</td>
<td>10,063 (2.8)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>9,618 (2.7)</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>9,543 (2.7)</td>
</tr>
<tr>
<td>Uterus</td>
<td>9,324 (2.6)</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>8,919 (2.5)</td>
</tr>
<tr>
<td>Ovary</td>
<td>7,378 (2.1)</td>
</tr>
<tr>
<td>Stomach</td>
<td>6,682 (1.9)</td>
</tr>
<tr>
<td>Liver</td>
<td>5,550 (1.6)</td>
</tr>
<tr>
<td>Myeloma</td>
<td>5,501 (1.5)</td>
</tr>
<tr>
<td>Brain, CNS, Intracranial</td>
<td>5,323 (1.5)</td>
</tr>
<tr>
<td>Thyroid</td>
<td>3,404 (1.0)</td>
</tr>
<tr>
<td>Cervix</td>
<td>3,224 (1.0)</td>
</tr>
<tr>
<td>Other</td>
<td>29,764 (8.3)</td>
</tr>
</tbody>
</table>

Source: Macmillan Cancer Support (2015b)

Table 2. The prevalence of cancer in the UK in 2015 by cancer type

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Estimated prevalence in 2015 – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>691,000 (27.8)</td>
</tr>
<tr>
<td>Prostate</td>
<td>330,000 (13.3)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>290,000 (11.7)</td>
</tr>
<tr>
<td>Lung, Trachea and Bronchus</td>
<td>72,000 (2.9)</td>
</tr>
<tr>
<td>Other</td>
<td>1,100,000 (44.3)</td>
</tr>
</tbody>
</table>

Source: Macmillan Cancer Support (2015b)
Death from cancer in the UK has shown a steady decline since 2000; however, with all cancers combined it is the leading cause of death in the UK (Public Health England, 2017).

**CANCER TREATMENT AND SIDE-EFFECTS**

The treatment received for a diagnosis of cancer depends on the type and stage of cancer. Many people will have a combination of cancer treatments. The main types of cancer treatment include surgery, radiation therapy, chemotherapy, immunotherapy, hormone therapy, stem cell transplant, targeted therapy, and precision medicine. Each treatment is now briefly covered including the potential side-effects.

**SURGERY**

Surgery involves the cutting out of a malignant tumour, or part of a tumour by a surgeon. Side-effects of surgery include pain, fatigue, appetite loss, swelling, bruising, numbness, bleeding, infection, iatrogenic infection and death.

**RADIATION THERAPY**

Radiation therapy uses high doses of radiation to reduce the size of malignant tumours by killing cancer cells, used to treat and cure cancer, or to ease cancer symptoms. Radiation therapy may be the only treatment for some cancer patients, however, radiation therapy can be used in combination with other cancer treatments, such as surgery and chemotherapy.

Radiation therapy can affect nearby healthy cells, which can result in side-effects. Depending on the areas of radiation treatment, these side-effects include hair loss, fatigue, nausea, headaches, blurred vision, skin changes, dyspnœa, trouble swallowing, reduce thyroid activity, urinary problems, sexual difficulties, and diarrhoea.

**CHEMOTHERAPY**

Chemotherapy is a systemic treatment that stops or slows the growth of malignant cells, used to treat and cure cancer or to lessen the chance of cancer returning. Chemotherapy might be used as neoadjuvant therapy to reduce the size of tumours before radiation therapy or surgery, as well as an adjuvant treatment therapy to kill malignant cells that may remain following radiation therapy or surgery. Chemotherapy can also be used to reduce the size of tumours to ease cancer symptoms.
Chemotherapy works by killing the cells within the body that are in the process of dividing into two new cells, such as cancerous cells. However, chemotherapy can also impact upon healthy cells that are continually dividing such as the cells within the hair, bone marrow which produce blood cells, the skin, and the lining of the digestive system. Side-effects of chemotherapy include hair loss, dryness of the mouth, mouth sores, nausea, and fatigue.

IMMUNOTHERAPY

Immunotherapy helps stimulate and strengthen a patient’s natural immune system to fight cancerous cells. There are many types of immunotherapy such as:

- Monoclonal antibodies which bind to specific cancerous cells causing the body’s immune system to attack these cells;
- Adoptive cell transfer which enhances the body’s T-cells, a type of white blood cell that fights cancer;
- Cytokine proteins which improve the immune system’s response to cancer; and
- Bacillus Calmette-Guerin, a weakened form of a bacteria linked to tuberculosis, which can be inserted into the bladder to encourage the immune system to fight bladder cancer.

Side-effects of immune-therapy can include fatigue and skin reactions at the needle administration sites causing pain, swelling, and a red, sore, itchy rash. Some cancer survivors may also experience flu-like symptoms, fluid retention, diarrhoea, health palpitations, sinus problems, and in some uncommon cases severe allergic reactions which can prove fatal.

HORMONE THERAPY

Some cancers, such as prostate and breast cancers, use hormones to grow. Hormone therapy, also known as hormonal or endocrine therapy prevents this by blocking the production of hormones or changes hormone behaviour.

The side-effects of hormone treatment can differ between males and females and depend on the type of hormone treatment received. For both genders side-effects can include hot flushes, loss of interest in sex, nausea, fatigue and weight gain. Common side-effects for males treated for prostate cancer include loss of ability to have sex, an enlargement of the breasts, diarrhoea, and osteoporosis. In females treated for breast cancer, additional common side-
effects include vaginal dryness, mood swings, and changes in the menstrual cycle if premenopausal.

---

**STEM CELL AND BONE MARROW TRANSPLANTS**

Stem cell and bone marrow transplantation do not directly fight against cancerous cell. It is a treatment for those that have received high dose chemotherapy or radiation therapy to restore the body’s blood-forming stem cells, destroyed due to treatment. The side-effects from high dose chemotherapy and radiation therapy are previously covered. In some forms of leukaemia and multiple myeloma, stem cell transplantation may attack the cancerous cells.

Stem cell and bone marrow transplantation are life-threatening procedures as the body’s immune system can attack the new cells. Longer-term side-effects from the transplant itself can include infertility, cataracts, thyroid problems, onset of early menopause in females, damage to the bones, damage to the lungs, and an increased risk of developing further cancers.

---

**TARGETED THERAPY**

Targeted therapies can enter or attach to cancerous cells. In doing so, this can prevent the cancer cells from dividing and growing and stop the formation of blood vessels required for tumour growth. Administered direct to the cancerous cells, targeted treatment attacks and kills these cells, or causes the cancerous cells to die as per normal healthy cells. Some hormone therapies and immunotherapies are types of targeted therapies.

Common side-effects from targeted therapy include problems with the liver, diarrhoea, fatigue, mouth sores, skin rashes, high blood pressure, blood clotting, and loss of hair colour. Most of the side-effects from targeted therapy will lessen or go away altogether after treatment has finished.

---

**FATIGUE**

Fatigue is a side-effect common across all cancer treatment and is the most widely reported and distressing consequence of cancer and its treatments across all types of cancer (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007). Cancer-related fatigue, referred to as fatigue in this document, is a physical or mental state that causes decreased motivation, lethargy, and severe tiredness (Hofman et al., 2007) and it is not predictable by treatment,
age, gender or ethnicity (Prue, Rankin, Allen, Gracey, & Cramp, Pinto; Servaes, Verhagen, & Bleijenberg, 2002). A review of 26 research papers by Servaes et al. reports that the prevalence of fatigue is as high as 99% in cancer survivors. Prue et al. support the findings of Servaes et al. in their review of 44 publications related to fatigue in cancer survivors. Prue et al. report that over 90% of cancer survivors experience fatigue during treatment with increasing intensity over time, and further, that between 19% and 38% experience extreme fatigue following treatment.

A 2012 survey by the Department of Health (DOH) of 3,300 breast, prostate, colorectal, and non-Hodgkin’s lymphoma cancer survivors, three of the four most prevalence cancers in the UK, reports that 79% of those one-year from diagnosis agreed to some degree with the statement *I get tired easily* compared to 74% of those five-years from diagnosis. The significance of these results is not reported, nor the comparison by tumour site (DOH, 2012).

It has been reported that 82% of those with lung cancer, the fourth most prevalent cancer in the UK, also experience some level of fatigue (Prue et al., 2006; Servaes et al., 2002).

Fatigue increases rest and results in cancer survivors becoming sedentary and physically inactive. This inactivity compounds the fatigue further due to the loss of physical condition which in-turn results in greater fatigue (Campbell, Stevinson, & Crank, 2016; Stone, Richards, A'Hern, & Hardy, 2001).

![Figure 1. The cycle of fatigue (adapted from Campbell, Stevinson, & Crank, 2016)](image)

Fatigue is known to have a negative impact on the HRQOL of cancer survivors across tumour sites (Berger, Gerber, & Mayer, 2012; Vijayvergia, Shah, & Denlinger, 2015). HRQOL is defined in this instance as the impact of cancer and its treatments on physical and
psychosocial functioning, and the overall well-being of cancer survivors (Zack, Moriarty, Stroup, Ford, & Mokdad, 2016).

Schmidt, Chang-Claude, Vrieling, Heinz, Flesch-Janys, and Steindorf (2011) report from a case-control study with 1,928 breast cancer survivors that those with persistent long-term fatigue have significantly worse HRQOL than those not experiencing fatigue. Schmidt et al. conclude that interventions to manage fatigue are required during and post cancer treatment. A follow-up prospective patient cohort study on the same study population by the same authors (Schmidt et al., 2015) concludes that the development of fatigue can be attributed to cancer treatment, however, it is other long-term conditions, psychological concerns, and lifestyle behaviours, particularly physical inactivity that result in long-term fatigue.

As presented in Figure 1, increased fatigue can increase sedentary time. This increase in sedentary time itself can have severe consequences in older adults such as an increase in all-cause mortality, metabolic syndrome, and body fatness (de Rezende, Rey-lopez, Matsudo, & Luiz, 2014). The impact of fatigue on the physical functioning of cancer survivors and their ability to perform normal daily activities is both widespread and profound (Hofman et al., 2007). Fatigue impacts upon the ability of cancer survivors to work, creating an additional financial burden and causing psychological distress, negatively impacting upon HRQOL (Hofman et al., 2007). Increases in fatigue have also been associated with worse disease outcomes in breast, urothelial, and colorectal cancer survivors, and those with advanced cancer (Hauser, Stockler, & Tattersall, 2006).

**HEALTH-RELATED QUALITY OF LIFE**

Cancer survivors state that their HRQOL is as important as their disease outcomes (Lee et al., 2014). HRQOL is an indicator of well-being and survival (Hauser et al., 2006) and has been shown to be a valid and worthwhile outcome in clinical trials and the surveillance of disease impacts (Zack et al., 2016).

An Australian prospective cohort study of 181 cancer survivors with advanced cancer by Shadbolt, Barresi, and Craft (2002) concludes that self-reported HRQOL is a reliable and valid predictor of survival. A systematic review by Hauser et al. (2006) supports this finding reporting improved cancer outcomes in survivors of advanced cancer with higher scores of global quality of life. A systematic review by Gotay, Kawamoto, Bottomley, and Efficace
(2008) of 36 cancer clinical trials, including a mix of cancer types, reports that overall quality of life is a better predictor of survival than other patient-reported outcome measures.

Lee et al. (2014) compare the HRQOL of South Korean cancer survivors to that of the general population concluding that cancer survivors have poorer HRQOL and should be offered support. These findings are supported by Annunziata et al. (2017) in cancer survivors five-years post diagnosis and free from cancer. A cross-sectional survey of 4,892 UK citizens, 780 of whom had a cancer diagnosis, shows that cancer survivors are significantly more likely to experience poor health and well-being than those without cancer (Elliott et al., 2011). People are now living longer with cancer; however, this does not mean that they are necessarily living well.

SECTION SUMMARY

Cancer is an uncontrolled reproduction of abnormal cells which can occur in any part of the body and may spread. It is estimated that 2.5-million people are living with or beyond cancer in the UK and this number is expected to grow to 3.8-million by 2030 (Maddams et al., 2012). The most prevalent cancers in the UK are breast, prostate, colorectal, and lung cancer (Macmillan Cancer Support, 2015b). Developing cancer depends on many factors including endogenous factors such as inherited genes, and exogenous factors such as excesses exposure to physical, chemical, or biological carcinogens. However, as many as 40% of all cancers in the UK could be prevented through changes to lifestyle behaviours (Parkin, 2011).

There are long-term consequences of cancer and its treatments, with fatigue being the most common and distressing (Hofman et al., 2007). Fatigue is compounded by a vicious circle of excess rest resulting in physical deconditioning resulting in greater fatigue (Campbell et al., 2016) which remains in the long-term. This long-term presence of fatigue has a significant negative impact on the HRQOL of cancer survivors (Elliott et al. 2011; Hofman et al. 2007), even in those free from cancer (Annunziata et al., 2017). HRQOL is a predictor of cancer outcomes (Hauser et al., 2006). HRQOL is significantly worse in cancer survivors than the general population (Elliott et al., 2011), and there is a need to intervene to improve this and fatigue during and post-treatment.
Lifestyle behaviours, such as smoking, alcohol use, an unhealthy diet, and physical inactivity are major risk factors in the development of cancer, as they are for many other non-communicable diseases (DOH, 2011). The WHO reports that Worldwide between 30% and 50% of all cancers are preventable (Cancer Key Facts, 2018). In the UK it is suggested that 40% of all cancers are preventable (Parkin, 2011).

Leading a physically active lifestyle, as an independent risk factor, reduces people's risk of developing some cancers (World Cancer Research Fund [WCRF] & American Institute for Cancer Research [AICR], 2007). Being physically active has also been shown to have many benefits for cancer survivors (Stout, Baima, Swisher, Winters-Stone, Welsh, 2017). This section will cover the evidence for physical activity and cancer across the cancer journey, including prevention, pre-treatment, treatment, post-treatment, survivorship, and in those with advanced cancer.

Physical activity is defined as “any bodily movement produced by skeletal muscles that requires energy expenditure” (WHO, 2010, p. 53). Physical activity includes: activities of daily living, such as housework and domestic chores, gardening or DIY; active recreation such as walking and cycling; and more structured exercise classes and sports (WHO, 2010).

The guidelines for physical activity for adults aged 16 to 64-years in the UK are as follows (DOH, 2011):

- To perform a minimum of 150-minutes of moderate-intensity activity over the course of one week, in bouts of 10-minutes or more; or to perform a minimum of 75-minutes or more of vigorous activity over the course of one week, or a combination of the two.
- To perform physical activity to improve muscle strength on at least two occasions each week.
- To keep sedentary time to a minimum.

For adults aged 65-years and over, the guidelines also incorporate physical activities to improve balance and coordination on at least two-days-a-week (DOH, 2011).

Moderate-intensity physical activities are those which are between three and six Metabolic Equivalents of Task or METs (WHO, 2011). One MET refers to the amount of energy expended at rest, so an activity with a MET value of five, such as brisk walking, expends
five-times the energy (or the number of calories) than at rest. Activities of daily living, for example hoovering, are rated as three METS, golf four METs, and cycling six METS (DOH, 2004). Physical activities over six METs are classified as vigorous intensity and includes activities such as swimming (eight METS), and brisk running (13 METS) (DOH, 2004).

Courneya and Friedenreich (2001, 2007) created a physical activity and cancer control framework to discuss the literature regarding physical activity across the cancer journey. Their physical activity and cancer control framework (Courneya & Friedenreich, 2001, 2007) covers the following areas:

1. Physical activity and cancer prevention;
2. Physical activity and preparing for cancer treatment;
3. Physical activity during treatment;
4. Physical activity to attenuate the consequences of cancer and its treatment;
5. Physical activity and cancer mortality and recurrence; and

The literature regarding physical activity and cancer across the areas of the physical activity and cancer control framework is now presented with a focus where possible on meta-analysis or systematic review-level evidence.

**PHYSICAL ACTIVITY AND CANCER PREVENTION**

Whilst this thesis focuses on physical activity in cancer survivors, the literature concerning physical activity and cancer prevention is still relevant regarding the prevention of second primary cancers. Meeting the recommendations for physical activity can help to prevent and manage 21 chronic conditions including coronary heart disease, stroke, type 2 diabetes, obesity, mental health problems, musculoskeletal conditions, as well as reducing the risk of some cancers (DOH, 2011). Cancer does not occur in isolation, 70% of cancer survivors are living with at least one other long-term condition, 47% with two other long-term conditions and 29% three or more (Macmillan Cancer Support, 2015a). The most common long-term conditions in cancer survivors are estimated to be high blood pressure, obesity, mental health problems, and heart disease (Macmillan Cancer Support, 2015a), all of which can be helped by performing physical activity to recommended levels (DOH, 2011).
A 2007 systematic review and meta-analysis, conducted by the WCRF in partnership with the AICR, concludes that there is convincing evidence that physical activity protects against colon cancer (relative risk reduction of 30-40%) and probable evidence that physical activity protects against post-menopausal breast cancer (relative risk reduction of 20-30%) and endometrial cancer (relative risk reduction of 30%) (WCRF & AICR, 2007). In addition, the WCRF and the AICR report limited but suggestive evidence to support the role of physical activity in the primary prevention of cancers of the lung, pancreas, and breast in pre-menopausal women.

A dose-response relationship has been reported with those more active having a lower risk of cancer (Li et al., 2016; Thune & Furberg, 2001; Wannamethee, Shaper, & Walker, 2001). A 2016 meta-analysis by Moore et al. (2016) pooled data from 12 European and USA prospective cohort studies using self-reported physical activity to identify the association of leisure-time physical activity with the risk of cancer in 1.4-million adults including 186,932 cancer cases. Moore et al. conclude that higher levels of physical activity are associated with a lower risk of developing 13 cancers including bladder, breast, colon, endometrial, gastric cardia, head and neck, kidney, liver, lung, myeloid leukaemia, myeloma, oesophageal adenocarcinoma and rectal cancer. Moore et al. suggest an association between higher levels of physical activity and a reduced risk of cancer of the gallbladder, non-Hodgkin lymphoma and cancer of the small intestine. No impact is reported from physical activity on cancers of the brain, oesophageal squamous, thyroid, soft tissue, pancreas, lymphocytic leukaemia, or ovary, and there is a reported risk increase for malignant myeloma (from increased sun exposure) and prostate cancer. Findings from the Australian Cancer, Lifestyle, and Evaluation of Risk Study (Nunez, Bauman, Egger, Sitas, & Nair-Shalliker, 2017), a case-control study of 6,831 cancer cases and 1,992 controls supports these findings, however, only a weak association exists between physical activity and an increased risk of prostate cancer.

The recommendation from the WCRF & AICR (2007) to reduce cancer risk is to limit sedentary time and be moderately active for at least 30-minutes-a-day, equivalent to brisk walking, guidelines similar to those in the UK (WCRF & AICR, 2007).

As well as protecting against cancer, physical activity has many benefits for cancer survivors. Studies investigating the benefits of physical activity for cancer survivors have been accumulating since the mid-1980s. Historically, cancer survivors have been told to rest and avoid physical activity, however, the growing body of research challenges this advice.
A recent systematic review of exercise systematic reviews in the cancer literature by Stout et al. (2017) supports these findings and concludes that physical activity can help cancer survivors tolerate difficult treatments such as surgery and chemotherapy, improve clinical and functional outcomes, and in some cancers improve survival outcomes. Stout et al. suggest that physical activity should be recommended to cancer survivors regardless of cancer type or stage but with screening in place to identify those that may need medical approval before increasing physical activity.

The American College of Sports Medicine (ACSM) advise cancer survivors to avoid inactivity and return to normal daily activities, as soon as possible after surgery and during cancer treatments adhering to the standard age-appropriate physical activity guidelines (Schmitz et al., 2010), advice that is mirrored by the British Association of Sport and Exercise Sciences (BASES) (Campbell, Stevinson, & Crank, 2012). BASES further recommend that cancer clinicians provide person-centred advice on physical activity to cancer survivors to help increase levels of physical activity and reduce sedentary time (Campbell, Stevinson, & Crank, 2012).

**PHYSICAL ACTIVITY AND PREPARING FOR CANCER TREATMENT**

A systematic review by Singh, Newton, Galvao, Spry, and Baker (2013) of 18 randomised control trials investigating the impacts of pre-treatment physical activity, including a total of 966 cancer survivors, suggests promising results. Singh et al. conclude that physically fit individuals are less likely to experience surgical complications, have higher rates of cardiorespiratory fitness, a quicker return to continence (where a consequence of treatment), improved HRQOL, and a shorter hospital stays.

A 2016 meta-analysis by Sebio Garcia, Yáñez Brage, Giménez Moolhuyzen, Granger, and Denehy (2016) investigates the effect of a preoperative physical activity intervention on physical function before surgery and post-surgical outcomes in lung cancer survivors. Sebio Garcia et al. (2016) observe that participants involved in a pre-surgical physical activity intervention, in comparison to participants receiving standard care, have improved pulmonary function, spend on average 4.8-days less in hospital, and have a significant reduction in post-surgical complications.
The role of oncology nurses in the promotion of physical activity in the prehabilitation phase is discussed by Shun (2016) in a review article. Shun highlights that oncology nurses can influence physical activity in cancer survivors before treatment. Shun goes on to state that for this to occur, oncology nurses need support in improving their knowledge of the benefits of physical activity for cancer survivors and an understanding of how to access interventions to support change with many cancer survivors waiting for surgery at home. Physical activity pre-treatment should be recommended particularly to those who are due to undergo surgery, but also more broadly for the wider health benefits.

**PHYSICAL ACTIVITY DURING TREATMENT**

Cancer survivors manage their health on a daily basis creating expertise by experience. The ability of cancer survivors to self-manage their condition is becoming increasingly important as the prevalence of cancer continues to increase. Physically active cancer survivors report a sense of taking back control of their health and lives (Larsson, Jönsson, Olsson, Gard, & Johansson, 2008; Maley, Warren, & Devine, 2013; Webb, 2016; Webb, Smerald, Ardid, Fu & Toombs, 2016). Further, there is evidence to support the role of physical activity in self-management of the disease during and post-treatment (Speck, Courneya, Mâsse, Duval, & Schmitz, 2010; van Dijck, Nelissen, Verbelen, Tjalma, & Gebruers, 2016). Self-management in this respect is defined as the provision of education and intervention by healthcare professionals, including regular assessment, goal-setting and problem-solving, to increase the skills and confidence of cancer survivors in managing their condition (McCorkle et al., 2011).

Speck et al. (2010) present a comprehensive review and meta-analysis of 33 control trials deemed to have high internal validity involving physical activity performed during treatment for cancer. The majority of the control trials included within this review report on outcomes for breast cancer survivors (n = 26), with prostate cancer, lung cancer, and leukaemia also covered. This meta-analysis by Speck et al. shows a series of small yet significant beneficial effects of being active during treatment. Significant improvements are observed for physical activity level, aerobic fitness, upper and lower body strength, body weight, body fat percentage, self-esteem, and positive mood. Overall HRQOL saw improvement in all ten included studies reporting on this outcome; however, the pooled results show improvement just outside the significance range ($p = .06$).
A more recent systematic review conducted by Chipperfield, Brooker, Fletcher, and Burney (2014) reports similar findings specifically in prostate cancer survivors undergoing androgen deprivation therapy. Chipperfield et al. support the use of physical activity as an intervention to improve the HRQOL of prostate cancer survivors undergoing treatment. However, Chipperfield et al. conclude that despite positive preliminary findings the existing evidence is not sufficiently robust to provide support for physical activity as an intervention to improve depression, anxiety, or cognitive function in prostate cancer survivors.

A 2014 Cochrane systematic review and meta-analysis conducted by Bergenthal et al. (2014) involving 818 haematological cancer survivors in treatment from nine randomised control trials assess the impact of physical activity on a range of outcomes. Bergenthal et al. report improvements in physical function, HRQOL, fatigue, and depression, from an increase in physical activity.

There are clear benefits of being active during cancer treatment particularly for the maintenance of physical function and possible improvements in HRQOL. Cancer care professionals should encourage cancer survivors to become and stay physically active during treatment following the recommendations of BASES (Campbell and Stevinson et al., 2012) and the ACSM (Schmitz et al., 2010).

**PHYSICAL ACTIVITY TO ATTENUATE THE CONSEQUENCES OF CANCER AND ITS TREATMENTS**

Higher levels of physical activity have been shown to impact positively on many of the consequences of cancer and its treatments. Fong et al. (2012) present a systematic review and meta-analysis of 34 randomised control trials of physical activity interventions against standard care, covering a mix of tumour sites. The physical activity interventions included within the review by Fong et al. are mainly aerobic (n = 33 of 34 included control trials). Fong et al. report a significant improvement in mental well-being, physical functioning, physical fitness, and HRQOL, and a significant reduction in depression for those in receipt of a physical activity intervention over participants receiving standard care. Further, Fong et al. suggest that physical activity is associated with a small yet significant reduction in body mass index (BMI), body weight, and a small yet significant improvement in fatigue.

The findings by Fong et al. (2012) are in support of a review by Speck et al. (2010) who report post-treatment improvements in physical fitness and strength, body weight, BMI, body
image, mood, confusion, HRQOL and fatigue. The findings by Fong et al. are also in support of the results of a Cochrane review by Cramp and Daniel (2008) investigating fatigue in cancer survivors. Cramp and Daniel include 56 studies and 4,068 participants in their review, reporting that aerobic physical activity benefits fatigue during and post-treatment in breast and prostate cancer survivors. The findings by Cramp and Daniel concerning prostate cancer survivors are supported by a more recent systematic review by Larkin, Lopez, and Aromataris (2013). Cramp and Daniel did not find an improvement in fatigue in those with a haematological malignancy; however, this is disputed by a more recent Cochrane review by Bergenthal et al. (2014).

A meta-analysis published in the Cochrane library by Mishra et al. (2012) investigates the influence of physical activity on HRQOL in 3,694 cancer survivors across a mixture of tumour sites from 40 studies. The results suggest that physical activity has a small yet significant positive effect on HRQOL and levels of fatigue in cancer survivors over control comparisons at six-month follow-up. In addition, Mishra et al. report significant improvements in body image and self-esteem, social functioning, and sexuality at six-month follow-up. Mishra et al. also report significant improvements in emotional well-being, sleep disturbances, anxiety, and pain in the physical activity groups, compared to control comparisons over 12-weeks.

Cormie, Zopf, Zhang, and Schmitz (2017) in a review of 100 studies including epidemiological evidence, systematic reviews, meta-analyses, and randomised control trials, support the role of physical activity in the management of post-treatment fatigue in breast and colorectal cancer survivors, but not in those with haematological malignancies. Cormie et al. (2017) report improvements in bone health, bladder function, bowel function, and sexual function in breast and prostate cancer survivors, and cognitive function in breast cancer survivors with higher levels of physical activity. Also, Cormie et al. report a significant positive impact of physical activity on HRQOL in breast and haematological cancer survivors, but not for prostate, lung, gynaecological, or colorectal cancers.

The current evidence investigating physical activity in cancer survivors after completion of active treatment is under-represented for the less common cancers, with an over-representation of breast cancer survivors. The balance of the evidence suggests that physical activity improves physical fitness, helps maintain healthy body composition, increases positive views of body image, improves physical and sexual functioning, and helps maintain
bone and heart health. Further, physical activity can improve mental well-being, combat depression and anxiety, increase self-esteem, and social functioning. The current evidence also highlights the role of physical activity in improving bladder and bowel function in those cancer survivors for whom this is an issue.

The most reported consequence of cancer and its treatments is fatigue, and this too is suggested to improve with higher levels of physical activity, although maybe not for those with a haematological malignancy such as leukaemia, or lymphoma. HRQOL, reported by cancer survivors to be as important as cancer outcomes, is suggested to improve by being physically active; although currently available evidence is not conclusive for prostate, lung, colorectal, or gynaecological cancer survivors.

### PHYSICAL ACTIVITY AND CANCER MORTALITY AND RECURRENCE

The first epidemiological study investigating the link between physical activity and cancer outcomes was published in 2005 by Holmes, Chen, Feskanich, Kroenke, and Colditz (2005). Holmes et al. report on the outcomes of 2,987 women diagnosed with breast cancer with an average follow-up of eight-years. The results suggest a 35% relative risk reduction in all-cause mortality, a 40% relative risk reduction for breast cancer-specific mortality and a 26% relative risk reduction for breast cancer recurrence, for the most physically active (greater than 24 MET-hours-per-week) compared to the least physically active (less than 3 MET-hours-per-week).³

Li et al. (2016) conducted a meta-analysis of 36 prospective cohort studies including 66,995 cancer survivors across a mix of cancers assessing the association between physical activity and cancer mortality. Li et al. report that high amounts of physical activity provide a significant protective effect of death from cancer ($HR = 0.78$ [95% CI = 0.72-0.84]), with greater protection reported from physical activity post-diagnosis than pre-diagnosis (pre-diagnosis $HR = 0.60$ [95% CI = 0.50-0.71]; post-diagnosis $HR = 0.86$ [95% CI = 0.80-0.92]). The pooled results show a non-linear inverse relationship between physical activity and cancer mortality, with a rapid decline in the cancer mortality hazard ratio of 2% for every

---
³ One MET-hour equates to sitting at rest for one hour. Three MET-hours equates to walking at a speed of 2 to 3 miles-per-hour for one hour.
one MET-hour-per-week increase in physical activity up to 10 MET-hours-per-week, before beginning to plateau. Compared to physically inactive cancer survivors, cancer survivors physically active to five MET-hours-per-week have an 18% reduction in cancer mortality, a 25% reduction if active to 10 MET-hours-per-week, a 27% reduction if active to 15 MET-hours-per-week, with a further 1% risk reduction for every increase of five MET-hours-per-week of activity up to 30 MET-hours-per-week. These findings are supported by Cormie et al. (2017) who report a 25% to 48% reduction in all-cause mortality, a 28% to 44% reduction in cancer-specific mortality and a 21% to 35% reduction in cancer recurrence in the cancer survivors with the highest levels of post-diagnosis physical activity compared to those inactive.

The evidence presented in this section suggests a strong association between higher levels of physical activity and a reduced risk of all-cause mortality, cancer-specific mortality, and cancer recurrence with a dose-response relationship suggested. Those physically inactive or with low levels of physical activity have the most to gain and see the greatest risk reductions across these three measures.

**PHYSICAL ACTIVITY AND PALLIATION**

The benefits of being physically active are not just limited to those cancer survivors with a good prognosis. A systematic review from Dittus, Gramling, and Ades (2017) of a small but growing body of evidence observes that physical activity improves cardiovascular fitness, physical function, fatigue, and HRQOL in cancer survivors with advanced disease. The findings from Dittus et al. (2017) are in support of an earlier systematic review by Albrecht and Taylor (2012).

Albrecht and Taylor (2012) raise the importance of oncology nurses discussing physical activity with cancer survivors, including those with advanced cancer, providing education, and signposting to more support. Albrecht and Taylor further state that increased physical activity in cancer survivors with advanced disease has the potential to reduce the length of hospital stays, and consequently reduce care costs. Albrecht and Taylor conclude that physical activity is safe and feasible in cancer survivors with advanced cancer; that cancer survivors with advanced cancer are indeed interested in physical activity interventions, and support should be provided to enable them to become active should they choose.
THE SAFETY OF PHYSICAL ACTIVITY FOR CANCER SURVIVORS

In 2010, the ACSM convened a roundtable of multidisciplinary experts to review the extant literature on the safety and efficacy of physical activity for cancer survivors and to provide guidelines for physical activity during and after adjuvant cancer therapy (Schmitz et al., 2010). The guidelines for physical activity in cancer survivors and the efficacy of physical activity across the cancer journey has been reported earlier in this chapter. The expert panel assembled by the ACSM concludes that physical activity is safe for cancer survivors both during and after cancer treatments, including intensive life-threatening treatments such as bone marrow transplants (Schmitz et al., 2010). However, some cancer survivors may need to obtain permission from their cancer care team before becoming physically active in case special precautions are necessary (Irwin, 2012; Schmitz et al., 2010; Stout et al., 2017), being:

- Those less than eight-weeks post-surgery;
- Those experiencing extreme fatigue, anaemia or severe balance and coordination problems;
- Those with cancer in their bones or bone thinning;
- Those with a heart or lung condition;
- Those with pain in their chest at rest, during your daily activities or when becoming active;
- Those with persistent pain muscles, bones or joint pain; and
- Those with swelling or inflammation in the abdomen, groin, or lower extremity.

Further, it is advised that cancer survivors with arm lymphedema wear well-fitting compression garments, colon cancer survivors should avoid exercises that increase abdominal pressure, and those with a stoma should avoid participation in contact sports and weight training (Schmitz et al., 2010, Irwin, 2012).

THE PHYSICAL ACTIVITY LEVELS OF CANCER SURVIVORS

Surveillance data on the physical activity levels of the general population across the UK is regularly collected (Physical Activity, 2018), however, routine surveillance of physical
activity in cancer survivors is not undertaken. The best available evidence is from a DOH survey conducted in 2012 of 3,300 breast, colorectal, prostate, and non-Hodgkin’s lymphoma cancer survivors in England. Using a self-reported single-item measure of physical activity, the DOH survey reports that 23% of cancer survivors are active to recommended levels for aerobic physical activity, 46% are active but not to recommended levels, and 31% are completely inactive. Of the 46% reporting some physical activity but not meeting the recommendations (measured in this instance as 5 x 30-minutes of moderate-intensity activity), 10% are performing only 30-minutes of moderate-intensity activity a-week, 15% are active for 30-minutes on at least two-days-a-week, 14% on at least three-days-a-week and 8% on at least four-days-a-week. Similar findings are observed in US cancer survivors with Blanc, Courneya, and Stein (2008) reporting that between 29% and 47% meet the recommendations for physical activity.

A 2016 survey conducted by this author and colleagues of a cross-section of 1,011 UK cancer survivors reports similar figures to that of DOH (2012) with 23% of cancer survivors active to recommended levels for aerobic physical activity and 26% inactive (Webb, 2016; Webb & Smerald et al., 2016). The survey conducted by this author and colleagues (Webb et al., 2016; Webb & Smerald et al., 2016) also reports that 13% of cancer survivors are active for only 30-minutes on one-day-a-week, 15% are active for 30-minutes on two-days-a-week, 13% on three-days, and 10% on four-days-a-week (Webb, 2016, Webb & Smerald et al., 2016).

Research has also explored whether physical activity decreases after the diagnosis of cancer. A French cohort study of 942 cancer survivors of mixed tumour sites reports a significant reduction in overall and vigorous self-reported physical activity following a cancer diagnosis (Fassier et al., 2016). Fassier et al. observe that sitting time significantly increases by an average of 2.44-hours-per-day following a diagnosis of cancer. Blanchard et al. (2003) from a survey of 352 adult cancer survivors across a mix of tumour sites report a 30% reduction in physical activity following a diagnosis of cancer. Irwin et al. (2003) also indicate that physical activity is significantly lower following the diagnosis of breast carcinoma. However, Hsu et al. (2012) in a longitudinal study with repeat-measures of 196 breast cancer survivors over 6-months, report that 40% state that their physical activity levels increase as a result of their cancer diagnosis compared to 13% who report a decreased.

Lynch, Cerin, Newman, and Owen (2007) in a study of 1,996 colorectal cancer survivors report that 21% fewer cancer survivors meet the physical activity guidelines following a
diagnosis of cancer. The findings from Lynch et al. (2007) are supported by Chung et al. (2013) in a survey of 431 colorectal cancer survivors, reporting a decrease from 27% meeting the physical activity guidelines to 10% following cancer diagnosis. Branstrom, Petersson, Saboonchi, Wemmman-Larsen, and Alexanderson (2015) report that only one-third of breast cancer survivors are active to recommended levels soon after diagnosis, reducing further 24-months after diagnosis.

The best available evidence on the physical activity levels of cancer survivors in comparison to the general population in the UK is from a large comparative study of 16,282 Scottish individuals, 922 of whom had a cancer diagnosis, by Wang, McLoone, and Morrison (2014). Wang et al. report that cancer survivors are 22% less likely to take part in at least two hours of physical activity per week (45% to 35% respectively).

The evidence suggests that physical activity decreases following a diagnosis of cancer and does not increase again to pre-diagnosis levels. However, there is some evidence to suggest that cancer may be a catalyst for change in some survivors which may result in increases in physical activity.

SECTION SUMMARY

Increasing physical activity before the start of treatment may help cancer survivors tolerate difficult treatments such as surgery and chemotherapy, and slow the decline in physical function (Singh et al., 2013). Prehabilitation is not commonplace in oncology practice, and the evidence to support its inclusion, whilst increasing, is still in its infancy. The current evidence suggests that physical activity can improve functional recovery post-treatment, reduce complications following surgery, and reduce the length of hospital stay (Singh et al., 2013).

The evidence supports the role of physical activity in the self-management of cancer (Speck et al., 2010). Physical activity can improve many common side-effects of cancer treatment, both during and following treatment, including fatigue, psychological distress, and an adverse impact on body composition, as well as improving physical function and HRQOL (Fong et al., 2012; Schmitz et al., 2010; Speck et al., 2010). Physically active cancer survivors report a sense of regaining control of, and some normalcy in, their lives following cancer diagnosis (Larsson et al., 2008; Maley et al., 2013; Webb, 2016; Webb & Smerald et al., 2016).
Increased physical activity is associated with improved survival and reduced disease recurrence with a dose-response relationship reported (Cormie et al., 2017; Li et al., 2016).

Being physically active is safe and adverse events are uncommon; however, cancer survivors should be screened for those that may need medical permission before becoming physically active (Irwin, 2012; Schmitz et al., 2010; Stout et al., 2017). The ACSM (Schmitz et al., 2010) and BASES (Campbell and Stevinson et al., 2012) advise cancer survivors to avoid inactivity and return to typical daily activities as soon as possible after surgery and during and after cancer treatments, working toward the standard age-appropriate physical activity guidelines.

Despite the benefits of being physically active, only 23% of cancer survivors in England are active at recommended levels, and 31% are completely inactive (DOH, 2012). Recommendations have been made to integrate physical activity into cancer care (Schmitz et al., 2010; Speck et al., 2010).
THE DETERMINANTS OF PHYSICAL ACTIVITY IN CANCER SURVIVORS

Changing behaviour to become physically active is difficult, particularly for people who have had a cancer diagnosis. Theories from the fields of social, educational, and health psychology are relevant in the field of physical activity behaviour change, and interventions that are theory-based are shown to be more effective than those that are not (Gourlan et al., 2015).

It is recommended by the Medical Research Council (MRC) that complex behaviour change interventions are systematically developed, based on relevant theory or theories and the best available evidence (Craig, Dieppe, Macintyre, Michie, Nazareth & Patticrew, 2008). The guidance from the MRC suggests that to develop effective interventions a full range of options should be considered in an orderly fashion using an appropriate and rational system (Craig et al., 2008).

A 2015 meta-analysis by Gourlan et al. report the most utilised causal theories to explain physical activity behaviour within the general population to be the Social Cognitive Theory (SCT) (Bandura, 1989) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991). These are also the most utilised causal theories in the study of physical activity behaviour change in cancer survivors (Basen-Engquist, Perkins, Hughes, 2012; Bluethmann, Bartholomew, Murphy, & Vernon, 2016; Pinto and Ciccolo, 2011; Stull, Snyder, & Demark-Wahnefried, 2007). In addition, the Transtheoretical model of behaviour (TTM) (Prochaska, & DiClemente, 1983) is identified as a useful model to explain the process of physical activity behaviour change in both the general population (Gourlan et al., 215) and in cancer survivors (Basen-Engquist, Perkins, Hughes, 2012). Marcus and Forsyth (2009) have advanced the TTM to create a physical activity specific stage of change model, a model to explain change, but not the determinants of physical activity.

The SCT (Bandura, 1989) emphasises the interaction between people and their environments, stating that behaviours, environmental factors, and personal factors are mutually influential. Knowledge is a core determinant of behaviour and is seen a prerequisite to change, however, it may not be enough to change behaviour on its own. The core behavioural determinants of the SCT as interpreted by McAlister, Perry, and Parcel (2008) are outcome expectations, perceived self-efficacy and collective efficacy, self-regulation (including goal-setting), observational learning, incentive motivation, and moral disengagement. The constructs of the
SCT as interpreted by McAlister et al. (2008) are presented in Table 3. The TPB (Ajzen, 1991) states that behaviour is predicted by intention, which is influenced by attitude, subjective norm, and perceived control. The constructs of the TPB are presented in Table 4.

Table 3. The constructs of the SCT

<table>
<thead>
<tr>
<th>Construct</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reciprocal determinism</td>
<td>Individuals and groups are influenced by their environment, but can also influence their environments to regulate behaviour</td>
</tr>
<tr>
<td>Outcome expectations</td>
<td>Beliefs about the consequences and likely outcomes of behaviour</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>A confidence in one’s ability to perform a behaviour, and belief in one’s ability to overcome the barriers to that behaviour</td>
</tr>
<tr>
<td>Collective-efficacy</td>
<td>Confidence in a group’s ability to perform a behaviour, and belief in a group’s ability to overcome the barriers to that behaviour</td>
</tr>
<tr>
<td>Observational learning</td>
<td>Learning behaviour by watching others</td>
</tr>
<tr>
<td>Incentive motivation</td>
<td>Behavioural modification using rewards and punishments</td>
</tr>
<tr>
<td>Facilitation</td>
<td>Behavioural modification using tools and resources</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>Use of self-monitoring, goal-setting, social support, self-instruction and self-reward to change and control behaviour</td>
</tr>
<tr>
<td>Moral disengagement</td>
<td>Diffusion of responsibility from harmful behaviours making suffering acceptable</td>
</tr>
</tbody>
</table>

Source: McAlister, Perry, and Parcel (2008)

Table 4. The constructs of the TPB that influence behavioural intentions

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>Attitude is influenced by the beliefs one has about the consequences of behaviour, an evaluation of the outcomes, and likelihood of these consequences</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>An individual’s subjective norm is influenced by their normative beliefs, that is, the approval or disproval of behaviour by referent others, and a motivation to comply with these referent others</td>
</tr>
<tr>
<td>Perceived control</td>
<td>An individual’s perceived control over behaviour is influenced by their beliefs about their control over the barriers and facilitators, or determinants of that behaviour, and their perceived power over these determinants</td>
</tr>
</tbody>
</table>

Source: Ajzen (1991)
A systematic review of physical activity interventions in cancer survivors by Bourke et al. (2013) highlights the need for better use of behavioural theories to influence intervention design and delivery. No one theory is perfect in all situations, and the selection of an appropriate theory can be difficult. Often multiple theories are required to explain and bring about change (Glanz, Rimer, and Viswanath, 2008).

Physical activity interventions targeting inactive individuals have had some success in the general population but have done little to bring about a population-level change (Buchan, Ollis, Thomas, & Baker, 2012; Foster, Hillsdon, Thorogood, Kaur, & Wedatilake, 2005). Therefore, it is necessary to take a broad approach to change physical activity behaviour, focusing on the behaviours not just of cancer survivors, but also the behaviours of the actors that can influence physical activity in cancer survivors.

The most successful approach to changing health-related behaviours are those that intervene not just with individuals but also at a community and systems level. Successful approaches are based on a thorough understanding of the barriers and the facilitators to the desired behaviour, and the context in which the behaviour occurs (Buchan et al., 2012; Glanz et al., 2008; Trinh et al., 2015). A socio-ecological approach looks to understand the determinants of behaviour at an individual, interpersonal, organisational, community, and policy level (McLeroy, Bibeau, Steckler, & Glanz, 1988). A description of each level of influence in a socio-ecological model is as follow:

1. Individual level: Includes the knowledge, attitudes, past behaviours, and the characteristics of individuals such as age and gender.
2. Interpersonal level: Includes support from family and friends, and inclusion in social networks.
3. Community level: Includes the wider community and environmental influences, for example, access to facilities.
4. Organisational level: Includes interactions with, and the rules and regulations of institutions, for example, healthcare organisations.
5. Policy level: Includes the influences of local, national or international policy on behaviour.

Taking a social-ecological approach when developing an intervention strategy recognises the complex interactions between a person and the context in which they live their lives (Sallis,
Owen, & Fisher, 2008). Knowledge of the widespread influences on physical activity can enable development of multilevel interventions to improve the likelihood of successful behavioural change (Bauman, Reis, Sallis, Wells, Loos, & Martin, 2012).

Reviews of the barriers and facilitators to physical activity in cancer survivors have been completed, but none comprehensively cover all levels of influence as identified in a socio-ecological model. The most recent systematic review, at the time of writing, of the barriers and facilitators to physical activity in cancer survivors is by Clifford et al. (2018) including 19 studies (nine qualitative and ten quantitative) but lacks a comprehensive discussion of the broad influences across multiple levels.

Kampshoff et al. in their 2014 systematic review, do adopt a socio-ecological approach to review the demographic, physical, psychological, social and environmental factors influencing exercise adherence and maintenance in cancer survivors. However, Kampshoff et al. do not include a discussion of the potential political influences on exercise adherence and maintenance in cancer survivors. There are few examples of an application of a socio-ecological approach to physical activity in cancer survivors within the literature. Lynch, Owen, Hawkes, and Aitken's (2010) research in colorectal cancer survivors, and the work of Trinh et al. (2015) in kidney cancer survivors are the only two studies to the knowledge of this author at the time of writing to use a socio-ecological approach in their primary research. No review level evidence adopting a socio-ecological approach is found for the determinants of physical activity in cancer survivors.

The MRC suggest that selection of theories, models, and frameworks for understanding behaviour should be logical, coherent, with previous use within the area of investigation (Craig et al., 2008). The MRC’s guidance goes further to state that many competing and overlapping theories may warrant consideration (Craig et al., 2008). Therefore, the TPB (Ajzen, 1991) and the SCT (Bandura, 1989) considered within a socio-ecological framework (Sallis, Owen, & Fisher, 2008) is judged by this author to be a logical, coherent, and systematic way to review the literature on the determinants of physical activity in cancer survivors.

For completeness, all constructs identified in Tables 3 and Table 4 for the TPB (Ajzen, 1991) and the SCT (Bandura, 1989; McAlister et al., 2008) respectively will now be discussed in relation to the literature on the barriers and facilitators to physical activity in cancer
survivors. The identification and links to the TPB and SCT constructs are provided in italics. The literature is presented under the social-ecological headings of individual, interpersonal, community, organisational, and policy influences on physical activity in cancer survivors.

INDIVIDUAL BARRIERS AND FACILITATORS OF PHYSICAL ACTIVITY

This section will cover the drivers of physical activity, and also the barriers to physical activity in cancer survivors at an individual level.

KNOWLEDGE OF PHYSICAL ACTIVITY IN THE CONTEXT OF CANCER

Systematic review evidence suggests that cancer survivors have a lack of knowledge and information about why physical activity is important for them and their condition (Clifford et al., 2018). Cancer survivors report not knowing what is safe and what is effective in regards to physical activity (Clifford et al., 2018). Further, some cancer survivors and their family members are sceptical about the evidence for physical activity (Webb, 2016; Webb & Smerald et al., 2016). Fifty-nine per cent of cancer survivors state that they would be more physically active if they had access to better information on physical activity related to their condition. Forty-three per cent of cancer survivors are at least sometimes unaware of the appropriate level of physical activity and 34% report not knowing what is safe which leads to anxieties about becoming more physically active (Webb, 2016; Webb & Smerald et al., 2016). In some cases, this lack of knowledge creates an irrational fear that physical activity might in some way increase the risk of cancer recurrence (Alfano & Rowland, 2006).

Cancer survivors associate the term physical activity with moderate to high-intensity formal exercise such as running or going to the gym (Webb, 2016; Webb & Smerald et al., 2016). Often lower intensity and non-formal activities, for example, household chores, gardening, or walking the dog, are not thought of as physical activities (Webb, 2016; Webb & Smerald et al., 2016). Hefferon, Murphy, McLeod, Mutrie, and Campbell (2013) report that cancer survivors who do not consider themselves as the sporty type are less likely to become and

---

4 To increase the flow and readability of the remainder of this chapter the references for the TBC and the SCT (being Ajzen (1991) for the TPB and Bandura (1989) as interpreted by McAlister et al. (2008) for the SCT) are not included in-text.
stay active. Cancer survivors relate increases in physical activity with strenuous exercise, often stating that it is not achievable or appropriate because of their condition (Webb, 2016; Webb & Smerald et al., 2016). Improving the knowledge of cancer survivors on the importance of physical activity for their condition including what is safe and the guidelines, could create a positive attitude and outcome expectations toward becoming more active.

It is reported that 80% of cancer survivors are interested in receiving lifestyle advice (Demark-Wahnefried, Peterson, McBride, Lipkus, & Clipp, 2000; Trinh, Plotnikoff, Rhodes, North, & Courneya, 2012). Information should be explicitly provided on the importance of physical activity for cancer survivors (Henriksson, Arving, Johansson, Igelström, & Nordin, 2016), redefining understanding of the term physical activity focusing on moving more, increasing everyday activities, and reducing sitting time (Webb, 2016; Webb & Smerald et al., 2016). The term exercise is considered out of reach for those not engaged in formal exercise before diagnosis (Webb, 2016; Webb & Smerald et al., 2016). An understanding that physical activity is not just exercise or sport, but rather any activity that expends energy which can be incorporated into the activities of daily living, may put what seems out of reach back into the control of cancer survivors, increasing their self-efficacy for change (Webb, 2016; Webb & Smerald et al., 2016). Knowledge of the benefits of physical activity and an understanding of what is safe are the foundations for change (Stacey, James, Chapman, Courneya, & Lubans, 2014).

**CANCER AS A TURNING POINT**

As highlighted in an earlier section, the balance of the evidence suggests that physical activity levels drop following a cancer diagnosis and do not return to pre-diagnosis levels; however, this is not the case for other lifestyle behaviours. Wang et al. (2014) report that cancer survivors are less likely to smoke, more likely to eat a healthy diet, and more liable to drink alcohol responsibly than the general population. This suggests that a teachable moment may exist with health and lifestyle behaviours becoming more salient following a cancer diagnosis.
A teachable moment is defined as “An event or experience which presents a good opportunity for learning something about a particular aspect of life” (Teachable moment, n.d.). McBride and Emmons (2003) suggest three domains which dictate the extent to which an event may be a teachable moment: 

1. The extent to which an event or experience increases one’s perceived risk to health and outcome expectations.
2. The extent to which an event or experience prompts a strong affective or emotional response.
3. The extent to which an event or experience redefines one’s social role or self-concept.

A cancer diagnosis is likely to impact each of these three domains (McBride & Emmons, 2003; McBride, Puleo, Pollak, Clipp, Woolford, & Emmons, 2008). It is suggested that the greater extent to which an event impacts upon these teachable moment constructs the higher the likelihood of change if coupled with delivery of an appropriate intervention, (McBride & Emmons, 2003; McBride et al., 2008). Further, it is suggested that low-intensity interventions delivered during a teachable moment may be enough to bring about change (Demark-Wahnefried, Pinto, & Gritz, 2006; Emmons et al., 2005, McBride & Emmons, 2003; McBride et al., 2008). Stubblefield (1986) suggests that if appropriate support is not in place to realise the intent of a teachable moment, then it may lead to nothing. Teachable moments can be created by healthcare professionals who can capitalise on events which strongly influence the three domains offered by McBride and Emmons (2003), signposting to appropriate interventions. McBride and Emmons (2003) suggest that the meeting of the three domains of a teachable moment come before one considers their motivation to change, their self-efficacy to change, and acquires the skills necessary to change.

In the UK it has been reported that cancer survivors and their closest supporters think lifestyle advice would be beneficial and would prefer such advice from a healthcare professional (Anderson, Steele, & Coyle, 2012; Anderson, Caswell, Wells, & Steele, 2013). However, the giving of physical activity advice is not a common practice amongst UK cancer care professionals (Fisher, Wardle, Beeken, Croker, Williams, & Grimmett, 2015; Fisher, Williams, Beeken, Fisher, & Wardle, 2015).

Clifford et al. (2018) in a systematic review of the barriers and facilitators to physical activity in cancer survivors identify cancer as a motivator for change as a frequent facilitator of physical activity. Clifford et al. (2018) also identify fear as a facilitator of physical activity,
fear of the negative health impacts of being sedentary. This suggests that cancer survivors with the *outcome expectation* or *attitude* that physical activity can help reduce the odds of cancer recurrence and mortality, and attenuate the consequences of cancer and its treatments, are more likely to be physically active. Advice and signposting from a healthcare professional may act as a cue to action and may create a *subjective norm*.

Brunet et al. (2013) and Sander et al. (2012) highlight that improving general health and appearance is a primary motivation for breast cancer survivors to become more physically active. Clifford et al. (2018) identify improving physical health and improving mental well-being as the two most frequently mentioned facilitators of physical activity in cancer survivors. Having a strong belief that one’s behaviour influences health, known as an internal locus of control a concept central to the SCT, has been shown to influence cancer survivor’s lifestyle behaviours (Patterson, Neuhouser, Hedder son, Schwartz, Standish, & Bowen, 2003). Cancer survivors with an external locus of control who believe that health is determined by chance or fate and therefore not within their control are less likely to see cancer as a turning point (Hubbard et al., 2014).

**PHYSICAL ACTIVITY HISTORY**

Kampshoff et al. (2014) report moderate evidence that a history of exercise pre-diagnosis is positively associated with exercise during and after treatment for cancer. History of exercise is the only determinant of exercise adherence identified by Kampshoff et al. to receive a moderate evidence rating with all other determinants having insufficient evidence to draw firm conclusions. Cancer survivors who report low levels of physical activity before diagnosis state that they are unlikely to take on new activities after diagnosis, particularly older cancer survivors aged 75-years and over who feel it is too late to create new habits or try new activities (Webb, 2016; Webb & Smerald et al., 2016). Those considered inactive before diagnosis may need more support, encouragement and reassurance with an increased emphasis on non-formal options for increasing physical activity (Webb, 2016; Webb & Smerald et al., 2016). Those previously active may be more likely to be physically active following diagnosis, but they may be unable to return to their previous levels of physical activity which may be psychologically challenging and demotivating (Webb, 2016; Webb & Smerald et al., 2016).
Glanz et al. (2008) offer an extension to the TPB which includes habit. Glanz et al. (2008) suggest that habit, developed by experience of performing a particular behaviour, may lessen the impact of attitude and subjective norms on behavioural intention with behaviour simply taking place as it is habitual.

Past physical activity behaviour is reported to predict future physical activity behaviour within the general population (Trost, Owen, Bauman, Sallis, & Brown, 2002) and also in cancer survivors (Kampshoff et al., 2014; Webb, 2016; Webb & Smerald et al., 2016). This could be explained by physical activity being habitual in cancer survivors with a history of being physically active and who identify as active individuals (Husebø, Dyrstad, Søreide & Bru, 2012). Physical activity decreases following a diagnosis of cancer, however, cancer survivors with a history of being physically active may be more able to overcome the barriers that present themselves, with physical activity being within their perceived control. Such cancer survivors may also already have a positive attitude toward physical activity and may be more able to self-regulate their physical activity, possessing the skills, resources (facilitation), and the self-efficacy to become or stay active.

The notion that previously active cancer survivors can identify the positive outcomes associated with physical activity are supported by Husebø et al., (2012) and previous research by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016). Physical activity in these cancer survivors is seen as a way of reaffirming a positive health status (Clifford et al., 2018), regaining control (Larsson et al., 2008; Maley et al., 2013) and a sense-of-self (Peddle, Plotnikoff, Wild, Au, & Courneya., 2007). A positive attitude toward physical activity increases the likelihood of being physically active (Webb, 2016; Webb & Smerald et al., 2016).

### SELF-EFFICACY

Self-efficacy is defined as an individual’s confidence that he or she can achieve an identified behaviour overcoming any barriers to that behaviour (Glanz et al., 2008). Self-efficacy is a foundation of human behaviour (Bandura, 2016) and is fundamental to increasing physical activity in cancer survivors (Webb, 2016; Webb & Smerald et al., 2016). The motivation to change lifestyle behaviours are rooted in a person’s self-efficacy to change and a belief that such a change will have the desired result (Bandura, 2016). Self-efficacy does not only influence behaviour directly, it also influences the antecedents of behaviour being outcome
expectations, the reciprocal determinism with socio-structural factors and the setting of behavioural goals as a form of self-regulation (Bandura, 2016).

Self-efficacy is consistently identified as a good predictor of physical activity in the general population (Bauman et al., 2012; Choi, Lee, Lee, Kang, & Choi, 2017; Young, Plotnikoff, Collins, Callister, & Morgan, 2014). A 2014 systematic review and meta-analysis conducted by Stacey et al. (2014) identifies that self-efficacy is positively associated with increases in physical activity in cancer survivors. Stacey et al. observe that cancer survivors with higher levels of self-efficacy increase their levels of physical activity more quickly than those with lower levels of self-efficacy. The findings by Stacey et al. (2014) are in support of a narrative review of the literature by Pinto and Ciccolo (2011); however, Husebø et al. (2012) report no relationship between self-efficacy and physical activity.

Clifford et al. (2018) support the notion that self-efficacy or rather lack of self-efficacy is a barrier to cancer survivors becoming active. However, self-efficacy is rated by Clifford et al. as 14th out of 19 identified barriers to becoming active. A possible reason for self-efficacy appearing as low as 14th in a list of 19 identified barriers could be that many cancer survivors feel confident in their ability to become active. This is supported by findings from this author and colleagues in a survey of 1,011 UK cancer survivors (Webb, 2016; Webb & Smerald et al., 2016) which suggest that only 20% of cancer survivors in the UK state that they are not confident in their ability to become more physically active.

Reflecting upon the evidence from Clifford et al. (2018), Husebø et al. (2012), Stacey et al. (2014), the previous research conducted by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016), and the strength of the evidence to support self-efficacy as a predictor of physical activity in the general population, it is concluded that self-efficacy is likely to be a predictor of physical activity in cancer survivors.

**BARRIERS TO PHYSICAL ACTIVITY FROM THE SIDE-EFFECTS OF CANCER AND ITS TREATMENTS**

Clifford et al. (2018) identify that treatment-related side-effects are the most frequently reported barriers to physical activity in cancer survivors, often related to the type of treatment received. Fifty-eight per cent of cancer survivors have at some time felt unable to be physically active around other people because of the consequences of their treatment. For example, 16% of cancer survivors feel unable to wear clothing for exercise because of the...
emotional and physical aspects of cancer and its treatments (Webb, 2016; Webb & Smerald et al., 2016) creating a negative attitude toward becoming active.

Body image concerns are common among breast cancer survivors and are a barrier to physical activity, but they may also act as a motivation to be more active to improve physical appearance (Alfano & Rowland, 2006). Adkins (2009) note that breast cancer survivors may have decreased arm mobility from lymphedema which can limit the type of physical activity they can undertake. Heffron et al. (2013) report that following surgery, breast cancer survivors report pain-related symptoms like numbness and shoulder stiffness, acting as a barrier to becoming physically active. Fear of developing lymphedema as a consequence of becoming physically active is reported by some breast cancer survivors (Anderson et al., 2011; Sander, Wilson, Izzo, Mountford, & Hayes, 2012). However, as noted by Schmitz (2010) this is an irrational fear as the evidence suggests physical activity does not increase lymphedema risk, highlighting the need to change the attitude of breast cancer survivors, and likely other cancer survivors, about the safety and benefits of physical activity.

Anderson, Caswell, Wells, Steele, and MacAskill (2010) report that colorectal cancer survivors may experience diarrhoea, or issues with a stoma, for example, a leakage, making them fearful of engaging in physical activity in public due to potential embarrassment. Fear of incontinence is also identified as a barrier to prostate cancer survivors undertaking physical activity (Craike, Livingston, & Botti, 2011). Research conducted by this author and colleagues reports that 25% of UK cancer survivors worry about incontinence (Webb, 2016; Webb & Smerald et al., 2016). Peddle et al. (2007) however, report that colorectal cancer survivors view physical activity as a coping mechanism for the side-effects of cancer treatments.

Forty per cent of UK cancer survivors report a fear of getting tired when becoming active with others not understanding why (Webb, 2016; Webb & Smerald et al., 2016). However, Clifford et al. identify overcoming fatigue as a motivator for physical activity, but this does appear last in a list of 19 identified facilitators possibly highlighting a lack of knowledge for physical activity as a mechanism to help combat fatigue.

Cancer survivors experiencing side-effects are unclear of what is safe in regard to physical activity and the side-effects that they are experiencing, highlighting the importance of improved knowledge and a change of attitude regarding physical activity (Webb, 2016; Webb & Smerald et al., 2016). Uncertainty around what is safe is likely to impact on the self-
efficacy of cancer survivors regarding becoming and staying physically active. Treatment-related side-effects will vary amongst cancer survivors based on their health condition, their cancer, and the treatment received (Jacobs & Shulman, 2016; Webb, 2016; Webb & Smerald et al., 2016). It can be inferred, although not explicitly highlighted in the literature, that those who have experienced intense treatments and or greater impacts on physical functioning, may have less perceived control and self-efficacy over becoming physically active.

COMORBIDITIES

It is estimated that 70% of cancer survivors will have at least one comorbidity in addition to their cancer, 47% will have two, and 29% will have three or more (Macmillan Cancer Support, 2015a). The impacts of a cancer survivor’s comorbid diseases or conditions can act as a barrier to physical activity. Given that cancer is commonly a disease of older age, the comorbidities associated with ageing tend to be more prevalent among cancer survivors, for example, osteoarthritis, cardiovascular disease, diabetes and joint problems which can be a barrier to physical activity (Alfano & Rowland, 2006; Anderson et al., 2010).

Obesity is common in cancer survivors. Forty-five per cent of women with breast cancer report significant weight-gain from cancer and its treatments, 53% of prostate cancer survivors are overweight or obese, and as many as 70% of bowel cancer survivors are reported to be overweight or obese (Thomas, Holm, & Al-Adhami, 2014). Obesity and its potential consequences such as hypertension and diabetes are associated with greater barriers to physical activity (Oyekanmi et al., 2014).

Mental health issues are also common in cancer survivors with a reported 25-30% experiencing psychological distress including post-traumatic stress disorder, depression, and anxiety (Thomas et al., 2014). Poor mental wellbeing may act as a barrier to physical activity, particularly when a cancer survivor is unaware of the benefits of physical activity (outcome expectations) alongside cancer recovery (Alfano & Rowland, 2006).

While these comorbidities and their related barriers exist in the general population, the way that these comorbidities and barriers to physical activity interact with a cancer survivor’s experience is unique. For example, an older person suffering from arthritis or obesity may already face several apparent barriers to becoming physically active such as a lack of energy, lack of mobility, or pain, but these barriers may be exacerbated in cancer survivors. Existing barriers related to comorbidities can also worsen resulting from cancer and its treatments, for
example, weight gain in an already obese cancer survivor may result in less physical activity
and thus increased obesity (Thomas et al., 2014).

Clifford et al., (2018) identify health problems in addition to cancer as a barrier to physical
activity in cancer survivors. However, Clifford et al. also identify improvements in physical
health, mental well-being, and gaining control over one’s health to be the most frequently
reported facilitators of physical activity in cancer survivors.

OTHER INDIVIDUAL BARRIERS AND FACILITATORS

Several other more infrequent barriers are noted in the cancer-specific literature that are
common in the general population, including lack of interest, motivation, enjoyment, or time,
and bad weather (Blaney, Lowe-Strong, Rankin-Watt, Campbell, & Gracey 2013; Brunet et
al., 2013; Clifford et al., 2018). In addition, other more infrequent facilitators are noted,
specifically to generally stay fit and healthy, improve sleep, and physical activity providing
an opportunity for personal time (Clifford et al., 2018).

The factors of age, gender, level of education, and ethnicity are reported to be correlates of
physical activity in the general population (Bauman, 2012, Varney, Brannan, & Aaltonen,
2014), however, Kampshoff et al., (2014) report insufficient evidence of an association
between these factors and exercise in cancer survivors. Kampshoff et al. report no association
between physical activity levels and the clinical factors of time since diagnosis, disease stage,
tumour location, or treatment received, supporting the findings of a review of the literature by
Szymlek-Gay, Richards, and Egan (2011). This author and colleagues find that whilst cancer
survivors of older age report being less active than those of a younger age, and males slightly
more active than females, the barriers and facilitators to becoming and staying physically
active are common across groups regardless of clinical and demographic factors (Webb,
2016; Webb & Smerald et al., 2016).

SUMMARY OF INDIVIDUAL INFLUENCES ON PHYSICAL
ACTIVITY

Knowledge is important however, it may not be enough to bring about a change in physical
activity in cancer survivors on its own. Improving the knowledge of cancer survivors on the
importance of physical activity for them and their condition, overcoming any safety fears, is
important (Clifford et al., 2018) and could change attitudes and outcome expectations.
Redefining physical activity for cancer survivors to include activities of daily living may increase perceived control over becoming active (Webb, 2016; Webb & Smerald et al., 2016).

Cancer survivors with a positive attitude for physical activity, who identify as a physically active individual, with the self-efficacy to become active, seeing cancer as a turning point, will find a way to become and stay physically active overcoming the barriers that present themselves (Webb, 2016; Webb & Smerald et al., 2016). Conversely, even in those with few physical symptoms, without a positive attitude and the self-efficacy to become active, they are unlikely to remain sedentary (Webb, 2016; Webb & Smerald et al., 2016).

The literature suggests that previous physical activity levels are a predictor of physical activity following diagnosis (Kampshoff et al., 2014). Identifying as a physically active individual may motivate cancer survivors to stay active as a way of getting back to normal and regaining control (Maley et al., 2013). Previously active cancer survivors may have the confidence and self-efficacy to overcome the barriers to physical activity that present themselves from cancer, its treatments, and other comorbidities. However, not being able to return to previous levels of physical activity could be psychologically challenging for previously active individuals (Webb, 2016; Webb & Smerald et al., 2016).

Cancer survivors want advice on physical activity from healthcare professionals, and this could increase self-efficacy to become active and help to overcome physical and psychological barriers (Webb, 2016; Webb & Smerald et al., 2016). Healthcare professionals support may facilitate improvements in knowledge, improving attitudes toward physical activity, potentially creating and capitalising on a teachable moment, with signposting onwards for more support.

**INTERPERSONAL INFLUENCES ON PHYSICAL ACTIVITY**

This section will cover the interpersonal influences on physical activity in cancer survivors as identified in the existing cancer-specific literature.
FAMILY AND FRIENDS

Social support and the social aspects of being physically active have been shown to motivate cancer survivors to increase physical activity (Webb, 2016; Webb & Smerald et al., 2016). Craike et al. (2013) in a qualitative study with survivors of multiple myelomas note that physical activity offers an opportunity to be with family and friends and to make new social connections to help cope with the struggles of life beyond cancer. Clifford et al. (2018) rank social benefits 4th in a list of 19 frequently mention facilitators to physical activity in cancer survivors, supporting the findings from an earlier systematic review from Barber (2012).

No one to be active with is ranked 8th out of 19 identified barriers by Clifford et al. (2018). Some cancer survivors express a feeling of being left behind by friends, particularly younger cancer survivors (Webb, 2016; Webb & Smerald et al., 2016). Cancer can be socially isolating (Muzzin, Anderson, Figueredo, & Gudelis, 1994) and those socially isolated are less likely to be physically active (Robins, Brown, Lalor, Stolwyk, McDermott, & Haines, 2018). However, increases in physical activity have been shown to reduce social isolation in older people and cancer survivors (Barber, 2012; Robins et al., 2018). Downs, Nigg, Hausenblas, and Rauff (2014) suggest that adherence to physical activity is more likely when social connections are present as this leads to greater satisfaction.

Olson et al. (2014) suggest that support from the friends and family of cancer survivors, such as encouragement and taking part in physical activity together, can act as a motivator to becoming and staying active, and can increase self-efficacy. Sixty-one per cent of cancer survivors state that having a family member or friend to become physically active with would help (Webb, 2016; Webb & Smerald et al., 2016). Conversely, the literature provides some, though not extensive, evidence to suggest that negative family and peer support can act as a barrier to becoming more physically active. Sander et al. (2012) in a qualitative study with breast cancer survivors note that many described their family and friends as a barrier to physical activity, encouraging rest (subjective norm) and avoiding household chores. This observation led Sander et al. (2012) to conclude that family support systems could be a barrier to physical activity because of a sense of protection for their loved one.

Falzon, Chalabaev, Schuft, Brizzi, Ganga, and d'Arripe-Longueville (2012) in a study with breast cancer survivors, note that cancer survivors often feel that their lack of confidence (self-efficacy) or capacity to engage in physical activity (perceived control) is reinforced by family and friends, who encourage inactivity. Close family members express concern for the
well-being of their loved one, particularly around the safety of physical activity, with a fear that they are taking on too much (Webb, 2016; Webb & Smerald et al., 2016). There is a perception that energy expended being physically active is at the expense of the energy required to fight cancer, with these concerns expressed by family and friends to cancer survivors (Webb, 2016; Webb & Smerald et al., 2016). Close family and friends also express fear of physical injury of their loved one from physical activity and psychological damage from failure to achieve desired goals (Webb, 2016; Webb & Smerald et al., 2016). Consequently, the attitude and the outcome expectations of people affected by cancer, not just cancer survivors themselves, towards physical activity must change. Fourteen per cent of cancer survivors report that family members worry that they are pushing themselves too hard, 29% state that close friends of family encourage rest, and only 20% state that they are encouraged to be more active by their family and friends (Webb, 2016; Webb & Smerald et al., 2016).

Having a sense of duty to children, partners, and pets, coupled with the motivation to keep daily life as normal as possible, is identified as a driver of physical activity, especially for female cancer survivors (Webb, 2016; Webb & Smerald et al., 2016). Cancer survivors express a concern about not letting other people down which could facilitate greater activity levels (Webb, 2016; Webb & Smerald et al., 2016). However, this sense of duty also acts as a barrier of physical activity, with some cancer survivors reluctant to make plans for fear of letting people down, for example, due to hospital appointments or feeling unwell (Webb, 2016; Webb & Smerald et al., 2016); this could be interpreted as a lack of perceived control. In some instances cancer survivors feel the burdened of responsibility, for example, being a full-time caregiver and looking after their family alongside coping with life beyond cancer, making physical activity not a priority and out of their control (Hefferon et al., 2013; Lim, Gonzalez, Wang-Letzkus, Baik, & Ashing-Giwa, 2013; Ottenbacher et al., 2011).

It is argued that close family and friends can influence many of the constructs of the SCT both positively and negatively dependent on their beliefs, values, and attitudes towards physical activity. For example, family and friends may help to create an active or an inactive environment (reciprocal determinism), enhance or hinder self and collective-efficacy, influence the outcome expectations of cancer survivors in regard to physical activity, and facilitate (or not) physical activity, maybe even supporting the learning of new skills (observational learning).
It is further argued that close family can influence all constructs of the TPB both positively or negatively. For example, influencing the attitude of cancer survivors in regard to physical activity, providing a subjective norm, and influencing control beliefs, and actual control over becoming active. Therefore, engagement of close family and friends when intervening to improve physical activity in cancer survivors must be considered.

SOCIAL STIGMA

The visible consequences of cancer such as scaring, or loss of hair, coupled with the physical symptoms such as extreme fatigue and incontinence, cause as many as 48% of cancer survivors to feel uncomfortable being physically active around others, sharing changing rooms, and swimming pools (Webb, 2016; Webb & Smeral et al., 2016). Henriksson et al. (2016) report that practical issues such as not knowing what clothing is appropriate, are also a barrier to physical activity. Thirty per cent of cancer survivors report not feeling comfortable in wearing exercise clothing or a swimming costume (Webb, 2016; Webb & Smeral et al., 2016).

Forty-five present of cancer survivors are worried about having access to a toilet when away from home, with 39% of cancer survivors stating that having greater access to public toilets would encourage them to become more physically active (Webb, 2016; Webb & Smeral et al., 2016). In addition, 33% state that they feel self-conscious because of the physical and emotional impacts of cancer and its treatments; 21% report feeling embarrassed, 20% report being anxious or worried about the reaction from others when taking part in physical activity, and 15% fear being subject to insensitive comments (Webb, 2016; Webb & Smeral et al., 2016).

Cancer survivors may experience social stigma and isolation from community services and networks that might help them take back control (Muzzin et al., 1994). Fifty-three per cent of cancer survivors state that they have felt socially isolated at least some of the time during their cancer journey (Webb, 2016; Webb & Smeral et al., 2016). These expressed fears are also likely to create a negative attitude toward physical activity and also impact on the perceived behavioural control of cancer survivors to become physically active. Further, social stigma or fear of social stigma may also influence self and collective-efficacy.

The SCT emphasises the importance of the relationship between an individual and their environment and posits that behaviour is a product of the reciprocal determinism between
personal, behavioural, and environmental influences. The interaction with others and the local environment, or fear of such interactions, relates to the *reciprocal determinism* construct of the SCT.

**SUMMARY OF INTERPERSONAL INFLUENCES ON PHYSICAL ACTIVITY**

Having the support of family and friends is a strong driver of physical activity, particularly having someone to be active with (Webb, 2016; Webb & Smerald et al., 2016). However, family and friends may also discourage physical activity (Falzon et al., 2012). Making a commitment or having a sense of duty can facilitate physical activity; however, a fear of letting people down could install a reluctance to make such commitments (Webb, 2016; Webb & Smerald et al., 2016). A sense of duty, to continue with the normal family responsibilities could act as a barrier to becoming physically active (Lim, Gonzalez, Wang-Letzkus, Baik, & Ashing-Giwa, 2013). Many cancer survivors fear social stigma from interactions within the community when trying to become active (Webb, 2016; Webb & Smerald et al., 2016).

**COMMUNITY INFLUENCES ON PHYSICAL ACTIVITY**

This section will cover the community influences on the drivers and the barriers to physical activity in cancer survivors.

**ACCESS TO PHYSICAL ACTIVITY FACILITIES AND OPPORTUNITIES**

Demark-Wahnefried (2005) and Downs et al. (2014) identify the importance of local opportunities to support cancer survivors to become active. Qualitative research by Henriksson et al. (2016) with 23 cancer survivors undergoing active treatment for cancer, suggests that a lack of local facilities and physical activity opportunities presents a barrier to becoming active. Clifford et al. (2018) support the findings by Henriksson et al. (2016), also stating that a variety of local opportunities is a facilitator of physical activity in cancer survivors.

Trinh et al. (2015) in a review of the socio-ecological correlates of physical activity in kidney cancer survivors report the proximity of local shops to be a significant predictor of meeting
the physical activity guidelines, as this encourages walking. Research by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016) suggests that having access to appropriate physical activity facilities, opportunities, and leaders within the community who understand the needs of cancer survivors can help increase physical activity.

The opportunities afforded by the local environment, or indeed the lack of, impacts on the perceived behavioural control of cancer survivors to become active. Clifford et al. (2018) identify the cost of taking part in physical activity as a barrier which could also influence control over becoming physically active. Bandura (1989) states, when discussing the reciprocal determinism construct of the SCT theory, that unless an environment supports behaviour change it will not occur. However, Kampshoff et al. (2014) suggest that the location of physical activity facilities is not a significant predictor of physical activity in cancer survivors.

Findings from this author and colleagues suggest that cancer survivors with a positive attitude towards physical activity with appropriate social support are likely to become or stay physically active, even when local physical activity opportunities and facilities are lacking, having the confidence to find a way to overcome this barrier (Webb, 2016; Webb & Smerald et al., 2016). On the other hand, those without a positive attitude, who are unaware of the benefits of being active, with little support, are unlikely to become or stay active even if there is an abundance of local physical activity opportunities and facilities available (Webb, 2016; Webb & Smerald et al., 2016).

Cancer survivors want to be physically active in a setting that is compatible with their physical appearance, with physical activity leaders that are understanding and accommodating to their state of health, accepting sickness and varying levels of performance (Albrecht and Taylor, 2012). Such settings and leaders enhance perceived control and improve the subjective norm in support of physical activity, creating an environment conducive to physical activity.

Cancer survivors want support that is relevant and appropriate to them and their condition (Webb, 2016; Webb & Smerald et al., 2016). In the UK, physical activity opportunities specifically for cancer survivors are uncommon, costly, and only engage a small number of cancer survivors. Macmillan Cancer Support and Sport England jointly funded six such physical activity services specifically for cancer survivors in 2016 and 2017 at a cost of £1,288,935 engaging 4,500 cancer survivors over two-years, giving crude figures of
£107,411 per programme engaging 375 cancer survivors per annum (£286.43 per person per annum) (Get healthy get active project summaries, n.d.).

It has been estimated, at the time of writing, that only 50 cancer-specific physical activity face-to-face services exist in the UK (Macmillan’s programmes and services: Physical activity, n.d.) meaning that the majority of cancer survivors will need to travel to access face-to-face support that is specific to cancer survivors. The time and resources to travel to such opportunities are a barrier to becoming physically active (Goode, Lawler, & Brakenridge, 2015).

A systematic review of 27 studies by Goode et al. (2015) supports the efficacy of broad-reach modalities in supporting cancer survivors in changing lifestyle behaviours. Stull et al. (2007) and Trinh et al. (2012) report that home-based physical activity programmes, delivered by mail, are of interest to cancer survivors, thus negating the barriers arising from a lack of local opportunities, whilst still providing cancer-specific physical activity support. This is supported by Clifford et al. (2018) and by previous research conducted by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016). Cancer survivors want to become active on their terms in a way suitable to them (Clifford et al., 2018; Webb, 2016; Stull et al., 2007; Webb & Smerald et al., 2016).

PREFERRED PHYSICAL ACTIVITY

Only a limited number of studies have collected information on the physical activity preferences of cancer survivors. Walking is the most popular form of physical activity in the UK general population (Sport England, 2017) and this is also the case in cancer survivors (Clifford et al., 2018; Webb, 2016; Trinh et al., 2012; Webb & Smerald et al., 2016). Other activities that could be termed activities of daily living are also popular with cancer survivors such as gardening, and playing with children and grandchildren (Webb, 2016; Webb & Smerald et al., 2016). The activities of yoga, swimming, cycling, and going to the gym, are less popular but are still activities that some cancer survivors take part in (Webb, 2016; Webb & Smerald et al., 2016). Other activities that are popular with older people, and therefore may be popular with many cancer survivors are badminton, bowls, golf, and walking sports (Sport England Market Segments, 2010). Cancer survivors also express a desire to be active outdoors (Webb, 2016; Webb & Smerald et al., 2016). Allowing cancer survivors, and their
families, to identify their preferred activity is likely to increase *perceived control* over becoming active and increase *self* and *collective efficacy*.

Stull et al. (2007) report that of US adult cancer survivors only 9% want to take part in clinic-based lifestyle interventions, 24% in telephone interventions, 39% in Internet-based interventions, 40% in video interventions, and 54% in mail/print-based interventions. This preference of cancer survivors for Internet, video, and mail-based physical activity interventions is supported by Trinh et al., (2012). Remote-based interventions may enhance *perceived control* and *self-regulation* of becoming active as they allow cancer survivors to become active on their own terms. A 2015 systematic review by Goode et al. (2015) assessing the efficacy of remote-based interventions to improve physical activity, diet, and weight management in cancer survivors, provides support for telephone, Internet, and print-based interventions to facilitate behavioural change. Goode et al. highlight a gap in the use of a relevant behavioural theory to design and develop remote-based interventions.

### SUMMARY OF THE COMMUNITY INFLUENCES

The proximity of physical activity opportunities is both a barrier (if lacking) and a facilitator (if available) to becoming active (Clifford et al., 2018; Henriksson et al., 2016). Physical activity opportunities specifically designed for cancer survivor are rarely available in practice and inaccessible for most cancer survivors in the UK (Webb, 2016; Webb & Smerald et al., 2016). The most popular and accessible activity is walking, followed by activities of daily living and gardening, with activities which could be considered exercise popular with a minority of cancer survivors (Webb, 2016; Webb & Smerald et al., 2016).

The most popular forms of physical activity support are mail-based (54%), use of video (40%), and use of Internet-based tools (39%), with the least popular form of support being clinic-based (9%) (Stull et al., 2007). Remote-based interventions have also shown promise (Goode et al., 2015); however, they are under-researched, particularly print-mail-based interventions supported by Internet-based tools.
ORGANISATIONAL INFLUENCES ON PHYSICAL ACTIVITY

This section will cover the organisational influences on the drivers and the barriers of physical activity in cancer survivors.

HEALTHCARE

The WHO (2005) identify healthcare settings as priority areas for health promotion. The importance of healthcare professionals advocating a physically active lifestyle to cancer survivors has already been highlighted in this thesis. Seventy-six per cent of UK cancer survivors consider their oncology consultant to be the expert for physical activity and their condition, 75% a physiotherapist, 64% a nurse and 63% their General Practitioner (Webb, 2016; Webb & Smerald et al., 2016).

Fisher and Williams et al. (2015) suggest that cancer survivors who recall receiving physical activity advice from a healthcare professional are 9% more likely to take part in brisk physical activity compared to those that cannot recall receiving such advice (51% vs 42% respectively). A randomised control trial conducted by Jones, Courneya, Fairey, and Mackey (2004) investigates the effects of advice from an oncology consultant on the self-reported physical activity of 450 breast cancer survivors. The advice provided to cancer survivors from the oncology consultant was as follows:

Recent research has shown that some of the side-effects you may experience during treatment may be controlled with a modest exercise program. I recommend trying to exercise 20–30-minutes every day at a moderate-intensity. Even less may be beneficial but try to do something every day. Exercises such as brisk walking will meet these requirements. (Jones et al., 2004, p. 106)

Jones et al. (2004) report that physical activity significantly increases by 3.4 MET-hours-per-week when in receipt of physical activity advice over usual care (95% CI = 0.7 to 6.1, $p = .01$) over five-weeks. These findings are in support of Chambers, Chambers, and Campbell (2000) who find that unsolicited physical activity advice improves physical activity and perceived health status in patients with significant medical problems.

Advice from healthcare professionals can positively influence physical activity in cancer survivors; however, only 31% of cancer survivors recall receiving such advice (Fisher and
Williams et al., 2015). In a survey of 460 UK healthcare professionals by Williams et al. (2015), 87% report giving some lifestyle advice, although often to less than 50% of cancer patients. Daley, Bowden, Rea, Billingham, and Carmicheal (2008) report that only 44% of UK oncology consultants routinely give physical activity advice to cancer survivors.

Conflicting messages from healthcare professionals to cancer survivors regarding lifestyle can result in a barrier to change (Murphy & Girot, 2013a). NICE (2014a) recommend that at least very brief advice is provided by healthcare professionals to all patients. As discussed earlier in this section, a cancer diagnosis may offer a teachable moment in regards to lifestyle behaviour change. Lawson and Flocke (2009) conclude that a teachable moment might not just be an unpredictable phenomenon arising from any combination of situational factors, but creatable in a clinician-patient interaction. Advice given in a healthcare setting may create and capitalise on a teachable moment (Lawson & Flocke, 2009).

A survey by Macmillan Cancer Support (2011) reports that 28% of nurses do not think that discussing physical activity is of critical importance, 42% of nurses are unaware of the guidelines for physical activity, and only 9% talk to all cancer patients about the benefits of physical activity. To support a change in the physical activity behaviours of cancer survivors, healthcare professionals also need to change their practice to routinely deliver physical activity advice (Murphy & Girot, 2013a, 2013b; Murphy, Worswick, Pulman, Ford, & Jeffery, 2015).

Healthcare professionals have an opportunity to provide information to enhance knowledge and change the attitudes of cancer survivors toward physical activity. Healthcare professionals can develop a subjective norm and enhance self and collective-efficacy if information and advice are given to cancer survivors and their family members. Further, healthcare professionals can increase perceived control over becoming active encouraging a level of physical activity that is right for the individual, advising cancer survivors that it is ok to start at a level that is right for them, with something better than nothing. Healthcare professionals can help overcome the barriers to physical activity by providing tools, resources, and signposting on for more support (facilitation) (Park et al., 2015).

As identified at the start of this section, the selection of an appropriate theory is necessary to understand behaviour (Craig et al., 2008). Many theories have tried to explain behaviour change in healthcare professional practice. However, researchers have been unable to identify
the theory or theories that are most appropriate (Colquhoun, Squires, Kolehmainen, Fraser, & Grimshaw, 2017; Smith, 2000).

A recent behavioural model not yet discussed in this thesis, the COM-B model, postulates that behaviour comes about from an interaction between one’s capability to perform a behaviour, the opportunity, and motivation to carry out that behaviour (Michie, van Stralen, & West, 2011). The COM-B model sits within an intervention development framework called the Behaviour Change Wheel, developed as an approach to implementation science supporting the adoption of evidence-based guidelines and interventions into routine public health and healthcare practice helping overcome the know-do gap (Hanies, Kuruvilla, & Borchert, 2004; WHO, 2006).

Despite its relatively new status there is some evidence of the effective application of the COM-B model and the Behaviour Change Wheel to change the practice of healthcare professionals (Connell, McMahon, & Redfern, 2015; Primrose, n.d.) including previous research work by this author and colleagues (Webb, Foster, & Poulter, 2016; Webb, Hall, Hall, & Fabunmi-Alade, 2016). Therefore, the COM-B model and the Behaviour Change Wheel are deemed relevant, appropriate and logical for the development and evaluation of interventions to influence the behaviour of healthcare professionals to give physical activity advice to cancer survivors.

**THE WORKPLACE**

The WHO identify the workplace as a setting to positively influence health (Types of healthy settings: Healthy workplaces, n.d.). The workplace is the only other organisational level influence that receives a mention in the extant literature regarding physical activity for cancer survivors. Work-related responsibilities are identified by Clifford et al. (2018) as a barrier to becoming or staying physically active; however, Kampshoff et al. (2014) report that being employed is associated with physical activity adherence and maintenance.

In qualitative work by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016), two of 20 cancer survivors participating in in-depth interviews report their motivation to return to work as a driver for increases in physical activity to help regain physical condition, demonstrating a positive attitude and outcome expectations toward physical activity. Further, several participants reported that work colleagues, out of concern for them and their condition, encouraged rest (subjective norm). Hefferson et al. (2013) report that the
energy required by cancer survivors to complete a working-day is such that exercising is thought not to be possible or within one’s control or even completely out of mind.

**SUMMARY OF ORGANISATIONAL INFLUENCES**

Getting back to work may act as a driver for cancer survivors becoming physically active, but once at work, colleagues may encourage rest, and the energy required to complete a working-day may put exercise out of mind (Hefferon et al., 2013).

There is evidence that healthcare professions can have a strong influence on the physical activity of cancer survivors (Fisher and Williams et al., 2015). Cancer survivors want messages regarding physical activity from healthcare professionals whom they consider the experts in this regard (Webb, 2016; Webb & Smerald et al., 2016).

Healthcare settings are identified as a priority area for health promotion by the WHO (2005). Advice given in healthcare settings can create and capitalise on teachable moments (Lawson & Flocke, 2009). However, advice on physical activity to cancer survivors is not common practice (Fisher and Williams et al., 2015). No one theory or theories are prominent in their use in changing the practice of healthcare professionals. The COM-B model and Behaviour Change Wheel (Michie et al., 2011) support implementation science and are therefore logical and relevant to behaviour change in healthcare professionals (Webb and Foster, 2016).

**POLICY INFLUENCES ON PHYSICAL ACTIVITY**

The use of the term policy in this section is in its broadest sense, inclusive of international and national policies, strategies, and guidance documents that relate in some way to physical activity in cancer survivors. The influence of policy on the barriers and facilitators of physical activity in cancer survivors is not reported in the existing literature. However, recommendations made within international and national strategy and policy documents may influence some of the barriers and facilitators identified thus far and therefore are important when considering the context in which interventions are to operate, and their influence on scaling decisions (Milat, Newson & King, 2014).

The WHO (2015) emphasises the importance of healthcare professionals providing person-centred advice and support for adults with regard to physical activity, stating those in need of more support should be offered more in-depth counselling. This is mirrored in the UK Government’s strategy for creating an active nation (HM Government, 2015). Guidance from
NICE (2014a) recommends that healthcare professionals at least deliver very brief advice on lifestyles at every available opportunity. An Independent Cancer Taskforce (2014) in England calls on NHS staff to provide lifestyle advice to all cancer survivors. This is echoed in the NHS (2014) five-year forward view strategy document which recommends provision of a recovery package for cancer survivors including the provision of lifestyle information and support.

The importance of health promotion within a healthcare setting is acknowledged in the physical activity strategy for England (Everyone active, every day, Varney et al., 2014), as is the need to do more to integrate physical activity as part of treatment for long-term conditions. Public Health England, the NHS, and Health Education England (Public Health England, NHS England, & Health Education England, 2016; Varney et al., 2014), Public Health Wales (2017), and the Scottish Government (2014) all have the ambition for physical activity to be a routine part of the conversation between healthcare professional and patient, making every contact count. Public Health Wales (2017) and the Scottish Government (2014) recommend the training of healthcare professionals to enable them to be confident in providing general physical activity advice and signposting to evidence-based interventions.

The WHO (2015) strategy calls for partnerships to be created across organisations and sectors to support physical activity from healthcare to the community. Public Health England (Varney et al., 2014) and the Scottish Government (2014) identify the need to engage and support community physical activity leaders, giving them the knowledge and skills to facilitate physical activity especially for those with complex health needs.

SUMMARY OF THE POLICY INFLUENCES

The need to change the behaviour of healthcare professionals towards the giving of lifestyle advice is included within multiple policy documents (Independent Cancer Taskforce, 2014; NHS, 2014; NICE, 2014a; Public Health Wales, 2017; The Scottish Government, 2014; Varney et al., 2014). Also evident is the need to support community physical activity providers to be better able to support vulnerable groups to become physically active (The Scottish Government, 2014; Varney et al., 2014). The theoretical constructs that relate to advice from a healthcare professional, and provision of physical activity opportunities within the community have been discussed earlier in this section.
To overcome an identified complex behavioural problem, the MRC suggest the use of a relevant and comprehensive framework upon which intervention development should be based (Craig et al., 2008). The use of a socio-ecological model (Bauman et al., 2012; Sallis et al., 2008) to identify the barriers and facilitators to physical activity in cancer survivors with the integrations of relevant behavioural theories to help explain physical activity behaviour at each level of influence, provides such a framework.

Cancer survivors face many barriers to become physically active, some of which are shared with the general population such as a lack of local opportunities, lack of time due to other commitments, physical limitations from morbidities other than cancer, and a lack of motivation (Webb, 2016). Other shared barriers take on greater meaning in cancer survivors such as a lack of confidence, not knowing what is safe, a fear of social stigma, and an increased need to look after their family (Webb, 2016). Cancer survivors also face many unique barriers to physical activity related to their condition and the consequences of cancer and its treatments, such as fatigue, being encouraged to rest by well-meaning family, friends and work colleagues, and in some instances healthcare professionals (Webb, 2016; Webb & Smerald et al., 2016).

Some of the facilitators to physical activity are also shared with the general population but most take on a greater meaning in cancer survivors such as spending time with family, improving HRQOL, a desire to stay fit and healthy, or to prove to themselves that they can still be physically active as a way of gaining control over the disease (Webb, 2016). Cancer itself may be a motivator to becoming active, with a cancer diagnosis being a turning point to take control and improve lifestyle behaviours at a time when health becomes salient.

The evidence suggests that if a cancer survivor is confident in their ability to become active with a focus on positive achievements and support from friends and family, they will find a way to become active regardless of their physical symptoms or a lack of opportunities afforded by their local environment (Webb, 2016, Stacey et al., 2014, Webb & Smerald et al., 2016). Cancer survivors that are physically active before diagnosis are suggested to be more likely to be active following diagnosis (Webb, 2016, Webb & Smerald et al., 2016). Advice from healthcare professionals is welcomed and can facilitate physical activity in
cancer survivors (Clifford et al., 2018; Webb, 2016; Webb & Smerald et al., 2016). The barriers and facilitators to physical activity in cancer survivors are summarised in Table 5.

All constructs of the TPB as presented in Table 4 are identified in the literature in relation to the barriers and facilitators to physical activity in cancer survivors. Seven of the nine constructs of the SCT as presented in Table 3 are identified in the literature on the barriers and facilitators to physical activity in cancer survivors. The SCT construct of *incentive motivation* is not identified; however, the use or misuse of rewards may impact on physical activity, and therefore it is recommended that it is still considered in intervention design. The SCT construct of *moral disengagement* is also not identified in the extant literature and is deemed by this author to be inappropriate when considering ways to influence physical activity in cancer survivors and should therefore not be utilised in intervention design.

It is noted that the practice of healthcare professionals giving physical activity advice to cancer survivors can influence their physical activity. The COM-B model and the Behaviour Change Wheel (Michie et al., 2011) are identified as offering a logical approach to understanding and influencing the practice of healthcare professionals in this regard (Webb & Foster et al., 2016; Webb & Hall et al., 2016).
Table 5. The barriers and motivators to physical activity in cancer survivors

<table>
<thead>
<tr>
<th>Level of influence</th>
<th>Barrier</th>
<th>Motivator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Lack of knowledge</td>
<td>Cancer as a turning point</td>
</tr>
<tr>
<td></td>
<td>Lack of confidence in the ability to become active and overcome barriers</td>
<td>Previously active</td>
</tr>
<tr>
<td></td>
<td>Treatment-related side-effects</td>
<td>Confidence in ability to become active and overcome barriers</td>
</tr>
<tr>
<td></td>
<td>Comorbidities</td>
<td>General fitness and physical function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improvements in HRQOL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improvements in sleep</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal time</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>Discouraged by family and friends</td>
<td>Support from family and friend</td>
</tr>
<tr>
<td></td>
<td>A sense of duty (other responsibilities; avoid making plans so as to not let people down)</td>
<td>A sense of duty (not letting people down)</td>
</tr>
<tr>
<td></td>
<td>Social isolation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fear of social stigma</td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td>Lack of access to appropriate facilities and opportunities</td>
<td>Easy access to appropriate facilities and opportunities</td>
</tr>
<tr>
<td></td>
<td>Cost of taking part in physical activity</td>
<td>Appropriately trained physical activity leaders</td>
</tr>
<tr>
<td>Organisational</td>
<td>Majority of cancer survivors do not receive physical activity advice from a healthcare professional</td>
<td>Advice and support from healthcare professionals</td>
</tr>
<tr>
<td></td>
<td>Promotion of rest from work colleagues</td>
<td>Getting back to work</td>
</tr>
<tr>
<td></td>
<td>The energy required to return to work puts exercise out of mind</td>
<td></td>
</tr>
<tr>
<td>Level of influence</td>
<td>Barrier</td>
<td>Motivator</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Policy            | Acknowledgement and recommendations to support physical activity for cancer survivors  
|                   | National guidance for healthcare professionals in relation to physical activity  
|                   | National guidance for healthcare professionals on the giving of physical activity advice  
|                   | Acknowledgement and recommendations to support community physical activity leaders to increase physical activity for health |
OPPORTUNITIES TO INTERVENE

Successful behavioural change interventions address the social and behavioural determinants across multiple levels of influence rather than focusing on just one determinant (Smedley & Syme, 2001). Intervention designers must identify where best to intervene from the broad range of factors that influence behaviour, considering how to enhance facilitators and overcome barriers, empowering people to change.

Consideration should be given to influencing not just the individual themselves, but also the behaviour of actors from across the levels of influence. Intervention designers must identify what is possible to change and what is likely to have the greatest impact (Michie, Atkins, & West, 2014). This author identified the following as areas where change is possible and, based on the evidence presented thus far, considered likely to improve physical activity in cancer survivors.

INFLUENCING HEALTHCARE PROFESSIONALS

Evidence from Fisher and Williams et al. (2015) and Jones et al. (2004) has shown that advice from healthcare professionals to cancer survivors can significantly increase their levels of physical activity. Healthcare professionals can create teachable moments following a diagnosis of cancer when health may be more salient (Lawson & Flocke, 2009).

Cancer survivors are interested in lifestyle advice and want such advice from healthcare professionals who they consider experts in this area (Anderson et al., 2012, 2013; Clifford et al., 2018; Demark-Wahnefried et al., 2000; Webb, 2016; Webb & Smerald et al., 2016; Williams et al., 2015). The giving of physical activity advice by healthcare professionals is advocated in national policy and guidance (Public Health Wales, 2017; Scottish Government, 2014; Varney et al., 2014; NICE, 2014a), however, 69% of cancer survivors do not recall receiving such advice (Fisher and Williams et al., 2015).

Provision of physical activity advice by UK healthcare professionals is inconsistent with only one in ten talking to all cancer patients about the importance of physical activity (Macmillan Cancer Support, 2011). Just under a third of UK nurses think that discussing physical activity with cancer patients is not of critical importance and four-in-ten are unaware of the recommended guidelines for physical activity. Therefore, intervening to change the
behaviour of healthcare professionals to increase the frequency of physical activity advice to cancer survivors is likely to be impactful and is deemed changeable by this author.

Advice from trusted healthcare professionals can give cancer survivors the confidence and permission to become active at a level that is right for them (Webb, 2016; Webb & Smerald et al., 2016). Person-centred advice from healthcare professionals is likely to improve knowledge specific to physical activity and cancer, comorbidities, and the consequences of treatment. Advice from healthcare professionals can address the barriers and enhance the facilitators at the interpersonal level by influencing the behaviour of family members and friends, providing them with the knowledge regarding physical activity and cancer, and overcoming their fears of injury and harm of their loved one, creating a collective-efficacy. Healthcare professionals can influence the determinants of physical activity at a community level, helping cancer survivors and their family and friends navigate the opportunities in the local environment (reciprocal determinism), or signposting on to other available support such as remote-based interventions (facilitation) (Goode et al., 2015; Park et al., 2015; Stull et al., 2007; Webb, 2016; Webb & Smerald et al., 2016).

This author with colleagues (Webb & Foster et al., 2016) developed a training intervention for healthcare professionals to increase their frequency of discussions on physical activity with cancer survivors, the first of its kind in the UK. The training intervention was developed using the COM-B model and the Behaviour Change Wheel (Michie et al., 2011) and consisted of a 60-minute training seminar delivered either in face-to-face or online setting, with four-points of follow-up over 12-weeks. Details of the development and feasibility testing of the training intervention have been reported previously (Webb & Foster et al., 2016; Webb & Hall et al., 2016); however, the reach, impact, and adoption of the training intervention requires investigation. Further, the predictive value of the COM-B components of capability, opportunity, and motivation following the training seminar on the giving of physical activity advice also warrants investigation.

REMOTE SUPPORT TO SUPPORT BEHAVIOUR CHANGE

Whilst cancer survivors want to receive physical activity advice from a healthcare professional (Anderson et al., 2012, 2013; Clifford et al., 2018; Demark-Wahnefried et al., 2000; Webb, 2016; Webb & Smerald et al., 2016; Williams et al., 2015) the majority (52% to 55%) prefer lifestyle interventions to be home-based delivered via mail (Stull et al., 2007,
Trinh et al., 2012). Print-based interventions to complete at home may be effective in influencing physical activity in cancer survivors (Stull et al., 2007; Goode et al., 2015). At a time when spending on public health and healthcare in the UK continues to be constrained, with demand for services increasing, the need for home-based interventions is growing. Home-based interventions using printed materials supported by Internet-based tools offer a potentially cost-effective means of intervening to improve physical activity in cancer survivors regardless of location (Goode et al., 2015; Stull et al., 2007; Trinh et al., 2012).

There is a demand for written health information to support behaviour change in cancer survivors (Demark-Wahnefried & Clipp et al., 2006; Elliott et al., 2011; Rock et al., 2012; Stull et al., 2007; Trinh et al., 2012). Advantages include message consistency, ease of delivery, self-paced learning, and the permanence of information with low production costs (Hoffmann & Worrall, 2004). However, there are some disadvantages, such as difficulty tailoring the written materials, the varying levels of health literacy of recipients, and the need to update regularly to ensure that the included information does not go out of date (NHS, 2012; The information standard, n.d.).

It is acknowledged that some cancer survivors will require more intensive, long-term, in-person support to become physically active. However, the scarcity of such cancer-specific physical activity support services and the growing number of cancer survivors in the UK highlights the need for an evidence-based remote intervention to provide wide-spread support for cancer survivors in regard to physical activity. Providing remote intervention may free up the resource of specialist services, where they exist, for those that need such additional support. Park et al. (2015) and Short, James, Girgis, D'Souza, and Plotnikoff (2014) call for scalable, cost-effective remote-based interventions to support cancer survivors to become more physically active.

Macmillan Cancer Support, a UK charity supporting the needs of cancer survivors, developed a printed resource in 2011 called the Move More Pack that aimed to effect change in physical activity in cancer survivors. The Move More Pack consisted of a Physical Activity and Cancer booklet and a series of written assignments to support behaviour change. No additional assistance or follow up was provided. The Move More Pack was available to order online or to pick-up from Macmillan hospital information centres; it was not distributed directly to cancer survivors. The effectiveness of the Move More Pack in effecting change in physical activity in cancer survivors has not before been investigated.
Following a detailed review of the literature, this author led the redevelopment of the Move More Pack in 2016, guided by the SCT (Bandura, 1989; McAlister et al., 2008), the TPB (Ajzen, 1991), and the physical activity stage of change model (Marcus and Forsyth, 2009). The revised Move More Pack became a multicomponent intervention, including a print-based resource supported by a series of Internet-based tools. The steps to redevelop the Move More Pack are presented in the introduction to chapter three of this thesis.

The revised Move More Pack has the potential to improve the knowledge, outcome expectations and attitudes of cancer survivors regarding physical activity, helping to overcome unnecessary fears, and improving self-efficacy and control over becoming and staying active. The revised Move More Pack provides an opportunity to become active at home or as part of daily living, as-well-as providing details of how to find physical activity opportunities within the local community (reciprocal determinism). The revised Move More Pack incorporates a series of behaviour change tasks to facilitate and self-regulate physical activity, encouraging engagement from family members and friends creating a collective-efficacy and influencing subjective norms. The revised Move More Pack makes use of observational learning through video case-studies of cancer survivors becoming active, and through use of an exercise-to-music DVD specifically for cancer survivors. Following guidance from the MRC (Craig et al., 2008; Moore et al., 2015), the effectiveness of this intervention at bringing about change should be assessed, as-well-as a process evaluation to understand intervention use and for whom it is useful.

SECTION SUMMARY

Influencing healthcare professional practice to promote physical activity to cancer survivors, and providing remote physical activity behavioural change support, cut across multiple levels of influence on physical activity. Intervening in these areas can help overcome many of the barriers and enhance many of the facilitators of physical activity identified earlier in this chapter and provide a route from healthcare into physical activity at home or within the community.

Healthcare professionals can create a teachable moment making cancer a turning point, increasing knowledge, confidence, and changing the beliefs and attitudes of both cancer survivors and their close family and friends regarding physical activity. The revised Move More Pack could improve knowledge and confidence and provide tools to help overcome
barriers to becoming and staying active, engaging family and friends in this change and maintenance of behaviour.
THE SCOPE AND RELEVANCE OF THIS RESEARCH

RESEARCH SCOPE

This PhD research consists of three research studies:

1. Understanding the reach, adoption, and impact of a training intervention to influence the behaviour of healthcare professionals to provide physical activity advice to cancer survivors. This study is covered in chapter two.

2. A randomised waiting list control trial and cost-consequence analysis, to examine the effect of the Move More Pack on the physical activity, self-efficacy, and health-related quality of life of UK cancer survivors. This research is covered in chapter three.

3. A process evaluation of the Move More Pack to contextualise its use and usefulness. This process evaluation is reported in chapter four.

RELEVANCE OF THIS RESEARCH

The WHO (2015) call for research to strengthen the evidence-base for physical activity interventions and policy instruments across individual, community, organisational, and broader macro levels of influence, specifically in vulnerable populations. The Independent Cancer Taskforce for England (2015) encourages research to understand physical activity in cancer survivors better.

This body of research is a continuation of work already completed by this author in the field of physical activity behaviour change in cancer survivors. The body of research presented in this thesis aims to enhance knowledge and offer an original contribution to the study of physical activity in cancer survivors. There is a need for theory-based, replicable, and scalable interventions to support physical activity behaviour change in cancer survivors. Interventions to change health-related behaviours are often poorly described, without a theoretical basis, with those that are theoretically based not addressing all theoretical constructs (Prestwich, Sniehotta, Whittington, Dombroski, Rogers, Michie, 2014). This body of research takes a robust, theory-lead approach to intervention design, development, and testing.
This author with colleagues developed an intervention using the COM-B model and the Behaviour Change Wheel (Michie et al., 2011) to influence the behaviour of healthcare professionals to deliver very brief advice on physical activity to cancer survivors (Webb & Foster et al., 2016; Webb & Hall et al., 2016). Rosenstock (1990) states that theories should be tested iteratively in a real-world setting. Analysis of the impact of the training intervention on the frequency of physical activity discussions with cancer survivors will advance knowledge of the appropriateness, and applicability of the COM-B model and Behaviour Change Wheel (Michie et al., 2011) in this area. Further, analysis of the predictive value of the capability, opportunity, and motivation constructs on improvement in physical activity discussions will also advance knowledge in this regard. At the time of writing, no evidence is available in the wider literature to the knowledge of this author evaluating interventions designed using the COM-B model and the Behaviour Change Wheel. This evaluation will, in the words of Catford (2008) enhance the “science of delivery of health promotion” (Catford, 2008, p1).

There is a lack of reporting within the literature on how theory-based physical activity interventions for cancer survivors are designed and develop, and their effectiveness in improving physical activity, self-efficacy, and HRQOL (Bourke et al., 2013). Printed materials supported by Internet-based tools are likely to provide a low-cost approach to physical activity behaviour change, however, the effectiveness of such interventions must be assessed. A randomised control trial is deemed the gold standard of evidence and a trial of this kind will further knowledge in the use of remote interventions to influence physical activity in cancer survivors. A cost-consequence analysis will further knowledge on intervention costs related to physical activity, self-efficacy, and HRQOL outcomes. Finally, a process evaluation of the revised Move More Pack will help understand the multiple realities of its use and usefulness, to augment efficient distribution if taken to scale.

The transfer of new knowledge from research into policy and practice is sub-optimal (WHO, 2006). White, McAuley, Estabrooks, and Courney (2009) in a review of the external validity of physical activity behavioural interventions for breast cancer survivors conclude that the translation of evidence-based interventions from a research setting into real-world practice is poor. The best available evidence should inform public health and healthcare practice, including health promotion, and the scaling up of effective interventions is no different (Naidoo & Wills., 2016). Milat et al. (2014) suggest the first step in the scaling of an intervention is an assessment of intervention effectiveness, reach and adoption, as-well-as
understanding intervention acceptability within a political and strategic context. This emphasises the importance of evaluating the training intervention for healthcare professionals and the revised Move More Pack in real-world settings before considering plans to take these interventions to scale. This further supports the broad approach taken to understanding the barriers and facilitators to physical activity in cancer survivors using a socio-ecological model as has been done in this thesis, to situate the findings in a broad social context.
CHAPTER SUMMARY

Two-and-a-half-million people are living with or beyond cancer in the UK (Maddams et al., 2012). In the last five-years, this number has grown by almost half-a-million (Maddams et al., 2012). The number of cancer survivors, i.e. someone living with or after any form of cancer diagnosis (National Cancer Institute, 2015), is expected to rise to 3.8-million by 2030 (Maddams et al., 2012). Developing cancer depends on factors such as age, genetics, and lifestyle behaviours, with a suggested 40% of all cancers diagnosed in the UK linked to tobacco, alcohol, an unhealthy diet, being overweight, and a lack of physical activity (Parkin, 2010). Leading a physically active lifestyle reduces people's risk of developing several cancers (WCRF, 2007).

Being physically active has multiple benefits for cancer survivors. Physical activity can improve many common side-effects of cancer treatments such as fatigue, psychological distress, and adverse impact on body composition, as well as improving physical function and HRQOL (Speck et al., 2010). Increased physical activity is associated with improved survival and reduced disease recurrence (Li et al., 2016). The evidence supports the unequivocal role of physical activity in self-management (Speck et al., 2010), and physically active cancer survivors report a sense of regaining control of their lives and some normalcy (Webb et al., 2016) following a cancer diagnosis.

Engaging in physical activity is not only recommended but also safe both during and after cancer treatments (Schmitz et al., 2010). The American College of Sports Medicine (Schmitz et al., 2010) advises that cancer survivors avoid inactivity and return to typical daily activities as soon as possible after surgery, during and after cancer treatments, working towards the standard age-appropriate physical activity guidelines. Despite these benefits, only one-fifth of cancer survivors in England are active at recommended levels, and one third are completely inactive (DOH, 2012). Changing behaviour is complex and has multiple layers of influence.

Applications of individual psychosocial models are successful in bringing about a change in individuals but do little to bring about a population-level change in physical activity (Burchan et al., 2012). Therefore, it is important to take a broad approach to change physical activity, focusing on the behaviours not just of cancer survivors, but also the behaviours of the actors that can influence physical activity in cancer survivors.
A cancer diagnosis may offer a teachable moment in which people may be more receptive to changing their lifestyle behaviours (Rabin, 2009). Advice received from a trusted healthcare professional could create a teachable moment, and access to a low-intensity intervention may be all that is necessary to facilitate physical activity behaviour change (Lawson & Flocke, 2009; McBride & Emmons, 2003).

There is an opportunity to influence healthcare professionals to give physical activity advice to cancer survivors. A training intervention has been designed (Webb & Foster et al., 2016) but further assessment is necessary to identify its reach, adoption, and impact. Face-to-face physical activity opportunities explicitly for cancer survivors are rare. The revised Move More Pack, a print-based intervention supported by Internet-based tools, may offer a broad-reach intervention to empower cancer survivors to increase their physical activity. The effectiveness of the revised Move More Pack and the process of its use need to be assessed.
CHAPTER TWO

STUDY ONE: UNDERSTANDING THE REACH, ADOPTION, AND IMPACT OF A TRAINING INTERVENTION TO INFLUENCE HEALTHCARE PROFESSIONALS TO GIVE ADVICE ON PHYSICAL ACTIVITY TO CANCER SURVIVORS

The following publications preceded the work presented in this chapter:


The following paper has been published from the service evaluation presented within this chapter:


CHAPTER TWO CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>67</td>
</tr>
<tr>
<td>Method</td>
<td>76</td>
</tr>
<tr>
<td>Results</td>
<td>87</td>
</tr>
<tr>
<td>Discussion</td>
<td>100</td>
</tr>
</tbody>
</table>
INTRODUCTION

Guidance from Public Health England, NHS England, Health Education England (2016), and from NICE (2014a), states that all health and social care professionals deliver, as a minimum, very brief advice using an ask, advise, and act framework on physical activity to the patients that they encounter. Making every contact count is a UK policy level initiative to improve the giving of consistent advice on lifestyles during routine healthcare interactions (Public Health England, NHS England, & Health Education England, 2016). However, discussion of physical activity with cancer survivors by healthcare professionals is not common practice (Fisher and Williams et al., 2015), and there are calls for the training of healthcare professionals in this regard (Cantwell et al. 2018; Kenzik, Pisu, Fouad, & Martin, 2015; van Veen, Hoedjes, Versteegen, van de Meulengraaf-Wilhelm, Kampman, & Beijer, S, 2017). Campbell and Blank et al. (2012) report a gap in the evidence for the impact of training interventions to change healthcare professional practice in regard to the giving of lifestyle advice.

A recent publication by Cantwell et al. (2017) confirms that the physical activity advice currently offered by healthcare professionals in Ireland is not in-line with the agreed physical activity guidelines. Four key areas for improvement are suggested by Cantwell et al. being (1) the need for increased training opportunities for healthcare professionals; (2) the need to improve the knowledge of healthcare professionals; (3) an understanding of the limited time available in healthcare professional and patient interactions, and (4) a current lack of resources and interventions including community programmes and remote interventions.

Changing the behaviours of healthcare professionals is multi-faceted and requires a complex intervention to bring about change (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005). Interventions to bring about change should be evidence-based and systematically developed, using a coherent and appropriate theory (Craig et al., 2008). This author and colleagues developed a training intervention to influence the giving of physical activity advice by healthcare professionals to cancer survivors (Webb and Foster et al., 2016). This training intervention was developed for UK charity Macmillan Cancer Support.

As identified in chapter one, the COM-B model and the Behaviour Change Wheel (Michie et al., 2011) were selected by this author and colleagues (Webb & Foster et al., 2016) for use in intervention development. A summary of the intervention development process across the
stages of the Behaviour Change Wheel is now provided to give the reader a complete understanding of the development decisions, intervention content, and modes of delivery.

DEVELOPMENT OF A TRAINING INTERVENTION USING THE BEHAVIOUR CHANGE WHEEL

The steps included within the Behaviour Change Wheel process include (1) understanding the behaviour, (2) identification of intervention functions and policy categories, and (3) identification of intervention content and implementation options. Each of these steps is now covered in turn.

UNDERSTANDING THE BEHAVIOUR

Interventions to change behaviour may fail due to incorrect assumptions being made about what needs to change to influence behaviour. The COM-B model provides a structured approach to identify what needs to change in regard to the capability, opportunity, and motivation to perform a behaviour (Michie et al., 2011). The COM-B model constructs of capability, opportunity, and motivation are further divided into physical and psychological capability, physical and social opportunity, and automatic and reflective motivation (Michie et al., 2011). Michie et al. suggest making what they have called a behavioural diagnosis, identifying what needs to change to influence behaviour.

This author with colleagues (Webb & Foster et al., 2016) following a review of the literature to identify the barriers and facilitators to healthcare professionals giving physical activity advice, and secondary data analysis of a Macmillan Cancer Support (2011) survey of 400 healthcare professionals on the giving of lifestyle advice to cancer survivors, made the behavioural diagnosis as presented in Table 6 (Webb & Foster et al., 2016).
<table>
<thead>
<tr>
<th>COM-B component</th>
<th>Behavioural diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability – Physical</td>
<td>A physical capability is not necessary to perform this behaviour</td>
</tr>
<tr>
<td>Capability – Psychological</td>
<td>Practitioners need the knowledge of what to say, the skills on how to say it and the memory and attention to remember to give very brief advice</td>
</tr>
<tr>
<td></td>
<td>Practitioner behaviour is influenced by their perception of the evidence of the effectiveness of physical activity advice, and their perception of the effectiveness of physical activity to improve health</td>
</tr>
<tr>
<td></td>
<td>Practitioners are more willing to discuss and/or prescribe physical activity where they perceive a link to the presenting condition</td>
</tr>
<tr>
<td></td>
<td>Perceived ability of the patient affects a practitioner's decision to discuss and/or prescribe physical activity</td>
</tr>
<tr>
<td></td>
<td>Practitioners need to understand the importance of physical activity for cancer survivors</td>
</tr>
<tr>
<td></td>
<td>A lack of knowledge of the guidelines for physical activity in cancer survivors is cited as a barrier</td>
</tr>
<tr>
<td>Opportunity – Physical</td>
<td>Practitioners need the resources to hand to signpost on for more support</td>
</tr>
<tr>
<td>Opportunity – Social</td>
<td>Practitioners have limited time</td>
</tr>
<tr>
<td>Social</td>
<td>Practitioners need the support of this practice in the workplace</td>
</tr>
<tr>
<td>Motivation – Reflective</td>
<td>Practitioners must have the belief that this is the right thing to do for their patient, that it is safe, the confidence to deliver advice, and the belief that this is within their remit</td>
</tr>
<tr>
<td></td>
<td>Practitioners who believe that physical activity improves health are more motivated to deliver advice</td>
</tr>
<tr>
<td></td>
<td>Practitioner perception of the abilities of their patient to be physically active impacts on their reflective motivation to give advice</td>
</tr>
<tr>
<td></td>
<td>Practitioner perception of the interest of their patient to be physically active impacts on their reflective motivation to give advice</td>
</tr>
<tr>
<td>Motivation – Automatic</td>
<td>Delivery of very brief advice on physical activity needs to become a habit and a routine part of the consultation</td>
</tr>
</tbody>
</table>

Source: Webb and Foster et al. (2016)
The Behaviour Change Wheel incorporates nine intervention functions and seven policy categories (Michie et al., 2011). Intervention functions are the specific activities aimed at changing behaviours. Michie et al. go one step further, linking the most frequently used BCTs to the intervention functions from a list of 93 BCTs included in the Behaviour Change Technique Taxonomy version 1 (BCTTv1) (Michie et al., 2013, 2014). Policy categories, as identified in the Behaviour Change Wheel, are the actions to support and enable the delivery of the intervention functions (Michie et al., 2011).

The affordability, practicability, possible effectiveness, and acceptability of each of the intervention functions and policy categories in relation to the giving of physical activity advice were reviewed by this author in collaboration with physical activity and cancer experts ($n = 4$), cancer care professionals ($n = 4$), and a health psychologist (Webb & Foster et al., 2016). The six intervention functions of education, training, persuasion, enablement, environmental restructuring and modelling were selected for use in the training intervention. These selected intervention functions were supported by the policy categories of communications and marketing, use of existing guidelines, with the training intervention itself constituting the provision of a service.

The BCTs most frequently used for the identified intervention functions were reviewed by this author supplemented by a full review of the BCTTv1 (Webb & Foster et al., 2016; Michie et al., 2013). Eight BCTs, as outlined in Table 7, were selected for inclusion in the final intervention (Webb & Foster et al., 2016; Webb & Hall et al., 2016).
Table 7. Selected BCTs to bring about a change in the practice of healthcare professionals to give physical activity advice to cancer survivors

<table>
<thead>
<tr>
<th>BCT</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal-setting with Commitment</td>
<td>Set an agreed goal defined in terms of the behaviour to be achieved, using the term “I will”</td>
</tr>
<tr>
<td>Self-monitoring of behaviour</td>
<td>Method of self-monitoring and recording behaviour</td>
</tr>
<tr>
<td>Instructions on how to perform the behaviour</td>
<td>Advise and agree on how to perform the behaviour</td>
</tr>
<tr>
<td>Salience of consequences</td>
<td>Emphasise the consequences of the behaviour making them memorable</td>
</tr>
<tr>
<td>Demonstration of the behaviour</td>
<td>Provide a sample performance of the behaviour</td>
</tr>
<tr>
<td>Prompts/cues</td>
<td>Introduce or define environmental stimulus with the purpose of prompting or cueing the behaviour</td>
</tr>
<tr>
<td>Credible source</td>
<td>Present verbal or visual communication from a credible source in favour of the behaviour</td>
</tr>
<tr>
<td>Adding objects to the environment</td>
<td>Add objects to the environment to facilitate performance of the behaviour</td>
</tr>
</tbody>
</table>

BCT = Behaviour Change Technique (Michie et al., 2013)
Source: Webb and Foster et al. (2016) and Webb and Hall et al. (2016)

CONTENT OF THE INTERVENTION

This author developed the final intervention content in consultation with practice nurses (n = 9), oncology nurse specialists (n = 24), a nurse educator, and two cancer survivors (Webb & Foster et al., 2016). The final intervention content includes:

- Information on the importance of physical activity for cancer survivors (Davies et al., 2010; Thomas et al., 2014);
- Detail of the physical activity guidelines for cancer survivors (Campbell and Stevinson et al., 2012; DOH, 2012; Rock et al., 2012; Schmitz et al., 2010);
- The reported physical activity levels of cancer survivors (Blanchard et al., 2003; Blanchard et al., 2008; DOH, 2012; Wang et al., 2014);
• The impacts of sedentary behaviour on health (de Rezende et al., 2014; McGavock et al., 2009);
• Detail of the teachable moment (Rabin, 2009);
• The impact of advice from a trusted healthcare professional on lifestyle behaviours (Chambers et al., 2000; Demark-Wahnefried, 2005; Fisher and Williams et al., 2015; Jones et al., 2004; McBride et al., 2008);
• Instruction on how to give very brief advice on physical activity using an ask, advise, and act framework (NICE, 2014a);
• A demonstration of the giving of physical activity advice using an ask, advice, and act framework (Understanding physical activity and cancer – ask advise act, 2017); and
• Detail of where to signpost for more help and support (Maintaining a healthy lifestyle – Keeping active, 2016).

Detail of the intervention content, the intervention functions, associated COM-B components, and application of the selected BCTs are presented in Table 8 included within the methods section of this chapter. The content of the training intervention has received accreditation by the Royal College of General Practitioners and the Royal College of Nursing.

MODE OF DELIVERY

Training delivered in face-to-face and online settings is familiar to healthcare professionals (Murphy et al., 2015; Schmitt, Titler, Herr, & Ardery, 2004) and has been shown to be effective in the continued professional development of healthcare professionals in the field of evidence-based practice (Schardt, Garrison, & Kochi, 2002). The decision was taken by this author and colleagues (Webb & Foster et al., 2016) to provide the training seminar both in a face-to-face and an online setting. In recognition of the high work demands and the limited time of healthcare professionals, the decision was taken to deliver the training seminar in 60-minutes to fit within most meeting time allocations (Webb & Foster et al., 2016).

Well-designed online learning has been shown to be as effective as traditional classroom-based learning in the development of the knowledge and skill of healthcare professionals (Schardt et al., 2002; Schmitt et al., 2004). Online training offers a potentially cost-effective means of influencing large groups of healthcare professionals in regard to the giving of physical activity advice to cancer survivors; however, the reach of this online training seminar is not known. The online delivery of this training seminar used online seminar...
technology to allow for greater real-time interpersonal communication (Wang & Hsu, 2008), supporting social learning, important in the adoption of new behaviours in healthcare (van Nieuwenborg, Goossens, De Lepeleire, & Schoenmakers, 2016).

**FEASIBILITY, EVALUATION, AND IMPLEMENTATION**

As recommended by the MRC (Craig et al., 2008), the feasibility of interventions should be confirmed following development. Nurses were selected as the initial focus of this training intervention as 90% of cancer survivors have a named oncology nurse in charge of their care (Quality Health, 2016), and practice nurses are involved in the follow up care of cancer survivors following treatment (Webb & Foster et al., 2016). Further, it is suggested by Karvinen, McGourty, Parent, and Walker (2012) that patients may be more receptive to advice from nurses. O’Hanlon and Kennedy (2014) identify nurses (and physiotherapists) as key professionals to deliver physical activity advice to cancer survivors in healthcare settings in Ireland.

A feasibility study of the training intervention by this author and colleagues (Webb & Hall et al., 2016) confirms its feasibility and acceptability with nurses. Further, there is suggestion that it may be effective when delivered in a face-to-face setting with the chances of discussing physical activity most of the time significantly increasing by an odds ratio of 12.0. The effect-size of the intervention, when delivered via an online training seminar, is inconclusive due to a very small sample of just seven nurses recruited to this delivery mode.

Qualitative data collected as part of the feasibility study (Webb & Hall et al., 2016) suggests that nurses are positive about the structure, content, and length of the training seminar. A thematic analysis reveals that job demands, shift patterns, and limited study leave are barriers to the attendance of face-to-face training, highlighting the importance of an online training option, delivered at varying times of the day and days-of-the-week, to increase accessibility. Having a population-level physical activity intervention to which cancer survivors can be signposted is also deemed important by nurses, providing a rationale to support the redevelopment and testing of the Move More Pack as covered in chapter three and chapter four of this thesis. The qualitative data also suggested that other healthcare professionals would benefit from this training intervention and therefore the scope of the training intervention was broadened to include all healthcare professions in contact with cancer survivors.
Once intervention feasibility is confirmed the MRC (Craig et al., 2008) recommend following an experimental design for evaluation. Following completion of the feasibility study, an experimental trial was suggested by this author and colleagues (Webb & Hall et al., 2016) as the next stage of intervention development. However, when designing and developing interventions to bring about change in a practical setting, removed from a research environment, there is sometimes pressure to implement the intervention before such experimental designs can be completed, which was the case with this training intervention. The training intervention was developed for Macmillan Cancer Support. The organisation decided to put the training intervention into service and progress with a small-scale rollout of this service based on the findings of the feasibility study, not using an experimental design as recommended by this author. The rollout of the service delivery included both the face-to-face and online training intervention and took place throughout 2016 and the start of 2017. Despite missing this important evaluation step, the MRC suggests that monitoring and evaluation should continue when implementing an intervention, supporting the translation of evidence into practice, and practice back into evidence (Craig et al., 2008). Milat et al. (2014) support ongoing evaluation early in the intervention development process to support scaling decisions.

Milat et al. (2014) suggest that a scalability assessment is undertaken before a scaling plan is developed, including an assessment of the impact of an intervention, assessment of potential intervention reach and adoption, its acceptability and feasibility, and alignment with the broader strategic context. The feasibility and acceptability of this training intervention have been confirmed (Webb and Hall et al., 2016). The reach, adoption, and impact (particularly for online training seminar delivery) warrant further investigation. Evaluation of this service in a real-world setting will provide meaningful findings upon which future implementation and scaling decisions can be made. The ability of the components of the COM-B model (Michie et al., 2011) at predicting improvements in physical activity discussion frequency following training seminar delivery also requires investigation.
SERVICE EVALUATION AIMS

This service evaluation continues the previous work of this author (Webb & Foster et al., 2016; Webb & Hall et al., 2016) and aims to answer the following questions:

1. What is the reach of the online training intervention?
2. What is the take-up of the training intervention by healthcare profession across and between delivery modes?
3. What is the impact of the training intervention on the frequency of physical activity advice across and between delivery modes at 12-weeks?
4. Does the mode of training seminar delivery influence the capability, opportunity, and motivation of healthcare professionals to deliver physical activity advice?
5. What is the predictive value of the COM-B components following the training seminar on improvements in the frequency of delivery of physical activity advice at 12-week follow-up?
STUDY DESIGN

Evaluation of an existing service, or service evaluation, is defined by the National Research Ethics Service (2013) as an evaluation to understand how well a service is achieving its intended aims, benefiting the people using the service. Service evaluations have positivist roots (McKillop et al., 2017) and are designed and conducted with the sole purpose of defining or judging a current service with the results generating information to inform future decision-making (National Research Ethics Service, 2013).

This study uses secondary data, routinely collected as part of service delivery. The anonymised data collected between January 2016 and March 2017 was made available to this author by Macmillan Cancer Support for the purposes of this service evaluation. All data was held securely in accordance with the Data Protection Act (1998). No additional data was collected. The National Research Ethics Service (2013) state that review by a research ethics committee is not required for service evaluations (Appendix 2).

Assessment of the impact of the training intervention used a pre-post design with the frequency of discussions on physical activity with cancer patients collected as part of the service immediately before training seminar delivery, and 12-weeks after completion of the training seminar. Assessment of the COM-B components was via a COM-B questionnaire, instructed as part of the service immediately after delivery of the training seminar.

participant journey through the service

The participant journey is presented from registration, contact prior to attendance of the training seminar, the delivery of the training seminar, and follow up after the training seminar; all of these points are considered to make up the training intervention.

5 The confidentiality agreement between this author and Macmillan Cancer Support in regard to using of the data for this service evaluation is available as Appendix 1. This author designed and delivered this training intervention as a then employee of Macmillan Cancer Support between January 2016 and March 2017. Training seminar delivery was supported during this period by a Macmillan Cancer Support Project Manager, Ms. Jenna Stockwell. The service delivery data was collected during this period by a Project Officer at Macmillan Cancer Support, Ms. Yanaiana Chavez-Ugalde.
REGISTRATION

The online training seminar was promoted by Macmillan Cancer Support throughout the period from January 2016 to November 2016. The online training intervention was promoted under the title Understanding physical activity and cancer. Interested participants were directed to an online registration page. The registration page outlined the following regarding the course:

“This training will enable you to raise awareness of the importance of physical activity and signpost people to further support. The National Institute of Health and Care Excellence recommends that all health and social care professionals should be encouraged to deliver very brief advice to motivate people to make a lifestyle change. 'Very brief advice' means a short intervention of less than two minutes based on 'ask, advise, act'.” (Understanding physical activity and cancer, n.d., para 1).

The registration page also listed the following learning outcomes (Understanding physical activity and cancer, n.d., para 2):

1. Understand the importance of physical activity for people living with cancer
2. Find out what resources are available to support people to become more active
3. Learn how to deliver advice on physical activity in less than two minutes

A screenshot of the registration page is available as Supplementary File 1. Occupation details were available for those registering for the online training intervention. Registration was not required before attendance at the face-to-face training seminar. Nine regional Macmillan Cancer Support Development Managers coordinated with the local healthcare professional workforce within their areas to arrange for delivery of the training seminar at pre-arranged training days or conference workshops. Occupation details were collected from those attending a face-to-face training seminar at the start of the training seminar.

---

6 Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRUq_evgSz1mNSefGTKmXaE3
CONTACT PRIOR TO DELIVERY OF THE TRAINING SEMINAR

No central contact was made by Macmillan Cancer Support with participants prior to delivery of the face-to-face training seminars, only with their regional Macmillan Cancer Support Development Managers.

Participants registered to take part in an online training seminar received a reminder email one week before the seminar, and again one day prior to delivery of the 60-minute online training seminar. These reminders offered participants the opportunity to download a calendar invitation which included detail of the technical requirements of the online seminar, and a link to access the online seminar. The one-week and one-day reminder emails are available as Supplementary Files 2 and 3.

DELIVERY OF THE TRAINING INTERVENTION

A full breakdown of the 60-minute training seminar across both delivery modes, face-to-face and online, including the format, content, intervention functions, BCTs and COM-B components is outlined in Table 8. The content replicates that delivered in the feasibility study (Webb & Hall et al., 2016), however, a review of the content of the training seminar by this author following the feasibility study lead to a reorganisation of some sections to improve the flow of the training seminar. The elements on the teachable moment were moved to the start of the seminar as it was felt that this set the scene for the training seminar. In addition, the video of a cancer survivor discussing the benefits of physical activity was moved to the end of the training seminar as it was felt that this provided a strong conclusion to the training, highlighting the benefits to the patient. There is evidence to suggest that Macmillan Cancer Support is a credible source to healthcare professionals working with cancer survivors (Williams et al., 2015). Being a credible source is a recognised BCT in the BCTTv1, however, as it applies across all elements of the training intervention it has not been included in Table 8.

---

* Supplementary Files are available at https://drive.google.com/open?id=1JzW0y6ZRu_q_evgaZz1mNSejGTKmXaE3
<table>
<thead>
<tr>
<th>Format</th>
<th>Content</th>
<th>Intervention function</th>
<th>BCT</th>
<th>COM-B components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Baseline questionnaire on the frequency of discussions on physical activity with cancer survivors</td>
<td>Enablement; Education</td>
<td>Self-monitoring of behaviour</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Presentation</td>
<td>Introduce the aims of the training</td>
<td>Enablement</td>
<td></td>
<td>Opportunity – Social</td>
</tr>
<tr>
<td>Video</td>
<td>The teachable moment and the positive effect of advice from a healthcare professional on physical activity</td>
<td>Education</td>
<td>Salience of consequences</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Presentation</td>
<td>Incidence and prevalence of cancer in the UK population; the evidence of the benefits of physical activity to cancer survivors including information on the safety of physical activity</td>
<td>Education</td>
<td>Salience of consequences</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Video clip</td>
<td>Professor of Oncology talking about the importance of physical activity</td>
<td>Education; Persuasion; Modelling</td>
<td>Instructions on how to perform the behaviour; Salience of consequence</td>
<td>Capability – Psychological; Opportunity – Social; Motivation – Reflective</td>
</tr>
<tr>
<td>Task and Presentation</td>
<td>What are the guidelines for physical activity in the general and cancer population?</td>
<td>Education</td>
<td>Salience of consequences</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Presentation</td>
<td>Current levels of physical activity amongst cancer survivors. The impact of sedentary behaviour (participants invited to stand during this section)</td>
<td>Education; Persuasion</td>
<td>Salience of consequences</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Format</td>
<td>Content</td>
<td>Intervention function</td>
<td>BCT</td>
<td>COM-B components</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Presentation</td>
<td>Introduce the <em>ask, advise, act</em> framework</td>
<td>Training</td>
<td>Instructions on how to perform the behaviour</td>
<td>Capability – Psychological</td>
</tr>
<tr>
<td>Video Clip</td>
<td>Clip of the behaviour in action</td>
<td>Training; Modelling</td>
<td>Instructions on how to perform the behaviour; Demonstration of the behaviour</td>
<td>Capability – Psychological; Opportunity - Social</td>
</tr>
<tr>
<td>Presentation</td>
<td>Resources available to support behaviour change in cancer survivors</td>
<td>Training; Enablement; Education</td>
<td>Instructions on how to perform the behaviour; Demonstration of the behaviour</td>
<td>Capability – Psychological; Opportunity – Physical</td>
</tr>
<tr>
<td>Presentation and discussion</td>
<td>What physical activity opportunities are available <em>(act)</em>?</td>
<td>Enablement</td>
<td>Instructions on how to perform the behaviour</td>
<td>Capability – Psychological; Opportunity – Physical</td>
</tr>
<tr>
<td>Video clip</td>
<td>A cancer patient story - how physical activity has helped?</td>
<td>Enablement; Persuasion</td>
<td>Salience of consequence</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Supporting Materials</td>
<td>Participants were given (face-to-face), or informed that they will receive in one week in the mail <em>(online)</em> an <em>ask, advise, act</em> coaster – including an Internet URL for cancer survivors, an <em>ask, advise, act</em> script card, and a certificate of attendance</td>
<td>Enablement; Restructuring the environment</td>
<td>Adding objects to the environment; Prompts/cues</td>
<td>Opportunity – Physical</td>
</tr>
<tr>
<td>Format</td>
<td>Content</td>
<td>Intervention function</td>
<td>BCT</td>
<td>COM-B components</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Task</td>
<td>Participants to make up to three pledges of what they will do differently using the term <em>I will</em>... focusing on a behavioural outcome</td>
<td>Enablement</td>
<td>Goal-setting; Commitment</td>
<td>Opportunity – Physical; Motivation – Reflective</td>
</tr>
<tr>
<td>Presentation</td>
<td>Summary and close. Opportunity to ask questions and discuss topics of interest further</td>
<td>Education;</td>
<td>Capability – Psychological;</td>
<td>Opportunity – Social</td>
</tr>
<tr>
<td>Task</td>
<td>Completion of a COM-B questionnaire immediately post-training seminar (online in the online delivery; paper-based in the face-to-face delivery)</td>
<td>Enablement</td>
<td>Self-monitoring of behaviour</td>
<td>Opportunity – Physical; Motivation – Reflective</td>
</tr>
<tr>
<td>Follow-up point 1 – three-days post-seminar</td>
<td>Participants receive presentation slides by email</td>
<td>Education;</td>
<td>Instructions on how to perform the behaviour; Salience of consequence</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Follow-up point 2 – one week post-seminar (online only)</td>
<td>Participants receive an <em>ask, advise, act</em> coaster, an <em>ask, advise, act</em> script card in the mail, and a certificate of attendance</td>
<td>Enablement</td>
<td>Adding objects to the environment; Prompts/cues</td>
<td>Opportunity – Physical</td>
</tr>
<tr>
<td>Follow-up point 3 – Eight-weeks post-seminar</td>
<td>Participant pledges returned via email (online) or post (face-to-face), including details of a video on the benefits of physical activity on fatigue (online only)</td>
<td>Enablement</td>
<td>Goal-setting; Commitment; Salience of consequence; Self-monitoring of behaviour</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
<tr>
<td>Follow-up point 4 – Task 12-weeks post-training seminar</td>
<td>Follow-up questionnaire on the frequency of discussions on physical activity with cancer survivors - sent over email</td>
<td>Enablement</td>
<td>Self-monitoring of behaviour</td>
<td>Capability – Psychological; Motivation – Reflective</td>
</tr>
</tbody>
</table>

*BCT = Behaviour Change Technique selected from the Behaviour Change Technique Taxonomy version 1 (Michie et al., 2013)*  
*COM-B = Capability, Opportunity and Motivation – Behaviour*  
*Source: Webb and Foster et al., (2016)*
FOLLOW-UP TOUCH POINTS AFTER COMPLETION OF THE TRAINING SEMINAR

Those who registered for an online training seminar but did not attend received an email inviting them to a future online training seminar. The participants completing the training seminar (face-to-face and online) received an email within three-days of attending with the presentation slides and associated references (available as Supplementary Files 4 and 5).8

One week after completion of the online training seminar participants received supporting materials in the post. The supporting materials included a coaster displayed with the words *ask, advise, act* and an Internet URL where healthcare professionals could signpost cancer survivors for more information (Supplementary File 6), a script card with an example of how to *ask, advise, and act* in regard to physical activity advice for cancer survivors (Supplementary File 7), and a certificate of completion (Supplementary File 8). These supporting materials were handed out to the face-to-face training seminar participants at the end of the training seminar.

Eight-weeks following competition of the training seminar participants received their pledge made during the training seminar, sent via email to those who attended the online training seminar (Supplementary file 9), and in the post to those attending a face-to-face session (those attending a face-to-face training seminar wrote a pledge, placing it in an envelope, sealing it, and adding their address). Online participants also received a link to a video (Cancer Related Fatigue, 2013) explaining the benefits of physical activity in relation to fatigue in cancer survivors (Supplementary Files 9 & 10).

Twelve-weeks after completion of the training seminar (face-to-face and online) participants received a follow-up questionnaire via email asking about their discussions on physical activity with cancer survivors (Supplementary File 11).

8 Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRUq_evgazZz1mNSeGTKmXaE3
The service evaluation data covered the period January 2016 to March 2017. Delivery of the training seminars both face-to-face and online took place between January 2016 and November 2016, with follow-up data collected throughout and up to March 2017, allowing for the intervention follow-up activities to be completed in those participants completing a training seminar in November 2016. The measure used to collect data during service delivery on the frequency of giving physical activity advice to cancer survivors replicated that used within the feasibility study (Webb & Hall et al., 2016) which was based on previous work by Bourne, Batehup, & Lynall (2013).

At the start of the online and face-to-face training seminar participants were asked the following question on their frequency of discussions on physical activity:

“I raise physical activity with my cancer patients….. 0% to 25% of the time; 26% to 50% of the time; 51% to 75% of the time or 76% to 100% of the time?” (Webb & Hall et al., 2016, p. 124)

This same question was posed again to those completing the training intervention, 12-weeks after the training seminar delivery.

At the end of the training seminar participants completed a 10-item COM-B questionnaire. Participants responded to statements identifying improvements in the COM-B components from the training seminar using a five-point Likert scale with one being strongly disagree, and five strongly agree (Table 9). This measure again replicates that used in the feasibility study of this training intervention (Webb & Hall et al., 2016), which was based on a similar COM-B questionnaire presented by Michie et al. (2014).
Table 9. Assessment of the COM-B components following the training intervention

<table>
<thead>
<tr>
<th>Statement</th>
<th>COM-B component</th>
</tr>
</thead>
<tbody>
<tr>
<td>This session has…</td>
<td></td>
</tr>
<tr>
<td>Improved my knowledge on the importance of physical activity for cancer patients</td>
<td>Capability</td>
</tr>
<tr>
<td>Improved my knowledge of what to say to cancer patients about physical activity</td>
<td>Capability</td>
</tr>
<tr>
<td>Given me the skills to have a conversation about physical activity</td>
<td>Capability</td>
</tr>
<tr>
<td>Given me the tools and prompts to have a conversation about physical activity</td>
<td>Opportunity</td>
</tr>
<tr>
<td>Helped me understand how to fit the conversation into the time I have available</td>
<td>Opportunity</td>
</tr>
<tr>
<td>Showed me how to get the materials I need</td>
<td>Opportunity</td>
</tr>
<tr>
<td>Made signposting to physical activity sessions easier</td>
<td>Opportunity</td>
</tr>
<tr>
<td>Given me the confidence that others are having the conversation</td>
<td>Motivation</td>
</tr>
<tr>
<td>Made me feel like I should talk about physical activity as part of my role</td>
<td>Motivation</td>
</tr>
<tr>
<td>Made me believe that it is the right thing to do</td>
<td>Motivation</td>
</tr>
</tbody>
</table>

PROMOTIONAL ACTIVITY

Data was not available on the promotional activity for the face-to-face training intervention as this was conducted by the regional Macmillan Cancer Support Development Managers through their local professional networks. However, data was made available to this author on the promotion of the online training intervention including the date, type of promotional activity, and its estimated reach.

DATA ANALYSIS

THE RE-AIM FRAMEWORK

The RE-AIM framework (Glasgow, Vogt, & Boles, 1999) provides a useful approach to the evaluation of public health interventions and is recommended by the MRC (Moore et al., 2015). The RE-AIM framework offers five domains for evaluation being (1) reach, (2) effectiveness, (3) adoption, (4) implementation, and (5) maintenance.
The reach in relation to this training intervention refers to the number of healthcare professionals made aware of the training intervention who then subsequently registered for the online training seminar (reach data was only available for online delivery). The effectiveness of the training intervention refers to the improvement, or maintenance at the highest level, of discussion on physical activity with cancer survivors at 12-week follow-up. The service evaluation did not include data from a controlled comparison and therefore it was not possible to conclusively access the effectiveness of the training intervention, rather the possible training intervention effect-size across delivery modes, referred to as impact from this point on. The adoption domain of the RE-AIM framework in this training intervention refers to the completion of the training seminar by healthcare profession.

The implementation domain of the RE-AIM framework would relate to the delivery of physical activity advice using the ask, advise, and act framework by healthcare professionals to cancer survivors, and to the implementation of very brief advice by all healthcare professionals in a particular setting. However, the implementation domain of the RE-AIM framework was not within the scope of the service evaluation. Finally, the maintenance domain of the RE-AIM framework would relate to the maintenance of discussions on physical activity over six months or more, maintenance of delivery of advice using an ask, advise, and act framework, and maintenance of delivery of very brief advice by healthcare profession or a particular setting. However, the maintenance domain was also not within the scope of the service evaluation.

THE IMPACT OF THE TRAINING INTERVENTION

The impact of the training intervention (online, face-to-face, and combined) was assessed using the self-reported ordinal data on physical activity discussions frequency at baseline and at 12-week follow-up. Those that reported physical activity discussions 0% to 25% of the time were recorded as a value of 1, 26% to 50% of the time a value of 2, 51% to 75% of the
time a value of 3, and 76% to 100% of the time a value of 4. Intention to treat analysis using the Wilcoxon signed-rank test, two-tailed, with an alpha of 0.05 was completed, with baseline values carried forward for any missing data at 12-weeks.

Differences between the two delivery modes at baseline were assessed using the Mann-Whitney U test. An Analysis of Covariance (ANCOVA) controlling for baseline physical activity discussion frequency, assessed the difference between the delivery modes at 12-weeks.

Odds ratios were calculated for those considered to have the highest frequency of discussions on physical activity (76% to 100% of the time), compared to those with sub-optimal discussion frequency, from baseline to 12-week follow-up. The dichotomous data of discussion frequency greater or less than 76% of the time was assessed using the McNemar test. All statistical analysis was completed using IBM’s™ statistics package SPSS version 24.

---

**THE ADOPTION OF THE TRAINING INTERVENTION BY HEALTHCARE PROFESSION**

The adoption of the training intervention by healthcare profession was assessed for online training seminar delivery by registrations, and by those completing the training seminar. The adoption for face-to-face training seminar delivery was assessed by the healthcare profession of participants completing the training seminar.

**ANALYSIS OF THE COM-B COMPONENTS**

An ANCOVA was conducted controlling for baseline physical activity discussion frequency on the impact of the mode of training seminar delivery on the capability, opportunity, and motivation scores, and a combined COM-B score (totalling the means for each component).

Binary logistic regression was performed on the combined data across delivery modes on a per protocol basis on the outcome of improvement in physical activity discussion frequency (or not) with the mean capability, opportunity, or motivation score as the independent variable. This analysis was repeated using a combined COM-B score totalling the means from each COM-B component. Michie et al. (2011) state that capability and opportunity influence motivation as well as the outcome behaviour. Therefore, the capability and opportunity components were assessed across the combined data for their impact on motivation using linear regression.
RESULTS

The results of this service evaluation are presented in four-sections in answer to the evaluation aims. The first section presents the reach of the online training intervention. The second section presents the adoption or take-up of the training intervention by healthcare profession across delivery modes. The third section presents the impact of the training intervention on physical activity discussion frequency. The fourth section includes analysis of the impact of the training intervention on the COM-B components, and the predictive value of the COM-B components on improvement in physical activity discussion frequency.

REACH

The online training intervention was promoted electronically to a network of 6,344 healthcare professionals held by Macmillan Cancer Support, through their Mac Mail e-newsletter. During the promotional period, this e-newsletter was opened by 1,802 healthcare professionals. Across two separate e-newsletter articles, January and August 2016, 67 and 111 healthcare professionals clicked on a link associated with the training intervention, a 3.7% and 6.2% response rate respectively for those that opened the e-newsletter, and 1.1% and 1.7% total response rate respectively.

The online training intervention was promoted throughout the period January 2016 to November 2016 on a consequences of cancer treatment webpage on doctors.net.uk, the UK's largest professional network for doctors. Over the promotional period, 4,742 unique visitors accessed this webpage with 23 healthcare professionals accessing information regarding the training intervention, a 0.5% response rate.

The online training intervention was promoted in two separate articles on a Nursing Times: Macmillan Cancer Support microsite in February 2016 and September 2016 (Macmillan resources hub, n.d.) The Nursing Times: Macmillan Cancer Support microsite had a monthly reach during 2016 of 538 unique visitors. Data was not available on the number of visitors accessing these two articles. Finally, the online training intervention was promoted at the
2016 National Cancer Research Institute conference, with a promotional leaflet placed within 600 delegate packs, a copy of which is available as Supplementary File 12⁹.

The total reach of this promotional activity combined is estimated to be 7,682 healthcare professionals (Figure 2). Two-hundred-and-seven healthcare professionals registered to attend one of 11 possible online training sessions (one available per-month from January 2016 to November 2016) a ratio of 38 contacts to 1 booking.

## ADOPTION

### ADOPTION OF THE ONLINE TRAINING INTERVENTION BY PROFESSIONAL GROUP

The largest number of registrations for the online training intervention came from nurses with 72 of 207 registrations (34.8%), the professional group for whom the training was originally developed. This was followed by support workers (n = 31 of 207, 15.0%), physiotherapists (n = 29 of 207, 14.0%), radiation therapists (n = 27 of 207, 13.0%), dietitians (n = 15 of 207, 7.2%), those in management positions (n = 14 of 207, 6.8%) and occupational therapists (n = 10 of 207, 4.8%), with a small number from other professions (n = 9 of 207, 4.3%).

Of the 207 registrations, 127 healthcare professionals completed the hour-long training seminar, a completion ratio of 61.4%. The highest registration to completion figures were observed in dietitians with a completion rate of 73.3% (n = 11 of 15), followed by those in management positions (n = 10 of 14, 71.4%), physiotherapists (n = 20 of 29, 69.0%), support workers (n = 21 of 31, 67.7%), nurses (n = 44 of 72, 61.1%), occupational therapists (n = 5 of 10, 50%), and radiation therapist (n = 13 of 27, 48.2%). The registrations and online training seminar completions are presented in Table 10.

---

⁹ Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRUq_evgaZz1mNSeGTKmXaE3
Figure 2. The reach, adoption, and impact of an online training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors.
Table 10. Registrations and completion of the online training seminar by professional group

<table>
<thead>
<tr>
<th>Profession</th>
<th>Registrations – n (%)</th>
<th>Completion – n (%)</th>
<th>Registrations to completion - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Psychologist</td>
<td>3 (1.4)</td>
<td>2 (1.6)</td>
<td>66.7</td>
</tr>
<tr>
<td>Consultant</td>
<td>1 (0.5)</td>
<td>0 (0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Dietitian</td>
<td>15 (7.2)</td>
<td>11 (8.7)</td>
<td>73.3</td>
</tr>
<tr>
<td>General Practitioner</td>
<td>5 (2.4)</td>
<td>1 (0.8)</td>
<td>20.0</td>
</tr>
<tr>
<td>Management</td>
<td>14 (6.8)</td>
<td>10 (7.9)</td>
<td>71.4</td>
</tr>
<tr>
<td>Nurse</td>
<td>72 (34.8)</td>
<td>44 (34.6)</td>
<td>61.1</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>10 (4.8)</td>
<td>5 (3.9)</td>
<td>50.0</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>29 (14.0)</td>
<td>20 (15.7)</td>
<td>69.0</td>
</tr>
<tr>
<td>Support Worker</td>
<td>31 (15.0)</td>
<td>21 (16.5)</td>
<td>67.7</td>
</tr>
<tr>
<td>Radiation Therapist</td>
<td>27 (13.0)</td>
<td>13 (10.2)</td>
<td>48.1</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>127</td>
<td>61.4</td>
</tr>
</tbody>
</table>

ADOPTION OF THE FACE-TO-FACE TRAINING INTERVENTION BY PROFESSIONAL GROUP

Over the 11-month period from January 2016 to November 2016, nine face-to-face training seminars were delivered and completed by a total of 130 healthcare professionals. The face-to-face training intervention was most popular with nurses, the professional group for whom the original training was designed with 57.7% of those attending from this professional group. This was followed by physiotherapists (20.8%), occupational therapists (7.7%), and support workers (6.9%). The completion of the face-to-face training seminar by professional group is outlined in Table 11.
Table 11. Completion of the face-to-face training seminar by professional group

<table>
<thead>
<tr>
<th>Profession</th>
<th>Completion - n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Psychologist</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>Counsellor</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>Dietitian</td>
<td>2 (1.5)</td>
</tr>
<tr>
<td>Nurse</td>
<td>75 (57.7)</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>10 (7.7)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>27 (20.8)</td>
</tr>
<tr>
<td>Support Worker</td>
<td>9 (6.9)</td>
</tr>
<tr>
<td>Radiation Therapist</td>
<td>4 (3.1)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>130</strong></td>
</tr>
</tbody>
</table>

ADOPTION OF THE TRAINING INTERVENTION – COMBINED ANALYSIS BY PROFESSIONAL GROUP

The adoption of the training intervention by healthcare profession across delivery modes and combined is presented in Table 12.

Table 12. Completion of the training seminar by professional group by delivery mode and combined

<table>
<thead>
<tr>
<th>Profession</th>
<th>Face-to-face training seminar completions – n (%)</th>
<th>Online training seminar completions – n (%)</th>
<th>Combined training seminar completions – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Psychologist</td>
<td>1 (0.8)</td>
<td>2 (1.6)</td>
<td>3 (1.2)</td>
</tr>
<tr>
<td>Counsellor</td>
<td>1 (0.8)</td>
<td>0 (0.00)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Dietitian</td>
<td>2 (1.5)</td>
<td>11 (8.7)</td>
<td>13 (5.0)</td>
</tr>
<tr>
<td>General Practitioner</td>
<td>0 (0.00)</td>
<td>1 (0.8)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Management</td>
<td>- (-)</td>
<td>10 (7.9)</td>
<td>10 (3.9)</td>
</tr>
<tr>
<td>Nurse</td>
<td>75 (57.7)</td>
<td>44 (34.6)</td>
<td>119 (46.3)</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>10 (7.7)</td>
<td>5 (3.9)</td>
<td>15 (5.8)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>1 (0.8)</td>
<td>0 (0.00)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>27 (20.8)</td>
<td>20 (15.7)</td>
<td>47 (18.3)</td>
</tr>
<tr>
<td>Support Worker</td>
<td>9 (6.9)</td>
<td>21 (16.5)</td>
<td>30 (11.7)</td>
</tr>
<tr>
<td>Radiation Therapist</td>
<td>4 (3.1)</td>
<td>13 (10.2)</td>
<td>17 (6.6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>130</strong></td>
<td><strong>127</strong></td>
<td><strong>257</strong></td>
</tr>
</tbody>
</table>
IMPACT

IMPACT OF THE ONLINE TRAINING INTERVENTION

Of the 127 healthcare professionals who completed the online training seminar, 45 (35.4%) declined to complete the baseline survey on their discussions of physical activity with cancer patients. Fifty-three of the 82 participants (64.6%) who provided baseline data reported discussing physical activity with their cancer patients less than 76% of the time.

Only 44 of the 82 (53.7%) participants who provided baseline data responded to the 12-week follow-up survey, despite participants receiving four personalised email reminders. Of those that responded, 19 of 44 (43.2%) maintained discussions at the highest level (76% to 100% of the time), 16 of 44 (36.4%) improved their discussions from baseline, six of 44 (13.6%) maintained discussions at a lower frequency, and three of 44 (6.8%) reported discussing physical activity less than at baseline.

Intention to treat analysis with the last observation carried forward for any missing data using the Wilcoxon signed-rank test, two-tailed, to an alpha of 0.05 reported a significant increase in the frequency of discussions on physical activity ($z = 3.10, p = .002, r = 0.34$).

Table 13. The frequency of discussions on physical activity at baseline and 12-weeks after delivery of the online training seminar

<table>
<thead>
<tr>
<th></th>
<th>0-25% of the time – n (%)</th>
<th>26-50% of the time – n (%)</th>
<th>51-75% of the time – n (%)</th>
<th>76-100% of the time – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>14 (17.1)</td>
<td>21 (25.6)</td>
<td>18 (22.0)</td>
<td>29 (35.4)</td>
</tr>
<tr>
<td>12-weeks</td>
<td>11 (13.4)</td>
<td>15 (18.3)</td>
<td>19 (23.2)</td>
<td>37 (45.1)</td>
</tr>
</tbody>
</table>

McNemar’s test on the dichotomous variable of discussing physical activity greater or less than 76% of the time, showed a significant improvement from baseline to 12-weeks post-training seminar ($p = .02$) with an odds ratio of 1.50.
Of the 130 healthcare professionals who completed the face-to-face training seminar, three declined to complete the baseline survey on their discussions of physical activity with cancer patients. Ninety-nine of the 127 participants (78.0%) who provided baseline data reported discussing physical activity with their cancer patients less than 76% of the time.

Only 46 of the 127 participants (36.2%) who provided baseline data responded to the 12-week follow-up survey, despite participants receiving four personal email reminders. Of those that responded, 12 of 46 (26.1%) maintained discussions at the highest level (76% to 100% of the time), 23 of 46 (50.0%) improved their discussions from baseline, seven of 46 (15.2%) maintained discussions at a lower frequency, and four of 46 (8.7%) reported discussing physical activity less than at baseline.

Intention to treat analysis with the last observation carried forward for any missing data using the Wilcoxon signed-rank test, two-tailed, to an alpha of 0.05 reported a significant increase in the frequency of discussions on physical activity ($z = 3.80, p < .001, r = 0.34$).

Table 14. The frequency of discussions on physical activity at baseline and 12-weeks after delivery of the face-to-face training seminar

<table>
<thead>
<tr>
<th>I raise physical activity with my cancer patients...</th>
<th>0-25% of the time – n (%)</th>
<th>26-50% of the time – n (%)</th>
<th>51-75% of the time – n (%)</th>
<th>76-100% of the time – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>36 (28.4)</td>
<td>29 (22.8)</td>
<td>34 (26.8)</td>
<td>28 (22.0)</td>
</tr>
<tr>
<td>12-weeks</td>
<td>30 (23.6)</td>
<td>22 (17.3)</td>
<td>34 (26.8)</td>
<td>41 (32.3)</td>
</tr>
</tbody>
</table>

McNemar’s test on the dichotomous variable of discussing physical activity greater or less than 76% of the time, showed a significant improvement from baseline to 12-weeks post face-to-face training seminar ($p = .002$) with an odds ratio of 1.69.
Figure 3. The adoption and impact of a face-to-face training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors

COMBINED ANALYSIS OF THE IMPACT OF THE TRAINING INTERVENTION

Of the 257 healthcare professionals who completed the training seminar across both delivery modes (127 online and 130 face-to-face), 48 declined to complete the baseline survey on their discussions of physical activity with cancer patients. One-hundred-and-fifty-two of the 209 participants (72.7%) who provided baseline data reported discussing physical activity with their cancer patients less than 76% of the time. At baseline, physiotherapists were the most likely to discuss physical activity with 43.6% (n = 17 of 39) of responders discussing physical activity more than 76% of the time. This compared to 25.2% of nurses (n = 26 of 103) and 20.0% of occupational therapists (n = 3 of 15) discussing physical activity more than 76% of the time. Other professional groups had ten responses or less and therefore have not been reported.
Only 90 of the 209 (43.1%) participants who provided baseline data across both delivery modes responded to the 12-week follow-up survey. Of those that responded, 31 of 90 (34.4%) maintained discussions at the highest level (76% to 100% of the time), 39 of 90 (43.3%) improved their discussions from baseline, 13 of 90 (14.4%) maintained discussions at a lower frequency, and seven of 90 (7.8%) reported discussing physical activity less than at baseline.

Intention to treat analysis with the last observation carried forward for any missing data using the Wilcoxon signed-rank test, two-tailed, to an alpha of 0.05 reported a significant increase in the frequency of discussions on physical activity ($z = 4.90, p < .001, r = 0.34$).

Table 15. The frequency of discussions on physical activity at baseline and 12-weeks after training seminar delivery (face-to-face and online delivery combined)

<table>
<thead>
<tr>
<th></th>
<th>0-25% of the time – n (%)</th>
<th>26-50% of the time – n (%)</th>
<th>51-75% of the time – n (%)</th>
<th>75-100% of the time – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>50 (23.9)</td>
<td>50 (23.9)</td>
<td>52 (24.9)</td>
<td>57 (27.3)</td>
</tr>
<tr>
<td>12-weeks</td>
<td>41 (19.6)</td>
<td>37 (17.7)</td>
<td>53 (25.4)</td>
<td>78 (37.3)</td>
</tr>
</tbody>
</table>

McNemar’s test on the dichotomous variable of discussing physical activity greater or less than 76% of the time showed a significant improvement from baseline to 12-weeks ($p < .001$) with an odds ratio of 1.59.

BETWEEN GROUP ANALYSIS OF IMPACT

Analysis using the Mann-Whitney U test, two-tailed to an alpha of 0.05, reported a significant between group difference for the frequency of discussions on physical activity at baseline ($z = -2.08, p = .04, r = 0.14$) (online group at baseline $M = 2.76, SD = 1.12$; face-to-face group at baseline $M = 2.43, SD = 1.12$) with those in the online group more likely to discuss physical activity than those in the face-to-face group. An ANCOVA controlling for baseline discussions on physical activity reported no significant difference between delivery modes on the frequency of physical activity discussions at 12-weeks ($F (1,206) = 0.30, p = .58, \eta^2_p = 0.001$).
Figure 4. The adoption and impact of a training intervention to improve the frequency of discussions on physical activity by healthcare professionals to cancer survivors (face-to-face and online delivery combined)

Table 16. The frequency of discussions on physical activity by healthcare professionals at baseline by delivery mode

<table>
<thead>
<tr>
<th></th>
<th>I raise physical activity with my cancer patients...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-25% of the time – n (%)</td>
</tr>
<tr>
<td>Online</td>
<td>14 (17.1)</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>36 (28.4)</td>
</tr>
</tbody>
</table>
Table 17. The frequency of discussions on physical activity by healthcare professionals 12-weeks after training seminar delivery by delivery mode

<table>
<thead>
<tr>
<th></th>
<th>0-25% of the time – n (%)</th>
<th>26-50% of the time - n (%)</th>
<th>51-75% of the time – n (%)</th>
<th>76-100% of the time – n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>11 (13.4)</td>
<td>15 (18.3)</td>
<td>19 (23.2)</td>
<td>37 (45.1)</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>30 (23.6)</td>
<td>22 (17.3)</td>
<td>34 (26.8)</td>
<td>41 (32.3)</td>
</tr>
</tbody>
</table>

COM-B ANALYSIS

Of the 209 participants who provided baseline data on the frequency of discussions on physical activity, 186 completed the COM-B questionnaire at the end of the training seminar, 127 in the face-to-face group and 59 in the online group. Mean scores for capability, opportunity, and motivation were calculated from the responses to the questionnaire detailed in Table 9. The questionnaire presented in Table 9 had excellent internal consistency for each COM-B construct (capability – $a = .89$; opportunity – $a = .85$; motivation – $a = .87$). The post-training COM-B scores are reported in Table 18.

An ANCOVA controlling for baseline physical activity discussion frequency reported no difference between training seminar delivery mode on the mean capability score ($F (1,183) = 0.31, p = .58, \eta^2_p = 0.002$), the mean opportunity score ($F (1,183) = 0.12, p = .74, \eta^2_p = 0.001$), or the mean motivation score ($F (1,183) = 0.20, p = .65, \eta^2_p = 0.001$).

The mean capability, opportunity, and motivation scores were added to create a combined COM-B score. An ANCOVA controlling for baseline physical activity discussion frequency also reported no difference between training seminar delivery mode on the combined COM-B score ($F (1,183) = 0.02, p = .88, \eta^2_p < 0.001$).

Baseline and 12-week follow-up data with COM-B scores were available for 74 participants across both delivery modes. This data was used to assess the predictive value of the COM-B components on improvement in physical activity discussions. Of these 74 participants, 24 were already discussing physical activity more than 76% of the time at baseline and continued to do so at 12-week follow-up and therefore were removed from this analysis.

Independently assessed using binary logistic regression, the mean capability score significantly predicted improvement in physical activity discussion frequency ($\beta = 1.36, p =$
.04, OR = 3.91 [95% CI = 1.06 to 14.47], Nagelkerke R² = 0.16), as did the mean opportunity score (β = 1.36, p = .02, OR = 3.90 [95% CI = 1.19 to 12.75], Nagelkerke R² = 0.18), and the mean motivation score (β = 1.30, p = .02, OR = 3.65 [95% CI = 1.20 to 11.08], Nagelkerke R² = 0.19).

The variation inflation factor for all combinations of the COM-B components was above 2.5 and a cause for concern. Therefore, to overcome multicollinearity between the COM-B components, a combined score of the means for each COM-B component was calculated and found to be a significant predictor of improvement in physical activity discussions at 12-weeks (β = 0.55, p = .02, OR = 1.74 [95% CI = 1.08 to 2.79]) with a Nagelkerke R² of 0.20.

Authors of the COM-B model (Michie et al., 2011) suggest a relationship between capability and motivation, and between opportunity and motivation. Regression analysis reported a significant association between the mean capability score and the mean motivation score (F(1, 48) = 72.79, p < .001, R² = 0.60) and a stronger association between the mean opportunity score and the mean motivation score (F(1, 48) = 120.28, p < .001, R² of 0.72).
Table 18. Post-training seminar COM-B analysis using a Likert scale from 1 (strongly disagree) to 5 (strongly agree)

<table>
<thead>
<tr>
<th>Statement</th>
<th>COM-B component</th>
<th>Overall M (SD)</th>
<th>Online M (SD)</th>
<th>Face-to-face M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>This session has…</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved my knowledge on the importance of physical activity for cancer patients</td>
<td>Capability</td>
<td>4.25 (0.79)</td>
<td>4.25 (0.80)</td>
<td>4.24 (0.78)</td>
</tr>
<tr>
<td>Improved my knowledge of what to say to cancer patients about physical activity</td>
<td>Capability</td>
<td>4.20 (0.76)</td>
<td>4.25 (0.73)</td>
<td>4.17 (0.78)</td>
</tr>
<tr>
<td>Given me the skills to have a conversation about physical activity</td>
<td>Capability</td>
<td>4.02 (0.83)</td>
<td>4.07 (0.89)</td>
<td>4.00 (0.91)</td>
</tr>
<tr>
<td>Mean</td>
<td>Capability</td>
<td>4.16 (0.72)</td>
<td>4.19 (0.72)</td>
<td>4.14 (0.72)</td>
</tr>
<tr>
<td>Given me the tools and prompts to have a conversation about physical activity</td>
<td>Opportunity</td>
<td>4.21 (0.79)</td>
<td>4.22 (0.83)</td>
<td>4.20 (0.76)</td>
</tr>
<tr>
<td>Helped me understand how to fit the conversation into the time I have available</td>
<td>Opportunity</td>
<td>4.10 (0.84)</td>
<td>4.14 (0.90)</td>
<td>4.08 (0.81)</td>
</tr>
<tr>
<td>Showed me how to get the materials I need</td>
<td>Opportunity</td>
<td>4.46 (0.68)</td>
<td>4.58 (0.62)</td>
<td>4.40 (0.70)</td>
</tr>
<tr>
<td>Made signposting to physical activity sessions easier</td>
<td>Opportunity</td>
<td>4.20 (0.81)</td>
<td>4.14 (0.88)</td>
<td>4.23 (0.78)</td>
</tr>
<tr>
<td>Mean</td>
<td>Opportunity</td>
<td>4.24 (0.65)</td>
<td>4.27 (0.66)</td>
<td>4.23 (0.64)</td>
</tr>
<tr>
<td>Given me the confidence that others are having the conversation</td>
<td>Motivation</td>
<td>4.08 (0.79)</td>
<td>4.09 (0.92)</td>
<td>4.08 (0.73)</td>
</tr>
<tr>
<td>Made me feel like I should talk about physical activity as part of my role</td>
<td>Motivation</td>
<td>4.37 (0.82)</td>
<td>4.32 (0.92)</td>
<td>4.39 (0.77)</td>
</tr>
<tr>
<td>Made me believe that it is the right thing to do</td>
<td>Motivation</td>
<td>4.49 (0.77)</td>
<td>4.47 (0.82)</td>
<td>4.50 (0.74)</td>
</tr>
<tr>
<td>Mean</td>
<td>Motivation</td>
<td>4.31 (0.72)</td>
<td>4.27 (0.82)</td>
<td>4.32 (0.67)</td>
</tr>
<tr>
<td>Combination of Mean scores to create a COM-B score</td>
<td></td>
<td>12.70 (1.95)</td>
<td>12.73 (2.09)</td>
<td>12.69 (1.89)</td>
</tr>
</tbody>
</table>
DISCUSSION

THE MAIN OUTCOMES

This service evaluation builds on the previous research conducted by this author and colleagues (Webb & Foster et al., 2016; Webb & Hall et al., 2016). This service evaluation set out to understand the reach, adoption, and impact of a training intervention designed to influence healthcare professional practice to improve the giving of physical activity advice to cancer survivors. Further, this service evaluation aimed to understand the influence of this training intervention on the capability, opportunity and motivation of healthcare professionals to give physical activity advice, and if these components could predict improvement in physical activity discussion frequency.

Within cancer care, calls continue to be made to improve the knowledge of healthcare professionals working with cancer survivors in regard to physical activity (Cantwell et al., 2017; Kenzik et al., 2015; van Veen, Hoedjes, Versteegen, van de Meulengraaf-Wilhelm, Kampman, & Beijer, S, 2017). NICE (2014a), and Campbell and Blank et al. (2012) cite a lack of research into the training of practitioners and estimates of effect-size of such training on practitioner behaviour. NICE identify a gap in knowledge regarding training interventions to overcome the barriers to delivery of physical activity advice by healthcare professionals.

The previous work by this author and colleagues (Webb & Foster et al., 2016; Webb & Hall., 2016) is the first to take a behaviour change approach to the design and development of a training intervention to increase the frequency of very brief physical activity advice specifically for cancer survivors by UK healthcare professionals. In addition, it is the first to make use of the COM-B model and Behaviour Change Wheel to design and develop an intervention in this field. This service evaluation is the first study to assess the COM-B model for its predictive values at identifying changes in professional practice.

Previous research has confirmed the positive impact of physical activity advice from healthcare professionals to cancer survivors (Jones et al., 2004; Fisher and Williams et al., 2015). However, there is no research to evaluate the impact of training interventions on healthcare professional practice regarding the giving of physical activity or lifestyle advice to cancer survivors. This service evaluation is the first to investigate the reach of such a training...
intervention, the adoption by healthcare profession, and the possible effect-size (impact) of such an intervention across face-to-face and online modes of delivery.

**REACH**

The total reach of the promotional activity for the online training intervention during the service evaluation period was 7,682 healthcare professionals. This results in 207 healthcare professionals registering for an online training session, a ratio of one registration to 38 healthcare professionals reached. One-hundred-and-twenty-seven healthcare professionals completing the online training, a ratio of one completion for every 61 healthcare professionals reached. When considering improvement in physical activity discussion frequency, or maintenance at the highest level, the ratio for the online training intervention is one for every 220 healthcare professionals reached. The reach of such online training for healthcare professionals has not before been investigated in the literature so comparisons are not possible. However, this demonstrates the vast number of healthcare professionals that will need to be approached to attend this online training intervention to bring about population-level change. It is noted that the best response rate for the promotion of the online training intervention is via a direct e-newsletter to a named healthcare professional (the *Mac Mail* e-newsletter) rather than placement on a website. This would suggest that better application of successful e-marketing techniques may improve the reach to training completion ratio.

A finding from the feasibility study of this training intervention (Webb and Hall et al., 2016) is the impact that organisational culture and practice have on access to training interventions. Participants involved in the feasibility study speak of job demands and limited study leave impacting on their ability to attend training, and further, the impact of internal structures and processes on the giving of physical activity advice (Webb and Hall et al., 2016). As outlined in Table 6, practitioners need workplace support in regard to giving lifestyle advice, a *social opportunity* as categorised by the COM-B model. Therefore, it is favourable to see the engagement of those in management positions (6.8% of the registrations) in the online training intervention, with a high (71.4%) registration to completion rate, as these people are possible instigators of change in regard to organisational culture and practice.

It is not possible to assess the reach of the training intervention via the face-to-face mode of delivery. However, it is noted that communicating through nine regional representatives, with
a knowledge of the local health and social care landscape and healthcare professionals in their area, results in a comparable number of training completions to online delivery (127 online vs 130 face-to-face) over less training seminars (nine training seminar vs 11 online training seminars). Therefore, it can be hypothesised that promotion through regional representatives has a greater reach to training completion ratio. Should this intervention be taken to scale, partnerships with local representatives who engage and have access to local healthcare professionals should be created to promote the training intervention.

ADOPTION

Improvements can be made between online training registrations and training attendance, as over one-third (38.6%) of healthcare professionals registered to attend do not do so despite receiving regular reminder emails in the lead up to the online training. Greater use of proven e-marketing techniques may help in this regard.

The face-to-face training intervention when promoted through local representatives attracts mainly nurses and physiotherapists with 57.7% and 20.8% completing the training seminar respectively. This compares to 34.8% of online training completions being from the nursing profession, and 15.8% being physiotherapists. O'Hanlon and Kennedy (2014) identify nurses and physiotherapists as two important healthcare professions to provide advice to cancer survivors on physical activity. O'Hanlon and Kennedy (2014) state that physical activity is a core physiotherapeutic skill, and further that nurses are likely to have the greatest interaction with cancer survivors; it is positive therefore, that both delivery modes attract these professions. Further, as identified by this author and colleagues (Webb, 2016; Webb and Smerald et al., 2016) physiotherapists and nurses are considered by the majority of cancer survivors (75% and 64% respectively) to be experts on physical activity for their condition.

The data from this service evaluation suggests that physiotherapists are most likely to discuss physical activity with their cancer patients at baseline with 46.6% discussing it more than 76% of the time. This is less than the 66% suggested by O'Hanlon and Kennedy (2014) highlighting a possible difference between Irish and UK physiotherapists. In this service evaluation, nurses are the next profession most likely to give physical activity advice to cancer survivors at baseline, and then occupational therapists, however, only 25.2% and 23.5% respectively discuss physical activity more than 76% of the time. This supports the
need for a training intervention of this kind. It is not possible to assess the baseline physical activity discussion frequency of other healthcare professions due to limitations in the data.

It is observed that the training intervention regardless of the mode of delivery does not engage oncology consultants, the profession that most cancer survivors (76%) consider to be the experts for physical activity and their condition (Webb, 2016; Webb & Smerald et al., 2016). The reasons for this are unclear and warrant further investigation. Further, only one GP completed the training, another profession that the majority of cancer survivors (63%) consider to be experts in physical activity (Webb, 2016; Webb & Smerald et al., 2016), and therefore this too needs further investigation.

It is noted that the healthcare professionals attending the face-to-face training seminar may not have made a conscious decision to do so, as it was included as part of a pre-arranged training day or conference. This may result in delivery to an audience less likely to discuss physical activity with their cancer patients, as opposed to those that have made a conscious decision to attend, as in the online training seminar. The baseline frequency of discussions on physical activity across the delivery modes would suggest this to be the case. Thirty-five-point-four per cent of the participants taking part in the online training intervention discuss physical activity more than 76% of the time at baseline, compared to just 22.0% of the participants in the face-to-face training intervention, a significant difference. This suggests that those deciding to attend an online training intervention on physical activity for cancer survivors are more likely to be those already giving physical activity advice. That said, 64.6% of those attending the online training discuss physical activity less than 76% of the time, suggesting that this delivery mode still engages many professionals who can improve discussion frequency, just not as many as face-to-face delivery at pre-arranged training days.

The online training intervention seems to attract a more even spread from a range of healthcare professions over the face-to-face training intervention, including a higher percentage of dietitians (8.7% compared to 1.5%), more professionals in management positions (7.9% compared to no attendance in the face-to-face training intervention), more support workers (16.5% compared to 6.9%) and more radiation therapists (10.2% compared to 3.1%). This suggests that the online training intervention is of interest to a range of healthcare professionals, not just nurses as identified by this author and colleagues during initial intervention development (Webb & Foster et al., 2016). This supports the need for both a face-to-face and an online mode of delivery if a wide-range of healthcare professionals are
to be influenced to give physical activity advice. The narrower focus in terms of professionals engaged in the face-to-face training intervention over online delivery may be indicative of the networks of the regional Macmillan Development Managers.

**IMPACT**

Twenty-seven-point-three per cent of healthcare professionals discuss physical activity more than 76% of the time before taking part in the training intervention. This compares to 9% reported by Macmillan Cancer Support in 2011 suggesting an improvement in recent years but with still some way to go for physical activity advice to become commonplace in cancer care.

The service evaluation made use of before and after data to assess the impact of the training intervention, however, in the absence of a control, is it not possible to confirm effectiveness. This service evaluation does give an understanding of a possible effect-size of the training intervention across both delivery modes. Significant improvements are reported in the frequency of discussions on physical activity between baseline and 12-week follow-up across both delivery modes using intention to treat analysis. Those who complete the online training intervention have a 50% greater likelihood of giving physical activity advice more than 76% of the time than at baseline. This compares to an odds ratio of 1.69 or a 69% greater likelihood of giving physical activity advice more than 76% of the time than at baseline in those completing the face-to-face training intervention. No significant difference is reported in the impact of the training intervention on physical activity discussion frequency across delivery modes.

It is not possible to compare the results of the impact of the training intervention with the extant literature as it does not exist. The only comparison possible is with the feasibility study of this intervention and only for face-to-face delivery, as not enough data is available from the feasibility study to draw comparisons to online delivery (Webb & Hall et al., 2016). The feasibility study includes only nurses with 55 taking part in face-to-face delivery, reporting an odds ratio far in access of the 1.69 reported in this service evaluation, of 12.0. The most likely explanation for this is the large lost-to-follow-up percentage in this service evaluation with 12-week follow-up data not available for 63.8% of participants taking part in the face-to-face intervention, compared to 0% in the feasibility study. With the last observation carried forward in this service evaluation, the odds ratio is diluted. A further explanation may be differing impacts of the training intervention across healthcare professional group. There
is not enough data available in this service evaluation to assess the impact by profession, but this is an area of interest and should be evaluated if the intervention is taken to scale.

Sixty-two-point-seven per cent of healthcare professionals still do not discuss physical activity all of the time even after completion of the training intervention (across delivery modes). This figure is again likely to be inflated by the poor rate of follow-up at 12-weeks, being just 56.9% across the combined data. None-the-less, it is suggested that further research and evaluation should focus on understanding the barriers and facilitators to the giving of physical activity advice in these healthcare professionals, particularly the 19.6% discussing physical activity less than 25% of the time after completion of the training intervention.

The implementation and maintenance of the giving of physical activity advice by healthcare professionals are out of the scope of this service evaluation, but evaluation of these domains of the RE-AIM framework should be considered if taking this intervention to scale.

**IMPACTS ON, AND PREDICTIVE VALUE OF THE COM-B COMPONENTS**

Participants involved in the feasibility study of this training intervention (Webb & Hall et al., 2016) report that their capability, opportunity, and motivation improve as a result. However, the number of participants involved in the online training intervention in the feasibility study is only small (n = 7) so analysis of the reported COM-B components across delivery modes is not possible. The findings of this service evaluation provide further support to suggest that the training intervention improves capability, opportunity, and motivation in participants (Table 18) with no difference reported between intervention delivery modes.

*Capability, opportunity, and motivation* scores are significant predictors of improvement in the frequency of physical activity discussions at 12-week follow-up. *Opportunity* and *motivation* scores are suggested to be slightly better predictors of improvement in physical activity discussion frequency than *capability* score. However, interpretation of the impact of the COM-B components individually on improvement in the frequency of physical activity discussions should not be overestimated due to the relationship that exists between these components. The combined COM-B score is a more appropriate measure which also significantly predicts improvement in physical activity discussions at 12-week follow-up, explaining 20% of the variance. This is the first study to assess the predictive value of the
COM-B components on improvement in the frequency of physical activity discussions following a training intervention so it is not possible to draw a comparison to other literature.

A strong significant association is observed between opportunity score and motivation score and also between capability score and motivation score. The questionnaire used to gather the data on the COM-B components as presented in Table 9 is not validated and therefore the findings should be viewed with caution. The findings do offer some suggestion for possible improvements to the intervention, for example, an increase in the follow-up touch-points following training seminar delivery for those reporting lower COM-B scores, however, this needs further investigation. In addition, the impact of opportunity on discussion frequency directly, and its impact on motivation, suggests that greater emphasis should be placed on the training elements that highlight the opportunities to support physical activity discussions. This could include greater emphasis on the opportunities to give very brief advice in less than two-minutes, in-line with the NICE (2014a) guidance. Greater emphasis should also be placed on the opportunities for healthcare professionals to signpost into, supporting the work of Park et al. (2015) and Cantwell et al. (2017).

Cantwell et al. (2017) identify a need for the training of healthcare professionals to improve knowledge regarding physical activity and cancer, increase skills to give advice within limited time, and improve signposting of cancer survivors to appropriate resources to increase physical activity. The results of the post-intervention COM-B questionnaire presented in Table 18 suggest that this training intervention, across delivery modes, achieves these outcomes.

STRENGTHS AND LIMITATIONS

There are many limitations to this service evaluation. There is no control comparison group which means that it is not possible to accurately assess the effectiveness of the training intervention by either delivery mode. There are limitations in the data available such as engagement with the online promotional activity for the nursing times microsite and reach data for the face-to-face training intervention delivery. The lost to follow-up rate is very high and far outside the commonly accepted standard of 20%. Data is also not available to assess the implementation and maintenance domains of the RE-AIM framework (Glasgow et al., 1999).
It is noted that the service evaluation data lacks baseline COM-B scores in relation to the giving of physical activity advice. This would allow for a more accurate assessment of change from the training intervention. Further, the COM-B questionnaire used is not a validated measure. However, a strength of this service evaluation is the consistent approach to delivery and data collection, replicating that used in the feasibility study (Webb & Hall et al., 2016).

It is important to keep in mind that this is a service evaluation, and despite these limitations, analysis of this secondary data does provide useful insight upon which to base intervention improvements and scaling decisions. In addition, this service evaluation may inform the development decisions of other intervention designers working in a similar field.

**CONCLUSION**

This service evaluation adds to the previous research conducted by this author and colleagues (Webb & Foster et al., 2016; Webb & Hall et al., 2016). This service evaluation provides further support to suggest that a training intervention, developed using the COM-B model and the Behaviour Change Wheel (Michie et al., 2011), can improve the frequency of physical activity discussions with cancer survivors across healthcare professions. However, some healthcare professional groups do not engage with this training intervention namely oncology consultants and GPs. Many healthcare professionals reached do not register to attend the online training intervention and many who register do not complete the online training intervention. Some who complete the training intervention (regardless of delivery mode) do not increase their physical activity discussion frequency. All of these areas require further investigation.

Evaluations of training interventions such as this are lacking from the extant literature. Whilst service evaluations are only for the purposes of intervention improvement and development, this service evaluation demonstrates that it is possible to translate practice back into evidence, supporting evidence-based public health.
CHAPTER THREE
STUDY TWO: A RANDOMISED WAITING LIST CONTROL TRIAL AND COST-CONSEQUENCE ANALYSIS TO EXAMINE THE EFFECTS OF THE MOVE MORE PACK ON THE PHYSICAL ACTIVITY, SELF-EFFICACY, AND HEALTH-RELATED QUALITY OF LIFE OF UK CANCER SURVIVORS

The following paper has been published from the research presented within this chapter:


CHAPTER THREE CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>109</td>
</tr>
<tr>
<td>Method</td>
<td>122</td>
</tr>
<tr>
<td>Results</td>
<td>140</td>
</tr>
<tr>
<td>Discussion</td>
<td>159</td>
</tr>
</tbody>
</table>
INTRODUCTION

Physical activity levels decrease following a diagnosis of cancer and may not increase without intervention (Lynch et al., 2007). There is a call for scalable, cost-effective remote-based interventions to support cancer survivors to become more physically active (Park et al., 2015; Short et al., 2017). Macmillan Cancer Support developed a printed resource in 2011 called the Move More Pack that aimed to affect change in the physical activity of cancer survivors. The Move More Pack consisted of a printed physical activity and cancer treatment information booklet and a series of written tasks to support behaviour change. No additional assistance or follow up was provided. The effectiveness of the Move More Pack in effecting change in physical activity in cancer survivors has not before been investigated.

This author led the redevelopment of the Move More Pack to become a printed resource supported by a series of Internet-based tools. A possible competing interest is stated upfront as this author was an employee of Macmillan Cancer Support at the time of the Move More Pack redevelopment but ceased employment with the charity at the start of this randomised waiting list control trial.

There is an under-reporting of behavioural strategies utilised in broad-reach interventions for cancer survivors (Bourke et al., 2013). Indeed, NICE (2014a) identify that many behaviour change interventions described in the published literature, report a named theory but lack detailed reporting of intervention development and the resulting behavioural change. NICE recommend provision of detailed accounts of multicomponent interventions, including their development, components, detail of the theories, theoretical constructs, and BCTs used. Therefore, this introduction provides detail of the intervention development process that preceded this randomised waiting list control trial.

REDEVELOPMENT OF THE MOVE MORE PACK

This author reviewed the literature, before assessing the original Move More Pack against the constructs of the TPB (Ajzen, 1991) and the SCT (Bandura, 1989) to highlight areas for improvement. In addition, this author reviewed the original Move More Pack using the BCTTv1 (Michie et al., 2013) to identify the included BCTs, and additional BCTs to be considered in its revision. Then, a group of six subject experts, including and lead by this
author, representatives from Macmillan Cancer Support’s Information Development Team, and four cancer survivors, developed the final content for the revised Move More Pack.

A REVIEW OF THE LITERATURE TO SUPPORT THE REVISION OF THE MOVE MORE PACK

Goode et al. (2015) offer the most recent (at the time of writing) consolidated review of the evidence of broad-reach interventions to affect lifestyle behaviours in cancer survivors. From 27 identified studies by Goode et al., 16 focus exclusively on physical activity. However, one-to-one support is provided in the form of face-to-face counselling, telephone, or email support for all participants in 13 of these 16 intervention studies. Providing one-to-one support significantly increases intervention cost and limits the number of cancer survivors that can engage with an intervention. The three physical activity interventions included in the review by Goode et al. that do not provide one-to-one support are those offered by Rabin, Dunsiger, Ness, and Marcus (2011); Vallance, Courneya, Plotnikoff, Yasui, and Mackey (2007); and Valle et al. (2013).

In a pilot trial, Rabin et al. (2011) report an increase in physical activity from an Internet intervention designed for young adult US cancer survivors (mixed tumour sites) in remission. The intervention is influenced by the SCT (Bandura, 1989) and the TTM (Prochaska, & DiClemente, 1983). Users of the intervention can set goals, keep a log of physical activity, and engage in an online forum with peers. The increase in physical activity reported by Rabin et al. is, however, not significant, likely due to their very small sample of just 18 participants.

Valle et al. (2013) conduct the first randomised control trial to evaluate a Facebook delivered intervention to influence physical activity in young adult US cancer survivors, not achieving the aerobic physical activity guidelines. The Facebook discussion wall includes messages guided by the SCT (Bandura, 1989) to prompt discussion, remind participants to set goals and log activity, with links provided to additional physical activity information. Participants also receive a pedometer. Valle et al. report a trend towards improvement in physical activity from the intervention over a control comparison of a standard Facebook group, but these improvements are not significant. Improvements in HRQOL are not observed by Valle et al., contrary to the broader physical activity and cancer literature (Mishra et al., 2012). Valle et al. observe that participants who make greater use of the intervention components,
particularly the self-monitoring tools, are more likely to increase their levels of physical activity.

Vallance, Courneya, Taylor, Plotnikoff, and Mackey (2006) developed a print-based workbook guided by the TPB (Ajzen, 1991) to support physical activity behaviour change in post-treatment breast-cancer survivors in Canada. The resulting intervention incorporates goal-setting, self-monitoring, barrier identification and contingency planning.

A randomised control trial followed intervention development (Vallance et al., 2007) with 377 breast-cancer survivors randomised to one of four intervention arms; (1) to receive the guidelines for physical activity which acted as a control comparison; (2) to receive the physical activity guidelines and the workbook; (3) to receive the physical activity guidelines and a pedometer; or (4) to receive the physical activity guidelines, the workbook, and a pedometer.

Vallance et al. (2007) report that breast cancer survivors receiving just the physical activity guidelines increase their physical activity by 30-minutes-per-week when followed-up at 12-weeks. Physical activity improves by 70-minutes-per-week in those receiving the physical activity guidelines and the printed workbook although this improvement is not significant when compared to the control comparison. Physical activity significantly improves by 89-minutes-per-week in those receiving the physical activity guidelines and a pedometer, and by 87-minutes-per-week in those receiving the physical activity guidelines and the printed workbook in combination with a pedometer. Improvements in HRQOL are reported but only those receiving the physical activity guidelines, the printed workbook and a pedometer report a significant improvement of 5.8% compared to a 1.4% in those just receiving the physical activity guidelines. These findings from Vallance et al. support the role of remote-print-based interventions in improving physical activity and HRQOL in cancer survivors.

Vallance et al. (2015) followed-up on their 2007 study to design and test a revised print-based workbook with a pedometer to improve physical activity in Canadian breast cancer survivors undergoing chemotherapy. Users of the intervention are encouraged to work towards the aerobic physical activity guidelines with walking recommended as the most accessible form of becoming active. The intervention incorporates goal-setting, physical activity planning including strategies for increasing walking, guidance on how to use a pedometer and log step count, barrier identification and contingency planning. A randomised control trial of this intervention reports no difference in physical activity between a control
comparison receiving the physical activity guidelines and the intervention. Vallance et al. (2015) offer little explanation for these results other than suggesting that the consequences and side-effects from active chemotherapy prevent participants from partaking in physical activity. Vallance et al. (2015) suggest that greater use of Internet and smartphone technology may help in bringing about change in physical activity with support and signposting required from healthcare professionals. Vallance et al. (2015) support the call for more research in this area, particularly the use and reporting of behavioural strategies to improve physical activity in cancer survivors.

The original printed workbook developed by Vallance et al. (2006) formed the basis for an Internet only intervention developed by Forbes et al. (2015) for Nova Scotian breast, prostate, and colorectal cancer survivors. The Internet intervention releases nine modules over a nine-week period covering (1) types of physical activity and how to gauge intensity; (2) myths regarding physical activity; (3) safety information; (4) goal-setting; (5) the benefits of physical activity for cancer survivors; (6) tips on how to keep physical activity fun; (7) barrier identification and how to overcome them; (8) being active with family and friends; (9) and relapse strategies. In addition, users of the intervention receive regular emails to encourage physical activity, and users also have the option to record daily step count. A randomised control trial again shows a trend towards improvements in physical activity against a usual care group, however, these improvements are not significant.

The printed workbook developed by Vallance et al. (2006) is also used by Short, James, Girgis, D'Souza, and Plotnikoff (2014) as a comparator for their print-based intervention for post-treatment breast cancer survivors in Australia. The intervention developed by Short, James, and Plotnikoff (2013a) is guided by the SCT (Bandura, 1989) and tailors the content of three printed newsletters delivered over 12-weeks by age, co-morbidity, weight, and previous levels of physical activity. A randomised control trial comparing the tailored newsletters, the physical activity workbook, and a standard letter recommendation (as a control comparison) reports a positive trend towards improvement in physical activity at 4-months. The tailored newsletters improve the odds of meeting the physical activity guidelines by 43%, with the physical activity workbook improving the odds by 73%, however, these improvements are not significant over a control comparison of a standard letter recommendation. Short et al. also report a trend toward improvements in HRQOL from the tailored newsletters and the physical activity workbook, however, these improvements are also not significant over the control comparison. Short et al. suggest that a ceiling effect
could explain the non-significant findings with cancer survivors physically active at baseline included within the study, and an unexpectedly high HRQOL observed in participants at baseline.

Golsteijn et al (2017) suggest that a combined approach using print and Internet-delivered intervention materials whilst costlier than Internet delivery alone, might increase the reach of physical activity interventions. There is a lack of reporting in the extant literature on how combined print and Internet-based interventions are designed and developed. Of the interventions presented thus far, only two report the intervention development process in detail, being Short et al. (2013b) and Vallance et al. (2006).

Broad-reach physical activity interventions covered in the extant literature are limited to a particular tumour site or stage of the cancer journey. Only one intervention, that of Valle et al. (2013) did not restrict cancer survivors based on the type or stage of cancer, however, this intervention did restrict use by age. The efficacy of such broad-reach interventions for other lifestyle behaviours is supported by Goode et al. (2015), however, the results for physical activity are mixed.

A REVIEW OF THE THEORETICAL CONSTRUCTS AND BEHAVIOUR CHANGE TECHNIQUES IN THE ORIGINAL MOVE MORE PACK

The constructs of the SCT utilised in the review of the original Move More Pack conducted by this author, were reciprocal determinism, outcome-expectations, self-efficacy, collective efficacy, observational learning, incentive motivation, facilitation, and self-regulation (Bandura, 1989; McAlister et al., 2008). The construct of moral disengagement was deemed not relevant for this review and therefore was not included. The constructs of the TPB utilised in this review were behavioural beliefs and evaluation of behavioural outcomes (attitude), normative beliefs and motivation to comply (subjective norm), and control beliefs and perceived power (perceived control) (Ajzen, 1991).

Whilst the SCT construct of self-efficacy was identified in the original Move More Pack, collective efficacy was not, nor incentive motivation. Further, the original Move More Pack did not encourage cancer survivors to influence their environment, identified as the reciprocal determinism construct of the SCT (Bandura, 1989; McAlister et al., 2008). The normative beliefs and motivation to comply (subjective norm) constructs of the TPB (Ajzen,
Twelve BCTs were identified in the original Move More Pack. These BCTs were:

1. Action planning;
2. Commitment;
3. Comparative imaging of future outcomes;
4. Goals setting;
5. Information about health and emotional consequences;
6. Instructions on how to perform the behaviour;
7. Monitoring of emotional consequences;
8. Problem-solving;
9. Pro’s and con’s;
10. Self-monitoring;
11. Social comparison; and
12. Social support.

A full review of the BCTTv1 (Michie et al., 2013) identified an additional ten BCTs for inclusion in the revised Move More Pack (Table 19).

The review of the original Move More Pack against the constructs of the TPB, the SCT, and the BCTTv1 for included BCTs, is presented in Table 20.
Table 19. Additional BCTs to include within the revised Move More Pack

<table>
<thead>
<tr>
<th>Additional BCT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about others’ approval</td>
<td>Provide information about what other people think about the behaviour. The information clarifies whether others will like, approve or disapprove, of what the person is doing or will do</td>
</tr>
<tr>
<td>Prompts/cues</td>
<td>Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour</td>
</tr>
<tr>
<td>Self-reward</td>
<td>Prompt praise and self-reward if there has been effort and/or progress in performing the behaviour</td>
</tr>
<tr>
<td>Adding objects to the environment</td>
<td>Adding objects to the environment in order to facilitate performance of the behaviour</td>
</tr>
<tr>
<td>Identification of self as a role model</td>
<td>Identify one’s behaviour as an example to others</td>
</tr>
<tr>
<td>Identity associated with changed behaviour</td>
<td>Construct a new self-identity as someone that engages with the new behaviour</td>
</tr>
<tr>
<td>Habit formation</td>
<td>Repetition of the behaviour in context to create a habit</td>
</tr>
<tr>
<td>Habit reversal</td>
<td>Rehearsal and repetition of an alternative behaviour to replace unwanted habitual (sedentary or inactive) behaviour</td>
</tr>
<tr>
<td>Graded tasks</td>
<td>Set easy tasks, making them progressively harder</td>
</tr>
<tr>
<td>Framing/reframing</td>
<td>Change the perspective of the behaviour</td>
</tr>
</tbody>
</table>

Source: Michie et al. (2013)
<table>
<thead>
<tr>
<th>Original Move More Pack component</th>
<th>Section heading(s)</th>
<th>Content</th>
<th>TPB and SCT construct</th>
<th>BCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical activity and cancer treatment information booklet</td>
<td>Being active during treatment; Reducing side-effects; Being active after treatment; Advanced cancer and physical activity</td>
<td>These sections provide information on the benefits of physical activity to cancer survivors</td>
<td>TPB - Behavioural beliefs; Evaluation of behavioural outcomes</td>
<td>Information about health and emotional consequences</td>
</tr>
<tr>
<td></td>
<td>How much activity is recommended; How much activity is right for you?</td>
<td>Guidelines; Recommended types of activities; Intensity guidance; Strength, cardiovascular, flexibility and balance activity examples</td>
<td>TPB - Behavioural beliefs; Control beliefs; Evaluation of behavioural outcomes</td>
<td>Information about health and emotional consequences</td>
</tr>
<tr>
<td></td>
<td>Being safe</td>
<td>Safety information</td>
<td>TPB - Behavioural beliefs; Control beliefs; Evaluation of behavioural outcomes</td>
<td>Information about health and emotional consequences</td>
</tr>
<tr>
<td></td>
<td>Getting started; What activities are near you?</td>
<td>Advice on how to become active</td>
<td>TPB - Control beliefs; Perceived power</td>
<td>Instructions on how to perform the behaviour;</td>
</tr>
<tr>
<td></td>
<td>Next steps; How can we help?</td>
<td></td>
<td>SCT - Self-efficacy; Self-regulation; Facilitation</td>
<td>Social support</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original Move More Pack component</td>
<td>Section heading(s)</td>
<td>Content</td>
<td>TPB and SCT construct</td>
<td>BCT</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Move More booklet, including written behaviour change tasks</td>
<td>Introduction</td>
<td>Information on the benefits of physical activity for people living with cancer</td>
<td>TPB - Behavioural beliefs; Evaluation of behavioural outcomes</td>
<td>Information about health and emotional consequences</td>
</tr>
<tr>
<td></td>
<td>Case studies</td>
<td>Patient testimonials are presented throughout</td>
<td>SCT - Outcome expectations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Getting started</td>
<td>Asks cancer survivors to consider their reasons for becoming active and what life would be like if achieved / not achieved</td>
<td>TPB - Control beliefs; Evaluation of behavioural outcomes; Perceived power</td>
<td>Comparative imagining of future outcomes; Pro’s and con’s</td>
</tr>
<tr>
<td></td>
<td>Simple ways to become active; Physical activity in your area; What activities are right for you?</td>
<td>As stated in the section titles</td>
<td>SCT – Self-efficacy; Outcome expectancy</td>
<td>Instructions on how to perform the behaviour; Problem-solving</td>
</tr>
<tr>
<td>Original Move More Pack component</td>
<td>Section heading(s)</td>
<td>Content</td>
<td>TPB and SCT construct</td>
<td>BCT</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Move More booklet, including written behaviour change tasks (continued)</td>
<td>Setting goals</td>
<td><em>As stated in the section title.</em></td>
<td>TPB - Control beliefs; Perceived power</td>
<td>Instructions on how to perform the behaviour (how to set goals); Goal-setting</td>
</tr>
<tr>
<td></td>
<td>Keeping an activity diary – a separate diary booklet was also provided</td>
<td><em>As stated in the section title</em></td>
<td>TPB - Control beliefs; Perceived power</td>
<td>Goal-setting; Problem-solving; Action planning; Commitment; Self-monitoring of behaviour (via diary); Monitoring of emotional consequences</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SCT – Self-efficacy; Self-regulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ten top tips</td>
<td><em>As stated in the section title</em></td>
<td>TPB - Control beliefs; Perceived power</td>
<td>Instructions on how to perform the behaviour (behavioural change skills)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SCT – Self-efficacy; Facilitation</td>
<td></td>
</tr>
</tbody>
</table>

BCT = Behaviour Change Techniques selected from the Behaviour Change Technique Taxonomy version 1 (Michie et al., 2013)

SCT = Social Cognitive Theory (Bandura., 1989) as interpreted by McAlister et al. (2008)

TPB = Theory of Planned Behaviour (Ajzen, 1991)
THE REVISED MOVE MORE PACK

It is suggested that tailored multi-component interventions are likely to be most effective in affecting physical activity behaviour change in cancer survivors (Demark-Wahnefried et al., 2007; Noar, Benac, & Harris, 2007; Short et al., 2013a). This author recommended that the Move More Pack become a printed resource supported by Internet-based tools. Based on the review of the existing evidence, and of the theoretical constructs and BCTs used within the original intervention, the following recommendations were made:

- Pack users should receive an e-newsletter with content tailored by age, gender and previous physical activity, with messages influenced by the physical activity stage of change model offered by Marcus and Forsyth (2009) (advanced from the TTM from Prochaska and DiClemente (1983)).

- Create an online social community linking Pack users together, promoting vicarious experiences, sharing action plans, enabling social learning and enhancing social norms creating a collective-efficacy. This would help Pack users identify themselves as physically active individuals as well as identifying themselves as a role model to others.

- Create an ask the physio online forum linking cancer survivors and their families, should they wish, to a cancer specialist physiotherapist.

- Provide detail on how to access local activity opportunities.

- Include the Macmillan Exercise to Music DVD, which did not come as standard in the original Move More Pack intervention.

- Make the information and tasks within the Move More Pack inclusive of both cancer survivors and their families, enhancing the supporting role of friends and family.

- Include a pull-out activity wall chart.

- Include the identification of a reward or self-incentive.

- Promote the use of a digital pedometer app.

All these recommendations were incorporated into the revision of the Move More Pack. As recommended by NICE (2014a) a detailed breakdown of the components of the revised Move More Pack including content, theoretical constructs, and BCTs is provided in Tables 21 and 22 in the methods section of this chapter. The efficacy of the revised Move More Pack at bringing about a change in physical activity needs to be confirmed.
SELF-EFFICACY AND SELF-IDENTITY

Interventions should aim to identify for whom they work, and in what context, identifying possible predictor variables to support effective distribution (Golsteijn et al., 2017; Vallance et al., 2015). This is especially important in the use of remote-based interventions to improve physical activity in cancer survivors considering the mixed findings in the existing literature.

Self-efficacy is central in overcoming the barriers faced by cancer survivors in becoming physically active (Pinto & Ciccolo, 2011; Stacey et al., 2014; Webb & Smerald et al., 2016). Self-efficacy is defined in this context as the confidence of a cancer survivor that he or she has the ability and capacity to be more physically active. Self-efficacy has been reported to be a predictor of intentions to change physical activity behaviour in cancer survivors (Trinh et al., 2012; Webb, 2016) consistent with the extant general literature on health behaviour change (Young et al., 2014). In addition, identifying as a physically active individual has been reported to be an indicator of physical activity engagement with those cancer survivors who are physically active before their diagnoses more likely to be so afterwards (Webb, 2016). These predictors of physical activity are reported to be consistent across cancer survivors regardless of age, stage, type of cancer, comorbidity, or treatment received (Webb, 2016). It is hypothesised that self-efficacy and previous levels of physical activity (as a measure of identifying as a physically active individual) will predict improvements in physical activity from the revised Move More Pack.

STUDY AIMS

The primary aim of this study is to investigate the effect of the revised Move More Pack on the physical activity of cancer survivors over 24-weeks. It is hypothesised that use of the revised Move More Pack will increase physical activity in cancer survivors, and the proportion of cancer survivors who are classified as active over 12-weeks will increase with its use, with changes being maintained at 24-weeks. The secondary aims of this study include:

- Analysis of pre-diagnosis levels of physical activity, and baseline self-efficacy, as potential predictors of physical activity improvement following receipt of the revised Move More Pack;
- Testing the effect of the revised Move More Pack on self-efficacy and HRQOL scores of cancer survivors;
• Analysis of pre-diagnosis physical activity levels in comparison to baseline physical activity levels; and
• A cost-consequence analysis.
METHOD

DESIGN

This study was a two-arm randomised waiting list control trial with embedded process evaluation and cost-consequence analysis, designed following guidance from the MRC (Craig et al., 2008; Moore et al., 2015). The conduct and reporting of this study adhered to the CONSORT e-health guidelines (Eysenbach, CONSORT-EHEALTH Group, 2011; Webb, Fife-Schaw, Ogden, and Foster., 2017). The embedded process evaluation is presented within chapter four of this thesis. The intervention was implemented by this author supported by UK charity Macmillan Cancer Support. The trial was registered with the ISRCTN registry (number: 66418871).

INTERVENTION

The revised Move More Pack with Internet-based tools was developed following guidance on the development of complex interventions from the MRC (Craig et al., 2008), by reviewing the existing evidence-base, with the application of appropriate theories to the intervention development process.

Macmillan Cancer Support’s Information Development Team wrote the final copy of the revised Move More Pack in partnership with this author, incorporating the recommendations made as presented in the introduction to this chapter. Final approval for the intervention was given by the charity’s chief medical editor with the intervention also receiving the NHS Information Standard (The information standard, n.d.). Support was provided by two graphic designers, a web developer, and a specialist email marketer to create the final intervention.

THE PRINTED COMPONENT

The printed component of revised Move More Pack included a series of written exercises to encourage physical activity behaviour change. The written behaviour change exercises included (1) identification of the top three reasons for becoming active; (2) a decision-balance table looking at two possible futures; (3) making a list with family members on interesting and enjoyable physical activities; (4) goal-setting; (5) reward identification; (6) barrier identification and contingency planning (including details of how to access a toilet
card for those worried about incontinence and diarrhoea); (7) an activity diary; and (8) action planning.

The printed component of the revised Move More Pack also included a ten top tips for becoming active section, and vignettes of cancer survivors who had benefitted from becoming physically active. Signposting was included throughout the printed component of the revised Move More Pack to the Internet-based tools (outlined later in this section). A PDF of the main printed component of the revised Move More Pack is available as Supplementary File 13\textsuperscript{10}.

The revised Move More Pack retained the Physical activity and cancer treatment booklet, however, treatment was removed from the title to reflect the importance of physical activity across the cancer journey, and where required, the information was brought up to date (Supplementary File 14\textsuperscript{10}). A pull-out 12-week wall chart was developed for users of the revised Move More Pack to track their physical activity progress, record achievements, and to serve as a visual prompt and reminder to be more active (Supplementary File 15\textsuperscript{10}). A fridge magnet was included to encourage cancer survivors to display the activity chart.

Five activity leaflets were developed on the physical activities suggested to be popular with cancer survivors (Webb, 2016; Webb & Smerald et al., 2016) namely (1) walking, (2) gardening, (3) recreational swimming, (4) physical activities as part of daily living, and (5) one leaflet covering the sports of badminton, bowls, cycling, golf, and walking football (Supplementary File 16\textsuperscript{10}). An exercise DVD specifically for cancer survivors was included and also made available to view on the Internet (Move more, 2016). An image of the printed component of the revised Move More Pack is provided as Figure 5.

\textsuperscript{10} Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRtq_evgaZz1mNSeIGTKmXaE3
E-NEWSLETTERS

Users of the revised Move More Pack received e-newsletters with differing messages for those who considered themselves never or rarely active before the diagnosis of cancer, and those that considered themselves sometimes or often active before diagnosis, determined using question two of the Godin Leisure-Time Exercise Questionnaire (GLTEQ) (Godin & Shephard, 1985). The messages included within the e-newsletters were influenced by the physical activity stage of change model offer by Marcus and Forsyth (2009).

Additional vignettes were included within the e-newsletters and tailored to the age and gender of the user of the revised Move More Pack. Following receipt of the printed component of the revised Move More Pack, a welcome email was sent to users within seven days, followed by e-newsletters sent during the first, second, third, and sixth month. The intervention was designed to continue sending e-newsletters for a period of 12-months; however, this study only assessed the impact on, and maintenance of, physical activity up to 24-weeks, therefore, the e-newsletters were not sent after the third-month from intervention initiation. Details of the theme of each newsletter, over the full 12-months, and the BCTs utilised are presented in Table 21. An example e-newsletter is included as Supplementary File 1711.

11 Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRUq_evgaZz1mNSelGTKmXaE3
<table>
<thead>
<tr>
<th>Newsletter</th>
<th>Theme</th>
<th>BCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>For those sometimes or often active before diagnosis</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month 1</td>
<td>Doing some physical activity</td>
<td>Information about others’ approval; Information about health consequences; Information about emotional consequences; Graded tasks; Social comparison; Goal-setting</td>
</tr>
<tr>
<td>Month 2</td>
<td>Doing some physical activity</td>
<td>Information about others’ approval; Information about health consequences; Information about emotional consequences; Framing or reframing; Graded tasks</td>
</tr>
<tr>
<td>Month 3</td>
<td>Doing enough physical activity</td>
<td>Information about others’ approval; Social support; Self-reward; Action planning</td>
</tr>
<tr>
<td>Month 6</td>
<td>Making physical activity a habit</td>
<td>Self-monitoring; Action planning; Habit reversal; Habit formation</td>
</tr>
<tr>
<td>Month 9</td>
<td>Making physical activity a habit</td>
<td>Self-monitoring; Action planning; Habit reversal; Habit formation; Social support</td>
</tr>
<tr>
<td>Month 12</td>
<td>Making physical activity a habit</td>
<td>Self-monitoring; Action planning; Habit reversal; Habit formation; Social support; Self-reward</td>
</tr>
</tbody>
</table>

*For those never or rarely active before diagnosis*

<table>
<thead>
<tr>
<th>Newsletter</th>
<th>Theme</th>
<th>BCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>Inactive and thinking about becoming physically active</td>
<td>Information about others’ approval; Information about health consequences; Information about emotional consequences; Graded tasks; Social comparison</td>
</tr>
<tr>
<td>Month 2</td>
<td>Doing some activity</td>
<td>Information about others’ approval; Information about health consequences; Information about emotional consequences; Framing or reframing; Graded tasks</td>
</tr>
<tr>
<td>Month 3</td>
<td>Doing some activity</td>
<td>Information about others’ approval; Goal-setting; Self-reward; Action planning; Commitment</td>
</tr>
<tr>
<td>Month 6</td>
<td>Doing enough physical activity</td>
<td>Self-monitoring; Action planning</td>
</tr>
<tr>
<td>Month 9</td>
<td>Making physical activity a habit</td>
<td>Self-monitoring; Action planning; Habit formation; Social support</td>
</tr>
<tr>
<td>Month 12</td>
<td>Making physical activity a habit</td>
<td>Self-monitoring; Action planning; Habit reversal; Habit formation; Social support; Self-reward</td>
</tr>
</tbody>
</table>

Theme based on the physical activity stage of change domains offer by Marcus and Forsyth (2009)

BCT = Behaviour Change Technique, selected from the Behaviour Change Technique Taxonomy version 1 (Michie et al., 2013)

Pre-diagnosis levels of physical activity assessed using question two of the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985)
INTERNET-BASED TOOLS

An online social community was available to users of the revised Move More Pack, enabling social learning. An online ask the physio group was also available allowing users of the revised Move More Pack to post questions on an open forum to a [volunteer] registered cancer specialist physiotherapist. Two cancer specialist physiotherapists worked on a two-week rotation during the study period. Useful web links were provided on how to find local physical activity opportunities. Details were provided on how to download a straightforward and easy to use digital pedometer app (Pedometer, 2017; Pedometer a. 2015), an app to reduce sitting time (Rise & recharge, 2016a, 2016b), and a beginners jogging app (One you couch to 5k, 2018a, 2018b). Finally, a series of video vignettes of cancer survivors talking about the benefits of physical activity were included (Physical activity – personal stories, 2016). A webpage dedicated to users of the revised Move More Pack was created at www.macmillan.org.uk/BeActive including links to these Internet-based tools. An image of this webpage is available as Supplementary File 18.

Identification of the underlying theoretical constructs of a health promotion programme is important when designing its evaluation (Craig et al., 2008; NICE, 2014a). Therefore, a full breakdown of the components of the revised Move More Pack including the associated constructs of the SCT (Bandura, 1989; McAlister et al., 2008), the TPB (Ajzen, 1991), and the included BCTs, is presented in Table 22.

SAMPLE SIZE

A survey by the DOH (2012) reports that only 23% of cancer survivors are active to the recommended levels for aerobic activity, 31% are inactive, and 46% are physically active but not to the recommended levels. The DOH (2012) also reports that 18% of cancer survivors are interested in becoming more active. The sample size for this study was calculated based on the assumption that the revised Move More Pack would increase the proportion of the sample achieving the aerobic physical activity guidelines by 18%. Therefore, a sample of 82 participants was required per arm for a one-tailed test, with a power of 80% and an alpha set at 5%. A total sample of 99 participants was targeted to allow for a 20% dropout.

12 Supplementary Files are available at https://drive.google.com/open?id=11JzW0y6ZRULq_evgaZz1mNSeIGTKmXaE3
### Table 22. Components of the revised Move More Pack, the SCT and TPB constructs, and BCTs used

<table>
<thead>
<tr>
<th>Component</th>
<th>Section heading</th>
<th>TPB and the SCT construct</th>
<th>BCT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Printed resource</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guide to becoming active</td>
<td>Why get active?</td>
<td>TPB - Behavioural beliefs; Normative beliefs; SCT - Facilitation</td>
<td>Instructions on how to perform the behaviour</td>
</tr>
<tr>
<td></td>
<td>Vignettes included throughout</td>
<td>TPB - Behavioural beliefs; Normative beliefs; Motivation to comply; Control beliefs; Perceived power; SCT - Self-efficacy; Observational learning; Outcome expectations</td>
<td>Information about health and emotional consequences; Social comparison</td>
</tr>
<tr>
<td>Getting started: Questions to help you get started</td>
<td></td>
<td>TPB - Evaluations of behavioural outcomes; Perceived power</td>
<td>Comparative imagining of future outcomes; Commitment; Social support; Pros and cons</td>
</tr>
<tr>
<td>Getting started: Simple ways to be more active; Which activities are right for you?; Physical activity in your area</td>
<td>Getting started: Ten top tips</td>
<td>TPB - Control beliefs; Perceived power; SCT - Self-efficacy; Collective-efficacy; Facilitation</td>
<td>Instructions on how to perform the behaviour; Problem-solving</td>
</tr>
<tr>
<td>Setting goals and staying active: How to set goals</td>
<td></td>
<td>TPB - Evaluations of behavioural outcomes; Control beliefs; Perceived power; SCT - Self-efficacy; Collective-efficacy; Outcome evaluation; Incentive motivation; Facilitation</td>
<td>Goal-setting; Self-monitoring of behaviour; Problem-solving; Social support; Habit formation; Self-reward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TPB - Control beliefs; Perceived power; SCT - Self-efficacy; Collective-efficacy; Self-regulation; Facilitation</td>
<td>Goal-setting; Problem-solving</td>
</tr>
<tr>
<td>Component</td>
<td>Section heading</td>
<td>TPB and the SCT construct</td>
<td>BCT</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Guide to becoming</td>
<td>Setting goals and staying active: Track your progress; My activity diary</td>
<td>TPB - Evaluation of behavioural outcomes; Control beliefs; Perceived power</td>
<td>Goal-setting; Commitment; Self-monitoring of behaviour; Monitoring of emotional consequences; Self-reward</td>
</tr>
<tr>
<td>active (continued)</td>
<td></td>
<td>SCT - Self-efficacy; Collective-efficacy; Self-regulation; Incentive motivation; Facilitation</td>
<td>Action-planning; Goal-setting; Commitment; Self-reward; Social support</td>
</tr>
<tr>
<td></td>
<td>Setting goals and staying active: Action plan</td>
<td>TPB - Evaluation of behavioural outcomes; Control beliefs; Perceived power</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Self-efficacy; Collective-efficacy; Self-regulation; Facilitation</td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>Why be more active? Being active before treatment; Being active during treatment;</td>
<td>TPB - Behavioural beliefs; Normative beliefs; Motivation to comply; Control beliefs</td>
<td>Framing or reframing; Information about health and emotional consequences; Information about others’ approval</td>
</tr>
<tr>
<td>and cancer booklet</td>
<td>Reducing side-effects; Being active after treatment; Advanced cancer and physical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(inserted)</td>
<td>activity</td>
<td>SCT - Outcome expectations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How much activity is recommended? How much activity is right for you? What types</td>
<td>TPB - Behavioural beliefs; Normative beliefs; Motivation to comply; Perceived power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of activity should you do?</td>
<td>SCT - Self-efficacy; Outcome expectations</td>
<td></td>
</tr>
<tr>
<td>Component</td>
<td>Section heading</td>
<td>TPB and the SCT construct</td>
<td>BCT</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Being safe</td>
<td>TPB - Behavioural beliefs; Control beliefs; Perceived power</td>
<td>TPB - Behavioural beliefs; Control beliefs; Perceived power</td>
<td>Information about health and emotional consequences</td>
</tr>
<tr>
<td></td>
<td>SCT - Self-efficacy; Outcome expectations</td>
<td>SCT - Self-efficacy; Outcome expectations</td>
<td></td>
</tr>
<tr>
<td>Getting started; what activities are near you? Next steps and who can help?</td>
<td>TPB - Normative beliefs; Control beliefs; Perceived power</td>
<td>TPB - Normative beliefs; Control beliefs; Perceived power</td>
<td>Instructions on how to perform the behaviour</td>
</tr>
<tr>
<td></td>
<td>SCT - Facilitation</td>
<td>SCT - Facilitation</td>
<td></td>
</tr>
<tr>
<td>Activity leaflets</td>
<td>TPB - Behavioural beliefs; Control beliefs; Perceived power</td>
<td>TPB - Behavioural beliefs; Evaluation of behavioural outcomes; Control beliefs; Perceived power</td>
<td>Information about health consequences</td>
</tr>
<tr>
<td>(inserted)</td>
<td>SCT - Outcome expectations; Facilitation</td>
<td>SCT - Outcome expectations; Facilitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pull-out wall chart and fridge magnet</td>
<td>Record your daily achievements</td>
<td>TPB - Behavioural beliefs; Evaluation of behavioural outcomes; Control beliefs; Perceived power</td>
<td>Adding objects to the environment; Self-monitoring of behaviour; Information about others’ approval; Prompt or cue; Self-reward</td>
</tr>
<tr>
<td>(inserted)</td>
<td></td>
<td>SCT- Self-efficacy; Collective-efficacy; Self-regulation; Facilitation</td>
<td></td>
</tr>
<tr>
<td>DVD (inserted)</td>
<td>TPB - Behavioural beliefs; Evaluation of behaviour outcomes; Normative beliefs; Control beliefs; Perceived power</td>
<td>DVD - Behavioural beliefs; Evaluation of behaviour outcomes; Normative beliefs; Control beliefs; Perceived power</td>
<td>Instructions on how to perform a behaviour; Information about health consequences; Information about emotional consequences; Demonstration of the behaviour; Social comparison; Information about others’ approval; Graded tasks</td>
</tr>
<tr>
<td></td>
<td>SCT - Self-efficacy; Observational learning; Outcome expectations; Facilitation; Reciprocal determinism</td>
<td>DVD - Behavioural beliefs; Evaluation of behaviour outcomes; Normative beliefs; Control beliefs; Perceived power</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component</td>
<td>Section heading</td>
<td>TPB and the SCT construct</td>
<td>BCT</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Internet-based tools</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online forum</td>
<td>Talk about being active</td>
<td>TPB - Normative beliefs</td>
<td>Social support; Identification of self as a role model;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Observational learning; Facilitation</td>
<td>Identity associated with changed behaviour</td>
</tr>
<tr>
<td>Online forum</td>
<td>Ask the physio</td>
<td>TPB - Normative beliefs</td>
<td>Information about others’ approval; Social support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Observational learning; Facilitation</td>
<td></td>
</tr>
<tr>
<td>Digital apps</td>
<td>Apps to help you get active</td>
<td>SCT - Facilitation</td>
<td>Self-monitoring of behaviour</td>
</tr>
<tr>
<td>Find activities near you</td>
<td>Activities near you</td>
<td>TPB - Control beliefs</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Facilitation</td>
<td></td>
</tr>
<tr>
<td>Video vignettes</td>
<td>Hear personal stories</td>
<td>TPB - Behavioural beliefs; Normative beliefs; Motivation to comply; Control beliefs; Perceived power</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Self-efficacy; Observational learning; Outcome expectations</td>
<td>Information about health and emotional consequences; Social comparison</td>
</tr>
<tr>
<td>DVD (Web-based)</td>
<td>Watch our exercise DVD</td>
<td>TPB - Behavioural beliefs; Evaluation of behaviour outcomes; Normative beliefs; Control beliefs; Perceived power</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCT - Self-efficacy; Observational learning; Outcome expectations; Facilitation; Reciprocal determinism</td>
<td>Instructions on how to perform a behaviour; Information about health consequences; Information about emotional consequences; Demonstration of the behaviour; Social comparison; Information about others’ approval; Graded tasks</td>
</tr>
</tbody>
</table>

BCT = Behaviour Change Techniques selected from the Behaviour Change Technique Taxonomy version 1 (Michie et al., 2013)
DVD = Digital Versatile Disc
SCT = Social Cognitive Theory (Bandura, 1989) as interpreted by McAlister et al. (2008)
TPB = Theory of Planned Behaviour (Ajzen, 1991)
RECRUITMENT AND RANDOMISATION

Participants were recruited by email invitation sent to 8,910 cancer survivors on the 29th March 2017 through a database of cancer survivors held by Macmillan Cancer Support. Those contacted to participate in the trial had been in contact with the charity within the previous six months. In addition, two separate adverts were placed on the Macmillan Cancer Support Facebook page on the 3rd and 24th April 2017.

Those that expressed interest were sent further participant information by email, with consent provided digitally by checkbox, following the British Psychological Society ethics guidance for Internet-mediated research (Hewson et al., 2013). Participants were informed that the study aimed to investigate the impact of health promotion information on lifestyle behaviours, with no specific reference made to physical activity.

Participants were randomised using simple randomisation, to the receive the guidelines for physical activity including additional safety information, or the revised Move More Pack supported by Internet-based tools. Participants who received the guidelines for physical activity received the revised Move More Pack supported by Internet-based tools 12-weeks later.

This study included cancer survivors regardless of cancer stage, cancer type, or comorbidity. Participants were aged 18-years or over, who could read English, provide consent, were computer and Internet literate, with a working email account. Cancer survivors already meeting the guidelines for aerobic physical activity were not excluded from this study as a dose-response relationship has been reported (Li et al., 2016; Thune & Furberg, 2001; Wannamethee et al., 2001), so they too may benefit from increasing their levels of physical activity. Further, the inclusion of those already meeting the aerobic physical activity guidelines helped to understand the context of use of the revised Move More Pack, and for whom it might be useful.

There are greater long-term risks to health from being inactive than from taking part in physical activity. The revised Move More Pack does not prescribe physical activity rather it aims to empower cancer survivors to increase control over their physical activity behaviour. The relevant safety information was sent in the post to participants at the start of the study. The safety information was taken from the Macmillan Cancer Support webpages (Macmillan
Cancer Support, 2014) and had received the NHS Information Standard (The information standard, n.d.). However, some cancer survivors require medical advice and approval before becoming more physically active. Such cancer survivors were excluded from this study.

Based upon guidance for exercise and cancer survivorship from the American College of Sports Medicine (Irwin, 2012; Schmitz et al., 2010), reviewed and approved by subject experts from Macmillan Cancer Support’s physical activity team, the following screening questions were asked of participants, with an answer of yes to any question resulting in exclusion from the study:

- Are you less than 8-weeks post-surgery?
- Are you experiencing extreme fatigue, anaemia, or severe balance and coordination problems?
- Do you have cancer in your bones or bone thinning?
- Do you have a heart or lung condition (excluding lung cancer)?
- Do you feel pain in your chest at rest, during your daily activities, or when becoming active?
- Do you have persistent pain in your muscles, bones, or joints?
- Do you have swelling or inflammation in the abdomen, groin, or lower extremity?
- Has your doctor ever said that you should only do medically supervised physical activity?
- Are you pregnant?

Excluded participants were informed that they might need medical approval before becoming more physically active and, therefore, were not eligible for this study. They were thanked for their time and given the details of how to obtain the revised Move More Pack, for use should they decide to become more active following discussion with and approval from their general practitioner or cancer care team.
PROCEDURES AND ASSESSMENT TOOLS

A participant information sheet (Appendix 3) informed participants that they would receive either:

1. Very brief well-being information plus lifestyle guidelines, or
2. Very brief well-being information plus a pack of health promotion resources to support people living with and beyond cancer to change a lifestyle behavior.

Participants were informed that they would receive these in the post, and if they received the guidelines, they would receive the pack of health promotion resources 12-weeks later.

Those receiving very brief well-being information and the pack of health promotion resources (the revised Move More Pack) served as the intervention arm. The intervention arm participants were sent a letter informing them that taking part in physical activity is important for everyone including for people who have had a cancer diagnosis with the revised Move More pack enclosed. The letter instructed participants to work their way through the revised Move More Pack. Participants were also informed that they would receive a welcome email and a series of e-newsletters to their registered email address. Finally, participants were directed to the Internet-based tools at www.macmillan.org.uk/BeActive (Supplementary File 18)\textsuperscript{13}.

The waiting list control arm participants were sent a letter in the post informing them that taking part in physical activity is important for everyone including for people who have had a cancer diagnosis. The UK guidelines for physical activity (DOH, 2011) were included with the letter to the waiting list control arm participants, as was relevant safety information (Macmillan Cancer Support, 2014). The waiting list control arm participants received the revised Move More Pack after 12-weeks. The letters sent to the intervention and the waiting list control arm participants are included as Appendices 4 and 5 respectively.

EFFECTIVENESS

Physical activity was assessed using the GLTEQ (Godin & Shephard, 1985) a reliable and validated tool to assess physical activity. The GLTEQ has been used previously with cancer patients.

\textsuperscript{13} Supplementary Files are available at https://drive.google.com/open?id=1JzW0y6ZRUq_evgaZz1mNSeIGTKmAe3
survivors (Amireault, Godin, Lacombe, & Sabiston, 2015), including in studies assessing the
efficacy of remote interventions to improve physical activity in cancer survivors (Short et al.,
2014; Vallance et al., 2007, 2015; Valle et al., 2013).

The GLTEQ is a four-item questionnaire assessing the number of 15-minute bouts of mild,
moderate, and strenuous activity in a standard week, with responses multiplied by an
equivalent MET value being three (mild), five (moderate), and nine (strenuous). The resulting
physical activity score is an arbitrary unit to measure a change in physical activity and to
categorise participants into insufficiently active (those scoring less than 14), moderately
active (those scoring greater than 14 and less than 24), and active groups (those scoring
greater than 24). The GLTEQ active category broadly relates to the meeting of the physical
activity guidelines and the insufficiently active category to those that would be considered
inactive.

The cancer-specific 7-item Functional Assessment of Cancer Therapy questionnaire (FACT-
G7), also a reliable and validated tool, was used to assess HRQOL (Yanez, Pearman, Lis,
Beaumont, & Cella, 2012)\(^\text{14}\). The FACT-G7 scores participants out of 28 with higher scores
relating to better HRQOL. The GLTEQ (Godin & Shephard, 1985) and the FACT-G7 (Yanez
et al., 2012) were administered electronically at baseline in the intervention and waiting list
control arms of the study.

Participants were asked to complete the GLTEQ twice: -

1. To consider their levels of physical activity in a standard week before their cancer
diagnosis, to allow for the tailoring of the e-newsletters, to provide a context for the
use of the revised Move More Pack, and to assess the predictive value of pre-
diagnosis physical activity on physical activity improvement from the revised Move
More Pack.
2. To consider their levels of activity in a standard week after diagnosis, as a baseline
assessment of physical activity.

Self-efficacy was assessed using the following single-item measure: “On a scale of 1 to 10 (1
= not at all confident and 10 = very confident), how confident are you that you will be

\(^{14}\) Approval for the use of the FACT-G7 questionnaire was obtained on the 27/02/17 – case number:13638905; email confirmation is
available in Appendix 6
physically active in situations such as the following: feeling tired, bad mood, not having the
time, on vacation, bad weather?” This single-item measure for physical activity self-efficacy
was developed and reliability-tested by Marcus, Selby, Niaura, and Rossi (1992), and has
been used previously with cancer survivors (Kampshoff et al., 2016). A single-item
assessment tool was selected for its practical application to a real-world setting, and further,
single-item assessment tools of self-efficacy have been shown to perform just as well as
multi-item assessment tools (Hoeppner, Kelly, Urbanoski, & Slaymaker, 2011).

Additional participant information was collected on date of birth, gender, primary cancer site
(type), time since diagnosis, treatment received, time since completion of treatment, response
to treatment, and ethnic group. This additional participant information was used to assess
baseline characteristics between the intervention and waiting list control arms, and the
representativeness of the study sample to the population of UK cancer survivors. The
structure of the questions used to obtain the additional participant information replicated that
used in a DOH survey (2012). All questionnaires were completed using software from
Qualtrics™, USA. The included questionnaires are available in Appendix 7. Data was
collected between April 2017 and October 2017.

12-WEEK FOLLOW-UP

The effectiveness of the revised Move More Pack in improving physical activity, self-
efficacy, and HRQOL in the intervention arm was evaluated after 12-weeks using the
assessment tools used at baseline. The waiting list control arm was also assessed at the 12-
week time point. Participants did not have access to their previous questionnaire scores.

At the 12-week time point, participants in the waiting list control arm were mailed the revised
Move More Pack, directed to the Internet-based tools, and received the e-newsletters as
outlined. Participants in the waiting list control arm were followed up a further 12-weeks
later, at 24-weeks, to evaluate the change in physical activity, self-efficacy, and HRQOL.
Participants in the intervention arm continued to have access to the Internet-based tools,
although they no longer received e-newsletters after the 12-week time point.
**MAINTENANCE**

The maintenance of reported changes in physical activity, self-efficacy, and HRQOL for participants in the intervention arm were evaluated after 24-weeks using the same assessment tools. Participants did not have access to their previous questionnaire scores.

**DATA ANALYSIS**

**RANDOMISED WAITING LIST CONTROL TRIAL**

The sample characteristics were assessed for their representativeness of the cancer population in terms of age, gender, tumour site, pre-diagnosis physical levels, and baseline levels of physical activity. The main outcome data was analysed using intention to treat analysis with the last observation carried forward for any missing data. ANCOVA assessed physical activity improvement; mild, moderate, and strenuous physical activity frequency; self-efficacy improvement; and HRQOL improvement at 12-weeks between arms, controlling for baseline observations for the outcome assessed, and also for age and gender when assessing the outcome of physical activity.

The paired t-test was used to assess within-group movement in the mean physical activity, HRQOL and self-efficacy scores, and the frequency of mild, moderate, and strenuous physical activity, from baseline to 12-weeks. In addition, the paired t-test was used to assess movement in physical activity, HRQOL and self-efficacy scores between 12-weeks and 24-week in the intervention arm (assessing maintenance of any reported changes) and the waiting list control arm (assessing change following the introduction of the revised Move More Pack).

There is a dose-response relationship in regard to physical activity and cancer outcomes with even small improvements likely to bring about some benefit (Li et al., 2016; Thune & Furberg, 2001; Wannamethee, Shaper, & Walker, 2001). Therefore, the impact of the revised Move More Pack on the dichotomous variable of physical activity improvement, or not, at 12-weeks was assess using the two-proportion z-test including calculation of a number needed to treat.

The two-proportion z-test was used to assess differences between the proportion of participants in the waiting list control arm and the intervention arm, classified as active. In
addition, binary logistic regression was performed to assess the impact of the revised Move More Pack on the number of participants classified as active, or not, controlling for baseline physical activity score, age, and gender. Within-group assessment of those active, or not, at 12-weeks was assessed using the McNemar test. These statistical tests were repeated to identify a change in the proportion of those considered insufficiently active (or not).

The predictive value of pre-diagnosis physical activity score and baseline self-efficacy score on the revised Move More Pack resulting in a physical activity improvement over 24-weeks in the intervention arm was assessed using regression analysis. This was only completed in the intervention arm as the waiting list control arm participants were only followed-up for 12-weeks from receipt of the revised Move More Pack. Further, the waiting list control arm participants had already received the guidelines for physical activity before receiving the revised Move More Pack, which could bias the result.

The mean difference between reported pre-diagnosis physical activity score and baseline physical activity score was assessed using the paired t-test for the group as a whole. This was to investigate the reported decrease in physical activity following a diagnosis of cancer. Additional quantitative data analysis included descriptive statistics such as means, standard deviations, and percentages. Analysis was completed using IBM’s™ statistics package SPSS version 24.

COST-CONSEQUENCE ANALYSIS

The economics of the revised Move More Pack took the form of a cost-consequence analysis. A cost-consequence analysis is a variation on cost-effectiveness analysis, with the presentation of costs disaggregated from the outcomes making it more transparent. A cost-consequence analysis is suggested to be more appropriate for public health interventions as it allows interested stakeholders to decide for themselves the relative importance of each outcome in relation to the associated costs, and where costs and benefits might be accrued (NICE, 2014b; Trueman & Anokye., 2013). The development costs and other costs needed to bring the revised Move More Pack into operation were not included in the cost-consequence analysis. The costs are provided per person to allow the reader to scale up costs to meaningful population level figures per 10,000 or 100,000 people as required.
DATA MANAGEMENT

Web-based questionnaires were completed using software from Qualtrics™, USA. The software from Qualtrics™, USA, treats data as highly confidential (Privacy statement, n.d.) and offered the highest levels of data security (Security statement, n.d.). Ownership, control, and management of data remained with the University of Surrey.

Information gathered was held securely on password-locked computers and the servers at the University of Surrey. No hard files were collected. Project data, for example, consent forms, will be retained for at least six-years and research data for at least 10-years as stipulated by University of Surrey policy (Research data management policy, n.d.). Personal data was secured and processed in the strictest confidence according to the Data Protection Act (UK Government, 1998). No identifiable data is reported in the results of this study. Identifiable data was accessible only by this author as the principal investigator, members of the research team, authorised personnel from the University of Surrey, and regulatory authorities for monitoring purposes.

ETHICAL CONSIDERATIONS

This study received ethical approval from the University of Surrey Research Ethics Committee on the 15th March 2017, reference UEC/2017/023/FHMS (Appendix 8). The information included in the revised Move More Pack was certified by the NHS Information Standard (The Information Standard, 2018). The NHS Information Standard ensures that information has undergone rigorous assessment, is evidence-based, of high quality, clear, accurate, and appropriate for its intended audience.

The revised Move More Pack did not prescribe exercise. The relevant safety information was sent to participants in the first postal communication and included criteria for cessation of physical activity being, sudden onset of dizziness, chest pains, a racing heartbeat, breathing problems, nausea, unusual back or bone pain, muscle weakness or a persistent headache, advising participants to contact their doctor for these or other symptoms. Appropriate screening was in place within the study procedures to identify participants needing medical permission before increasing their physical activity, with these participants excluded from this study. A log of participant issues was maintained throughout the study, and participants were offered a phone debriefing session at the end of the study.
Participants were informed that they could withdraw from the study at any time by contacting this author as the principal investigator. In such cases, attempts were made to identify the reason for withdrawal from the study. Non-responders to the follow-up questionnaire were followed up by email in an attempt to obtain and record their reasons for dropping out of the study. Participants in the control arm were not restricted in regard to becoming or staying physically active. The participants in the control arm were asked as part of the questionnaire instructed at 12-week follow-up if they had used the revised Move More Pack within the previous 12-weeks, with their data omitted from the study if they had.
RESULTS

FLOW OF PARTICIPANTS

One-thousand-and-nineteen cancer survivors expressed an interest in the study and were sent a participant information sheet, consent form, and screening questionnaire. Four-hundred-and-eighteen cancer survivors provided consent and completed the screening questionnaire. Of these 418, 180 (43.1%) cancer survivors were screened out of the study for having to obtain medical approval before increasing levels of physical activity. The baseline survey was completed by 212 of the remaining 238 cancer survivors, with 106 randomised to both the intervention arm and waiting list control arm. This was greater than the targeted sample of 99 per arm; however, a decision was made to include all 212 in the study as there was a capacity to do so.

Upon receipt of the posted materials, five participants withdrew from the study and asked for their data to be withdrawn, two from the intervention arm and three from the waiting list control arm. The reasons for withdrawal were not wanting to be physically active (n = 1), on advice from their healthcare team (n = 1), poor health (n = 1), with two giving no reason. The data for these participants was removed from the study, leaving baseline data for 104 participants in the intervention arm and 103 in the waiting list control arm.

Retention of participants in the intervention arm at the 12-week time point was 93.3% (n = 97 of 104), dropping to 87.5% (n = 91 of 104) at the 24-week time point. Retention of participants in the waiting list control arm at the 12-week time point was 92.2% (n = 95 of 103), dropping to 87.4% (n = 90 of 103) at the 24-week time point. Across the whole study 92.8% of participants (n = 192 of 207) were retained at the 12-week time point, and 87.4% (n = 181 of 207) at the 24-week time point. Figure 6 shows the flow of participants through the trial.
Figure 6. Flow of participants through the trial
# BASELINE CHARACTERISTICS

The baseline characteristics for all trial participants are presented in Table 23.

Table 23. Participant baseline characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention (n = 104)</th>
<th>Waiting list control (n = 103)</th>
<th>Overall (n = 207)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>29</td>
<td>(27.9)</td>
<td>25</td>
</tr>
<tr>
<td>Female</td>
<td>75</td>
<td>(72.1)</td>
<td>78</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White English / Welsh / Scottish / Northern Irish / British</td>
<td>96</td>
<td>(92.3)</td>
<td>94</td>
</tr>
<tr>
<td>White Irish</td>
<td>1</td>
<td>(1.0)</td>
<td>1</td>
</tr>
<tr>
<td>Any other White background</td>
<td>3</td>
<td>(2.9)</td>
<td>5</td>
</tr>
<tr>
<td>White and Black Caribbean</td>
<td>1</td>
<td>(1.0)</td>
<td>0</td>
</tr>
<tr>
<td>White and Black African</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>White and Asian</td>
<td>1</td>
<td>(1.0)</td>
<td>0</td>
</tr>
<tr>
<td>Any other Mixed / Multiple ethnic background</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Indian</td>
<td>1</td>
<td>(1.0)</td>
<td>0</td>
</tr>
<tr>
<td>Pakistani</td>
<td>0</td>
<td>(0.0)</td>
<td>1</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Chinese</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Any other Asian background</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Black African</td>
<td>0</td>
<td>(0.0)</td>
<td>1</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>1</td>
<td>(1.0)</td>
<td>1</td>
</tr>
<tr>
<td>Any other Black / African / Caribbean background</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Any other ethnic group</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>0</td>
<td>(0.0)</td>
<td>0</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Intervention (n = 104)</td>
<td>Waiting list control (n = 103)</td>
<td>Overall (n = 207)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Site of primary cancer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>4 (1.9)</td>
</tr>
<tr>
<td>Bowel</td>
<td>10 (9.6)</td>
<td>13 (12.6)</td>
<td>23 (11.1)</td>
</tr>
<tr>
<td>Brain, other CNS and intracranial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>39 (37.5)</td>
<td>40 (38.8)</td>
<td>79 (38.2)</td>
</tr>
<tr>
<td>Cervix</td>
<td>2 (1.9)</td>
<td>4 (3.9)</td>
<td>6 (2.9)</td>
</tr>
<tr>
<td>Head and neck</td>
<td>7 (6.7)</td>
<td>2 (1.9)</td>
<td>9 (4.3)</td>
</tr>
<tr>
<td>Kidney</td>
<td>2 (1.9)</td>
<td>1 (1.0)</td>
<td>3 (1.4)</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>3 (2.9)</td>
<td>2 (1.9)</td>
<td>5 (2.4)</td>
</tr>
<tr>
<td>Liver</td>
<td>0 (0.0)</td>
<td>1 (1.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Myeloma</td>
<td>1 (1.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Melanoma skin cancer</td>
<td>2 (1.9)</td>
<td>6 (5.8)</td>
<td>8 (3.9)</td>
</tr>
<tr>
<td>Non-Hodgkin’s Lymphoma</td>
<td>5 (4.8)</td>
<td>4 (3.9)</td>
<td>9 (4.3)</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>0 (0.0)</td>
<td>2 (1.9)</td>
<td>2 (1.0)</td>
</tr>
<tr>
<td>Ovary</td>
<td>4 (3.8)</td>
<td>3 (2.9)</td>
<td>7 (3.4)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>1 (1.0)</td>
<td>2 (1.9)</td>
<td>3 (1.4)</td>
</tr>
<tr>
<td>Prostate</td>
<td>8 (7.7)</td>
<td>6 (5.8)</td>
<td>14 (6.8)</td>
</tr>
<tr>
<td>Stomach</td>
<td>1 (1.0)</td>
<td>3 (2.9)</td>
<td>4 (1.9)</td>
</tr>
<tr>
<td>Thyroid</td>
<td>1 (1.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Uterus</td>
<td>4 (3.8)</td>
<td>2 (1.9)</td>
<td>6 (2.9)</td>
</tr>
<tr>
<td>Ovary</td>
<td>4 (3.8)</td>
<td>3 (2.9)</td>
<td>7 (3.4)</td>
</tr>
<tr>
<td>Other</td>
<td>8 (7.7)</td>
<td>6 (5.8)</td>
<td>14 (6.8)</td>
</tr>
<tr>
<td>Time since diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-year or less</td>
<td>40 (38.5)</td>
<td>33 (32.0)</td>
<td>73 (35.3)</td>
</tr>
<tr>
<td>1 to 3-years</td>
<td>25 (24.0)</td>
<td>40 (38.8)</td>
<td>65 (31.4)</td>
</tr>
<tr>
<td>3 to 5-years</td>
<td>14 (13.5)</td>
<td>8 (7.8)</td>
<td>22 (10.6)</td>
</tr>
<tr>
<td>Over 5-years</td>
<td>11 (10.6)</td>
<td>13 (12.6)</td>
<td>24 (11.6)</td>
</tr>
<tr>
<td>No answer</td>
<td>14 (13.5)</td>
<td>9 (8.7)</td>
<td>23 (11.1)</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Intervention (n = 104)</td>
<td>Waiting list control (n = 103)</td>
<td>Overall (n = 207)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td>n (% )</td>
<td>n (% )</td>
<td>n (% )</td>
</tr>
<tr>
<td>Treatment received</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active surveillance</td>
<td>5 (4.8)</td>
<td>8 (7.8)</td>
<td>13 (6.3)</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>66 (63.5)</td>
<td>66 (64.1)</td>
<td>132 (63.8)</td>
</tr>
<tr>
<td>Hormone therapy</td>
<td>24 (23.1)</td>
<td>23 (22.3)</td>
<td>47 (22.7)</td>
</tr>
<tr>
<td>Immunotherapy</td>
<td>6 (5.8)</td>
<td>1 (1.0)</td>
<td>7 (3.4)</td>
</tr>
<tr>
<td>Radiation therapy</td>
<td>47 (45.2)</td>
<td>53 (51.5)</td>
<td>100 (48.3)</td>
</tr>
<tr>
<td>Stem cell transplant</td>
<td>2 (1.9)</td>
<td>3 (2.9)</td>
<td>5 (2.4)</td>
</tr>
<tr>
<td>Surgery</td>
<td>84 (80.8)</td>
<td>75 (72.8)</td>
<td>159 (76.8)</td>
</tr>
<tr>
<td>Not started treatment</td>
<td>3 (2.9)</td>
<td>0 (0.0)</td>
<td>3 (1.5)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (6.7)</td>
<td>7 (6.8)</td>
<td>14 (6.8)</td>
</tr>
<tr>
<td>Times since completion of treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-year or less</td>
<td>35 (33.7)</td>
<td>38 (36.9)</td>
<td>73 (35.3)</td>
</tr>
<tr>
<td>1 to 5-years</td>
<td>30 (28.9)</td>
<td>23 (22.3)</td>
<td>53 (25.6)</td>
</tr>
<tr>
<td>Over 5-years</td>
<td>4 (3.9)</td>
<td>9 (8.7)</td>
<td>13 (6.3)</td>
</tr>
<tr>
<td>Still receiving treatment</td>
<td>31 (29.8)</td>
<td>33 (32.0)</td>
<td>64 (30.9)</td>
</tr>
<tr>
<td>Not started treatment</td>
<td>3 (2.9)</td>
<td>0 (0.0)</td>
<td>3 (1.5)</td>
</tr>
<tr>
<td>No answer</td>
<td>1 (1.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Response to treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In remission</td>
<td>55 (52.9)</td>
<td>65 (63.1)</td>
<td>120 (58.0)</td>
</tr>
<tr>
<td>Treated but cancer still present</td>
<td>13 (12.5)</td>
<td>15 (14.6)</td>
<td>28 (13.5)</td>
</tr>
<tr>
<td>Cancer has come back since treatment</td>
<td>6 (5.8)</td>
<td>5 (4.9)</td>
<td>11 (5.3)</td>
</tr>
<tr>
<td>Cancer present, no treatment received</td>
<td>3 (2.9)</td>
<td>0 (0.0)</td>
<td>3 (1.5)</td>
</tr>
<tr>
<td>Not known</td>
<td>27 (26.0)</td>
<td>18 (17.5)</td>
<td>45 (21.7)</td>
</tr>
<tr>
<td>Physical Activity: Pre-diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficiently active</td>
<td>24 (23.1)</td>
<td>20 (19.4)</td>
<td>44 (21.3)</td>
</tr>
<tr>
<td>Moderately active</td>
<td>24 (23.1)</td>
<td>33 (32.0)</td>
<td>57 (27.5)</td>
</tr>
<tr>
<td>Active</td>
<td>56 (53.9)</td>
<td>50 (48.5)</td>
<td>106 (51.2)</td>
</tr>
</tbody>
</table>
Table 24. Baseline mean scores for physical activity, self-efficacy, and HRQOL

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention (n = 104)</th>
<th>Waiting list control (n = 103)</th>
<th>Overall (n = 207)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Physical activity score</td>
<td>25.99</td>
<td>19.37</td>
<td>28.70</td>
</tr>
<tr>
<td>Self-efficacy (score out of 10)</td>
<td>4.89</td>
<td>2.44</td>
<td>5.20</td>
</tr>
<tr>
<td>HRQOL (score out of 28)</td>
<td>16.85</td>
<td>4.70</td>
<td>17.24</td>
</tr>
</tbody>
</table>

Physical activity measured using the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985)
Self-efficacy measured using a single-item measure offered by Marcus et al. (1992)
HRQOL = Health-Related Quality of Life; measured using the FACT-G7 (Yanez et al., 2012)

The mean age of participants was 55.97-years in the intervention arm, and 55.24-years in the waiting list control. Participants in the intervention arm and the waiting list control arm were broadly similar across characteristics at baseline; however, baseline physical activity was higher in the waiting list control arm over the intervention arm.
before their cancer diagnosis at a level classified as active, lower than the gender and aged standardised average of 58.8%. It is recognised that the Health Survey for England (2016) physical activity questionnaire is different to the GLTEQ (Godin & Shephard, 1985), however, it is a worthwhile comparison to understand the pre-diagnosis physical activity of participants in contrast to the general population (Table 25).

Table 25. Age and gender standardised pre-diagnosis physical activity active classifications

<table>
<thead>
<tr>
<th>Age group</th>
<th>Trial sample - n</th>
<th>Standardised active percentage</th>
<th>Expected trial sample active classifications - n</th>
<th>Self-assessed trial sample active classifications - n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-24</td>
<td>1</td>
<td>75.0</td>
<td>0.75</td>
<td>1 (100.0)</td>
</tr>
<tr>
<td>25-34</td>
<td>0</td>
<td>77.9</td>
<td>0.00</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>35-44</td>
<td>6</td>
<td>71.6</td>
<td>4.30</td>
<td>4 (66.7)</td>
</tr>
<tr>
<td>45-54</td>
<td>7</td>
<td>67.9</td>
<td>4.75</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>55-64</td>
<td>20</td>
<td>59.2</td>
<td>11.84</td>
<td>11 (55.0)</td>
</tr>
<tr>
<td>65-74</td>
<td>19</td>
<td>56.7</td>
<td>10.77</td>
<td>8 (42.1)</td>
</tr>
<tr>
<td>75+</td>
<td>1</td>
<td>36.0</td>
<td>0.36</td>
<td>1 (100.0)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-24</td>
<td>0</td>
<td>63.6</td>
<td>0.00</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>25-34</td>
<td>4</td>
<td>66.3</td>
<td>2.65</td>
<td>3 (75.0)</td>
</tr>
<tr>
<td>35-44</td>
<td>19</td>
<td>67.0</td>
<td>12.73</td>
<td>11 (57.9)</td>
</tr>
<tr>
<td>45-54</td>
<td>56</td>
<td>62.1</td>
<td>34.78</td>
<td>33 (58.9)</td>
</tr>
<tr>
<td>55-64</td>
<td>45</td>
<td>55.2</td>
<td>24.85</td>
<td>20 (44.4)</td>
</tr>
<tr>
<td>65-74</td>
<td>24</td>
<td>53.5</td>
<td>12.84</td>
<td>9 (37.5)</td>
</tr>
<tr>
<td>75+</td>
<td>5</td>
<td>25.5</td>
<td>1.27</td>
<td>2 (40.0)</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>58.8</td>
<td>121.72</td>
<td>106 (51.2)</td>
</tr>
</tbody>
</table>

Source: Standardised active percentage taken from the Health Survey for England (2016)

The age and gender standardised physical activity active classification for cancer survivors at baseline was calculated using a survey completed by this author and colleagues of 1,011 UK cancer survivors (Webb & Smerald et al., 2016). Twenty-point-six per cent of the trial sample were expected to be classified as active at baseline to be representative of the cancer population, however, 44.0% of the trial sample were classified as active at baseline (Table 26).
Table 26. Age and gender standardised baseline physical activity active classifications

<table>
<thead>
<tr>
<th>Age group</th>
<th>Trial sample - n</th>
<th>Standardised active percentage</th>
<th>Expected trial sample active classifications - n</th>
<th>Self-assessed trial sample active classifications - n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-44</td>
<td>7</td>
<td>20.5</td>
<td>1.43</td>
<td>5 (71.4)</td>
</tr>
<tr>
<td>45-54</td>
<td>7</td>
<td>25.9</td>
<td>1.81</td>
<td>1 (14.3)</td>
</tr>
<tr>
<td>55-64</td>
<td>20</td>
<td>29.1</td>
<td>5.82</td>
<td>9 (45.0)</td>
</tr>
<tr>
<td>65+</td>
<td>20</td>
<td>27.7</td>
<td>5.54</td>
<td>9 (45.0)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-44</td>
<td>23</td>
<td>14.2</td>
<td>3.27</td>
<td>11 (47.8)</td>
</tr>
<tr>
<td>45-54</td>
<td>56</td>
<td>18.0</td>
<td>10.08</td>
<td>27 (48.2)</td>
</tr>
<tr>
<td>55-64</td>
<td>45</td>
<td>20.2</td>
<td>9.09</td>
<td>18 (40.0)</td>
</tr>
<tr>
<td>65+</td>
<td>29</td>
<td>19.3</td>
<td>5.60</td>
<td>11 (37.9)</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>20.6</td>
<td>42.61</td>
<td>91 (44.0)</td>
</tr>
</tbody>
</table>

Source: Standardised active percentage taken from Webb and Smerald et al., 2016

It is estimated that 27.8% of the population of cancer survivors in the UK are living with breast cancer, 13.3% are living with prostate cancer, and 11.7% are living with colorectal cancer (Macmillan Cancer Support, 2015b). This compares to 38.2%, 6.8%, and 11.1% of the trial sample for breast, prostate, and colorectal cancer survivors respectively, suggesting an over-representation of breast cancer survivors in the trial sample.

The gender split in regard to cancer prevalence in the UK is 56.7% female, and 43.3% male (Macmillan Cancer Support, 2015b). The trial sample had an over-representation of female cancer survivors with 73.9% (26.1% male). The age profile of participants was also younger than that of the UK cancer population, as presented in Table 27.

Table 27. Age of the trial sample compared to the UK population of cancer survivors

<table>
<thead>
<tr>
<th>Age group</th>
<th>Trial sample percentage</th>
<th>Percentage of cancer survivors in the UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-44</td>
<td>14.5</td>
<td>7.8</td>
</tr>
<tr>
<td>45-64</td>
<td>61.8</td>
<td>29.2</td>
</tr>
<tr>
<td>65+</td>
<td>23.7</td>
<td>63.0</td>
</tr>
</tbody>
</table>

Source: Age profile of UK cancer survivors in 2012 taken from Maddams et al. (2012)
OUTCOMES

All trial participants received the intervention as planned. Sadly, one person in the waiting list control arm passed away between the 12-week and 24-week follow-up time points, not related to the intervention. No adverse events were reported. No participants were removed from the waiting list control arm for previous use of the revised Move More Pack.

PHYSICAL ACTIVITY

CHANGES IN THE PHYSICAL ACTIVITY SCORE

The intervention arm reported a mean improvement of 9.58 (SD = 23.14) over 12-weeks, compared to 2.61 (SD = 24.10) in the waiting list control. An ANCOVA controlling for the baseline physical activity, age, and gender, reported a significant difference in the physical activity change score over 12-weeks between the intervention and waiting list control arms (F(3, 202) = 4.34, p = .04, ηp² = 0.021).

The GLTEQ collects frequency data on mild, moderate, and strenuous physical activities. An ANCOVA on the impact of the intervention on mild activity frequency (considered to be three-METs) over the waiting list control, controlling for baseline frequency, age, and gender reported no significant difference (F(3, 202) = 0.36, p = .54, ηp² = 0.002). However, the impact of the intervention on moderate activity frequency (considered to be five-METs) over the waiting list control was significant (F(3,202) = 4.88, p = .03, ηp² = 0.024). The impact of the intervention on strenuous activity frequency (considered to be nine-METs) over the waiting list control was not significant (F(3, 202) = 0.81, p = .37, ηp² = 0.004). When assessing the mild, moderate, and strenuous activity frequencies within-group, using the paired t-test, a significant result was only reported in increases in moderate activity frequency in the intervention arm (t(103) = 5.01, M difference = 1.39, SD = 2.82, p < .001, d = 0.49)

Within-group analysis using the paired t-test reported a significant improvement in physical activity score from baseline to 12-weeks in the intervention arm (t(103) = 4.22, M difference = 9.58, SD = 23.14, p < .001, d = 0.41), but not the waiting list control (t(102) = 1.10, M difference = 2.61, SD = 24.10, p = .27, d = 0.11). Physical activity score increased by a further 5.27 in the intervention arm from 12-weeks to 24-weeks, although this increase was not significant (t(103) = 1.57, M difference = 5.27, SD = 34.16, p = .12, d = 0.15). However, physical activity improvement from baseline to 24-weeks in the intervention arm was
significant ($t(103) = 4.27, M$ difference $= 14.85, SD = 35.47, p < .001, d = 0.42$). Within-group analysis reported a significant physical activity improvement following the introduction of the revised Move More Pack in the waiting list control arm between 12-weeks and 24-weeks ($t(102) = 3.61, M$ difference $= 8.18, SD = 23.01, p < .001, d = 0.36$). The mean physical activity scores in the intervention and waiting list control arms across all time-points are presented in Table 28 and in Figure 7.

PHYSICAL ACTIVITY IMPROVEMENT

The data was coded to identify those that achieved a positive change in physical activity, and those that did not over 12-weeks. Using the two-proportion z-test a statistically significant result was observed ($z = 2.30, p = .021, r = 0.16$) in the proportion of the intervention group that achieved a positive change in physical activity ($n = 66$ of $104, 63.5\%$) compared to the waiting list control ($n = 49$ of $103, 47.6\%$).

Analysis of the number needed to treat showed that six-point-two-nine cancer survivors (eligible to become physically active without prior medical approval) need to receive the revised Move More Pack for one to increase physical activity levels at 12-weeks over a standard letter recommendation (Table 29).

![Figure 7. Mean physical activity score with 95% confidence interval at baseline, 12-weeks, and 24-weeks](image)
Table 28. Change in the mean physical activity scores

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12-week follow-up</th>
<th>24-week follow-up</th>
<th>24-week follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>difference (baseline to 12-weeks)</td>
<td>p value within-group</td>
<td>difference (12 to 24-weeks)</td>
<td>p value between groups</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>within-group</td>
<td>p value</td>
<td>within-group</td>
</tr>
<tr>
<td></td>
<td>baseline (12 to 24-weeks)</td>
<td>within-group</td>
<td>between groups</td>
<td>(baseline to 24-weeks)</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>within-group</td>
<td>p value</td>
<td>within-group</td>
</tr>
<tr>
<td></td>
<td>baseline (12 to 24-weeks)</td>
<td>within-group</td>
<td>between groups</td>
<td>(baseline to 24-weeks)</td>
</tr>
<tr>
<td>Intervention arm</td>
<td>25.99</td>
<td>19.37</td>
<td>35.57</td>
<td>23.14</td>
</tr>
<tr>
<td>Waiting list control*</td>
<td>28.70</td>
<td>24.05</td>
<td>31.31</td>
<td>22.65</td>
</tr>
</tbody>
</table>

* The revised Move More Pack (intervention) was introduced to the waiting list control arm participants at 12-weeks

Table 29. Physical activity improvement ratio and number needed to treat

<table>
<thead>
<tr>
<th></th>
<th>Improvement - n (%)</th>
<th>No improvement - n (%)</th>
<th>Improvement ratio</th>
<th>Absolute improvement - %</th>
<th>Number needed to treat*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>66 (63.5)</td>
<td>38 (36.5)</td>
<td>1.33</td>
<td>15.9</td>
<td>6.29</td>
<td>.021</td>
</tr>
<tr>
<td>Waiting list control</td>
<td>49 (47.6)</td>
<td>54 (52.4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Calculated by dividing 100 by the absolute improvement percentage
PHYSICAL ACTIVITY CLASSIFICATION

ACTIVE VS MODERATELY ACTIVE OR INSUFFICIENTLY ACTIVE

Across arm comparison using the two-proportion z-test showed the difference in those classified as active in the intervention arm and the waiting list control arm at 12-weeks to be just outside the level of significance (intervention: n = 68 of 104, 65.4%; waiting list control: n = 54 of 103, 52.4%; z = 1.89, p = .06, r = 0.13). However, binary logistical regression on the dichotomous variable of active, or not (moderately active or insufficiently active), at 12-weeks controlling for baseline physical activity, age, and gender, did show a significant relationship between receipt of the revised Move More Pack and the likelihood of being classified as active ($\beta = 0.80$, $p = .02$, OR 2.23 [95% CI = 1.16 to 4.27]).

McNemar’s test for paired groups showed a statistically significant absolute increase of 19.2% (46.2% to 65.4%) in the proportion of participants classified as active in the intervention arm from baseline to 12-weeks ($p = .002$, OR = 2.20). The proportion of the intervention arm classified as active was maintained at 24-weeks, increasing slightly to 66.3% (n = 69 of 104), an absolute increase in the proportion classified as active of 20.2% from baseline ($p < .001$, OR = 2.30).

The proportion of those classified as active in the waiting-list control increased, from 41.7% at baseline (n = 43 of 103) to 52.4% (n = 54 of 103) at 12-weeks, although this increase was just outside the level of significance ($p = .052$, OR = 1.54). Following the introduction of the revised Move More Pack to the waiting list control arm at 12-weeks, the proportion of participants classified as active significantly increased from 52.4% (n = 54 of 103) to 67.0% (n = 69 of 103) over the following 12-weeks, ($p = .006$, OR = 1.84).

INSUFFICIENTLY ACTIVE VS MODERATELY ACTIVE OR ACTIVE

Across arm comparison using the two-proportion z-test, reported no statistical difference between the proportion of the waiting list control arm classified as insufficiently active at 12-weeks (n = 19 of 103, 18.5%) compared to the intervention arm (n = 18 of 104, 17.3%) (z = 0.21, $p = .83$, r = 0.015). Binary logistical regression on the dichotomous variable of insufficiently active, or not (moderately active or active), at 12-weeks, controlling for baseline physical activity, age, and gender, also reported no difference ($\beta = 0.15$, $p = .70$, OR 1.17 [95% CI = .53 to 2.55])
Within-group analysis using McNemar’s test showed a significant absolute reduction of 10.6% in the proportion classified as insufficiently active from baseline to 12-weeks in the intervention arm (baseline: n = 29 of 104, 27.9%; 12-weeks: n = 18 of 104, 17.3%) (p = .02, OR = 1.85). The proportion classified as insufficiently active within the intervention arm remained at 17.3% at 24-weeks (n = 18 of 104), a significant difference from the baseline proportion classified as insufficiently active (p = .03, OR = 1.85).

The waiting list control arm reported a reduction in those classified as insufficiently active from 27.2% at baseline (n = 28 of 103) to 18.4% (n = 19 of 103) at 12-weeks; however, this reduction was outside the level of significance (p = .06, OR = 1.65). The proportion of the waiting list control classified as insufficiently active dropped from 18.4% (n = 19 of 103) at 12-weeks to 11.7% (n = 12 of 103) at 24-week following the introduction of the revised Move More Pack; however, this reduction was also just outside the level of significance (p = .07, OR = 1.72).

![Physical activity classification in the intervention arm at baseline, 12-weeks, and 24-weeks](image-url)

Figure 8. Physical activity classification in the intervention arm at baseline, 12-weeks, and 24-weeks
SELF-EFFICACY

Self-efficacy improved by 0.52 (SD = 2.44) in the intervention arm over 12-weeks, compared to an improvement of 0.23 (SD = 2.51) in the waiting list control, a difference of 0.29. An ANCOVA controlling for baseline self-efficacy reports this difference between the intervention and waiting list control to be non-significant ($F(1, 204) = 0.22, p = .64, \eta^2_p = 0.001$).

Within-group analysis using the paired t-test reported a significant improvement in self-efficacy in the intervention arm from 4.89 (SD = 2.44) at baseline to 5.41 (SD = 2.59) at 12-weeks ($t(103) = 2.17, M$ difference = 0.52, $SD = 2.44, p = .03, d = 0.21$). Self-efficacy increased in the waiting list control arm from 5.20 (SD = 2.67) at baseline to 5.44 (SD = 2.55) at 12-weeks; however, this increase was not significant ($t(102) = 0.94, M$ difference = 0.23, $SD = 2.51, p = .35, d = 0.09$).

Self-efficacy increased by 0.43 between 12-weeks and 24-weeks in the intervention arm from 5.41 (SD = 2.59) to 5.84 (SD = 2.66); this increase was just outside the level of significance ($t(103) = 1.89, M$ difference 0.43, $SD = 2.30), p = .06, d = 0.19$). However, a significant improvement was observed in self-efficacy between baseline and 24-weeks ($t(103) = 3.50, M$ difference = 0.94, $SD = 2.75, p < .001, d = 0.34$).
An improvement in self-efficacy was observed following the introduction of the revised Move More Pack to the waiting list control arm, between 12-weeks and 24-weeks, from 5.44 ($SD = 2.55$) to 5.83 ($SD = 2.39$); however, this increase was not significant ($t(102) = 1.57$, $M$ difference 0.39, $SD = 2.58$, $p = .13$, $d = 0.15$). Change in the self-efficacy scores are presented in Table 30.

![Figure 10. Self-efficacy score with 95% confidence interval at baseline, 12-weeks, and 24 weeks](image)

HEALTH-RELATED QUALITY OF LIFE

HRQOL improved in both arms between baseline and 12-weeks; however, the improvement observed in the intervention arm was less than that observed in the waiting list control arm by 0.26, 0.95 ($SD = 3.49$) and 1.21 ($SD = 4.11$) respectively. An ANCOVA on the HRQOL improvement scores between arms at 12-weeks controlling for baseline HRQOL reported the difference between the two arms as non-significant ($F(1,204) = 0.55$, $p = .46$, $\eta^2_p = 0.003$).

Within-group analysis using the paired t-test to assess change from baseline to 12-weeks reported an improvement in HRQOL in the intervention arm although just outside the level of significance ($t(103) = 2.78$, $M$ difference = 0.95, $SD = 3.49$, $p = .06$, $d = 0.27$). The
improvement in HRQOL in the waiting list control arm between baseline and 12-weeks, however, was significant ($t(102) = 3.00$, $M$ difference $= 1.22$, $SD = 4.11$, $p = .003$, $d = 0.30$).

HRQOL increase by a further 0.52 ($SD = 3.92$) in the intervention arm between 12-weeks and 24-weeks from 17.80 ($SD = 5.16$) to 18.32 ($SD = 5.26$), a non-significant increase ($t(103) = 1.35$, $M$ difference $= 0.52$, $SD = 3.92$, $p = .18$, $d = 0.13$). However, a significant increase was observed in HRQOL from baseline to 24-weeks ($t(103) = 3.66$, $M$ difference $= 1.47$, $SD = 4.12$, $p < .001$, $d = 0.36$).

Following the introduction of the revised Move More Pack to the waiting list control arm at the 12-week time point, an improvement of 0.54 ($SD = 3.12$) was observed in the HRQOL score from 18.46 ($SD = 4.99$) to 19.00 ($SD = 5.27$); however, this increase was not significant ($t(102) = 1.76$, $M$ difference $= 0.54$, $SD = 3.12$, $p = .09$, $d = 0.17$).

![Figure 11. HRQOL score with 95% confidence interval at baseline, 12-weeks, and 24-weeks](image-url)
Table 30. Change in the mean self-efficacy scores

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12-week follow-up</th>
<th>24-week follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td><strong>Intervention arm</strong></td>
<td>4.89</td>
<td>2.44</td>
<td>5.41</td>
</tr>
<tr>
<td><strong>Waiting list control</strong></td>
<td>5.20</td>
<td>2.67</td>
<td>5.44</td>
</tr>
</tbody>
</table>

* The revised Move More Pack (intervention) was introduced to the waiting list control at 12-weeks

Table 31. Change in the mean HRQOL scores

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12-week follow-up</th>
<th>24-week follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td><strong>Intervention arm</strong></td>
<td>16.85</td>
<td>4.70</td>
<td>17.80</td>
</tr>
<tr>
<td><strong>Waiting list control</strong></td>
<td>17.24</td>
<td>5.22</td>
<td>18.46</td>
</tr>
</tbody>
</table>

* The revised Move More Pack (intervention) was introduced to the waiting list control at 12-weeks
SELF-EFFICACY AND PRE-DIAGNOSIS PHYSICAL ACTIVITY AS PREDICTORS OF CHANGE IN PHYSICAL ACTIVITY

Baseline self-efficacy and pre-diagnosis physical activity were analysed using logistic regression to assess their predictive value on 24-week physical activity improvement in the intervention arm. Neither was found to be a predictor of change (baseline self-efficacy: \( \beta = -0.07, p = .40, \text{OR} = 0.93 \) [95% CI = 0.79 to 1.10], Nagelkerke \( R^2 = 0.009 \); pre-diagnosis physical activity: \( \beta = -0.16, p = .08, \text{OR} = 0.98 \) [95% CI = 0.97 to 1.01], Nagelkerke \( R^2 = 0.04 \)).

PRE-DIAGNOSIS AND POST-DIAGNOSIS PHYSICAL ACTIVITY

The paired t-test assessed the difference between the pre-diagnosis and post-diagnosis (baseline) physical activity score for all participants. A significant drop was reported in physical activity from pre-diagnosis (\( M = 31.99, SD = 23.42 \)) to post-diagnosis (baseline) (\( M = 27.34, SD = 21.81 \)) (\( t(206) = -3.43, M \text{ difference} = -4.65, SD = 19.50, p = .001 \)).

COST-CONSEQUENCE ANALYSIS

The costs for the revised Move More Pack (intervention) and the standard letter recommendation including the physical activity guidelines and safety information (waiting list control) are presented in Table 32. The 12-week outcomes for physical activity, self-efficacy, and HRQOL are presented in Table 32. The cost-consequence analysis is presented for a 12-week (three-month) period.

Six-point-two-nine cancer survivors (able to increase physical activity without prior medical approval) need to receive the revised Move More Pack for one to improve their physical activity over receipt of a standard letter recommendation at 12-weeks, a total cost of £45.13 per physical activity improvement.
Table 32. Intervention and control costs

<table>
<thead>
<tr>
<th>Intervention – The revised Move More Pack</th>
<th>Cost per unit</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print costs – revised Move More Pack</td>
<td>£5.00</td>
<td>104</td>
<td>£520.00</td>
</tr>
<tr>
<td>Print costs – cover letter</td>
<td>£0.07 per page</td>
<td>104 (two-pages)</td>
<td>£14.56</td>
</tr>
<tr>
<td>Cost of postage</td>
<td>£1.87</td>
<td>104</td>
<td>£194.48</td>
</tr>
<tr>
<td>Website hosting</td>
<td>£40.81 per month</td>
<td>3</td>
<td>£122.43</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>£851.47</td>
</tr>
<tr>
<td>Estimated cost per person (based on 104 people)</td>
<td></td>
<td></td>
<td>£8.19</td>
</tr>
</tbody>
</table>

**Waiting list control – Standard letter recommendation**

<table>
<thead>
<tr>
<th></th>
<th>Cost per unit</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print costs - letter</td>
<td>£0.07</td>
<td>104 (four-pages)</td>
<td>£29.12</td>
</tr>
<tr>
<td>Cost of postage</td>
<td>£0.67</td>
<td>104</td>
<td>£69.68</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>£98.80</td>
</tr>
<tr>
<td>Estimated cost per person (based on 104 people)</td>
<td></td>
<td></td>
<td>£0.95</td>
</tr>
</tbody>
</table>

Source: The revised Move More Pack printed component costs taken from The cost of Macmillan's services fact sheet (2017)

The letter sent to the waiting list control and intervention arm participants was printed A4 in colour. The print costs for the letter in the waiting list control arm were calculated for 104 units to allow direct comparison to the intervention.

The Internet-based tools are included on the Macmillan Cancer Support website which is hosted by Microsoft Azure™. The costs were estimated for a basic service to create webpages (Pricing calculator, 2018).

The e-newsletters were created and sent by this author but if an automated system were to be used the intervention cost-per-unit would increase.

Table 33. Physical activity, self-efficacy, and HRQOL outcomes at 12-weeks

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Waiting list control</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean physical activity score</td>
<td>35.57</td>
<td>31.31</td>
<td>4.86</td>
</tr>
<tr>
<td>Mean physical activity improvement score</td>
<td>9.58</td>
<td>2.61</td>
<td>6.97</td>
</tr>
<tr>
<td>Mean HRQOL score (out of 28)</td>
<td>17.80</td>
<td>18.46</td>
<td>-0.66</td>
</tr>
<tr>
<td>Mean HRQOL improvement score</td>
<td>0.95</td>
<td>1.21</td>
<td>-0.26</td>
</tr>
<tr>
<td>Mean self-efficacy score (out of 10)</td>
<td>5.41</td>
<td>5.44</td>
<td>-0.03</td>
</tr>
<tr>
<td>Self-efficacy improvement</td>
<td>0.52</td>
<td>0.24</td>
<td>0.28</td>
</tr>
</tbody>
</table>
DISCUSSION

This study aimed to investigate the effectiveness, using a randomised waiting list control trial, of the revised Move More Pack at increasing the physical activity, self-efficacy, and HRQOL of cancer survivors. Before discussing the impact of the revised Move More Pack on these outcomes, the representativeness of the trial sample of the UK cancer population will be discussed to help understand the generalisability of the finds from this study.

REPRESENTATIVENESS

The physical activity levels of the trial sample pre-diagnosis of cancer are 7.6% less than the standardised physical activity levels in the general population. Lower levels of physical activity are an independent risk factor for cancer (WCRF & AICR, 2007), therefore, it is not unexpected that the trial sample would be less active (pre-diagnosis) than the general population.

The trial sample is substantially more active at baseline than cancer survivors in the UK, with 44.0% of the trial sample classified as active compared to an expected 20.6%. It is acknowledged that the GLTEQ may not map directly onto the UK physical activity guidelines, but it is however, a useful comparison. This disparity may be explained by the recruitment of cancer survivors through Macmillan Cancer Support. It may be that those that engage and seek support from the charity are more likely to adopt healthy lifestyle behaviours and be more physically active.

Another possible reason for the higher than expected proportion of active participants in the trial sample is the screening out of 180 interested participants for needing medical approval before becoming active. The screening out of these interested participants may have resulted in those less active being inadvertently removed from the study, leaving a higher proportion of active individuals. This is an important finding in itself as the need to obtain medical approval before becoming more active is likely to create a barrier to physical activity. The reader is asked to keep this in mind when reading this section, understanding that the results are discussed in the context of cancer survivors who can be active without prior medical approval.

The screening out of such a high proportion of cancer survivors provides support for healthcare professionals discussing physical activity with their cancer patients, giving person-
centred advice, identifying precautions that may be necessary, and giving permission to be active at the outset (Webb, 2016; Webb & Smerald et al., 2016). Another possibility for the higher than average active proportion is the possible over-reporting of physical activity by participants, pushing more participants into the active category, however, the comparison data also uses a self-reported measure, so this is less likely.

Of the most common cancer types, the trial sample has an over-representation of breast cancer survivors, an under-representation of prostate cancer survivors, with a comparable representation for colorectal cancer survivors. This may also be explained by the recruitment of cancer survivors through Macmillan Cancer Support and may be indicative of their customer base. The same may be true for the younger age profile of the trial sample than the UK cancer population, and the over-representation of women in the trial sample. Despite these differences, this study provides the most generalisable data to date on the use of a broad-reach intervention combining print and Internet-based tools without one-to-one support to increase physical activity in the UK cancer population.

Assessment of pre-diagnosis physical activity levels compared to post-diagnosis (baseline) physical activity levels shows a significant decrease of 14.5%; this is less than the 30% reported by Blanchard et al. (2003). In regard to the proportion meeting the physical activity guidelines pre-diagnosis compared to post-diagnosis (baseline) using the GLTEQ active category as a proxy measure, there is a reduction of 7.2% from 51.2% to 44.0%. This 7.2% reduction is comparable to the 10% difference reported by Wang et al. (2016) in the general population and the cancer population achieving two hours of aerobic activity each week (45% and 35% respectively). It is acknowledged that two hours of aerobic activity is not the same as the UK physical activity guidelines, however, it does provide a useful comparison. These results support the need to intervene to increase physical activity in cancer survivors.

THE MAIN OUTCOMES

Considering that improvement in cancer outcomes from increases in physical activity are shown to be dose-response (Li et al., 2016; Thune & Furberg, 2001; Wannamethee et al., 2001), physical activity improvement of any size is an important indicator upon which to base intervention scaling decisions. The revised Move More Pack is significantly more likely to result in an improvement in physical activity over a standard letter recommendation, with
cancer survivors 33% more likely to improve their physical activity. These findings are important if considering this intervention on a population scale.

This study reports that the revised Move More Pack reclassifies 19.2% of cancer survivors from either insufficiently active or moderately active categories, to active over 12-weeks. The change in the proportion classified as active from the revised Move More Pack over 12-weeks is 8.6% greater than that observed from a standard letter recommendation.

The findings from this study support the positive trend toward increases in physical activity reported by Short et al. (2014). Short et al. report an odds ratio of 1.43 for meeting the aerobic physical activity guidelines in those receiving a tailored newsletter, and an odds ratio of 1.73 for those receiving a physical activity workbook, over a standard letter recommendation. This study suggests that the revised Move More Pack significant increases the likelihood of being classified as active at 12-weeks over a standard letter recommendation with an odds ratio of 2.23 (when controlling for age, gender, and baseline physical activity). This more pronounced improvement in physical activity over the findings from Short et al. may be explained by the combination of tailored e-newsletters, a physical activity workbook, and the series of Internet-based support tools used within the revised Move More Pack.

The revised Move More Pack, whilst reducing the proportion of cancer survivors classified as inactive, does not do so significantly more than a standard letter recommendation. The standard letter recommendation reduces those classified as insufficiently active by 8.7% over 12-weeks compared to 10.6% from the revised Move More Pack. This may suggest that a standard letter recommending physical activity is enough to bring cancer survivors out of the insufficiently active category but to reach higher levels of physical activity, additional support is required as in the revised Move More Pack. This is supported by the data showing the significant impact of the revised Move More Pack on the frequency of taking part in moderate-intensity physical activities.

The difference in mean physical activity improvement score between receipt of the revised Move More Pack over a standard letter recommendation is significant when controlling for baseline physical activity, age and gender. It is suggested that this difference would be larger if the control group consisted of usual care rather than a standard letter recommendation, as this in itself impacts positively on physical activity in cancer survivors, also seen by Short et al. (2014) and Vallance et al. (2007).
Those in receipt of a standard letter recommendation increase levels of physical activity by 9.1% over 12-weeks. This increase in physical activity is comparable to the 9% increase in brisk physical activity reported by Fisher and Williams et al. (2015) for those who recall a physical activity recommendation from a healthcare professional. The 9.1% increase in physical activity over 12-weeks from a standard letter recommendation compares to a 36.9% increase from receiving the revised Move More Pack. The significant increase in physical activity from the revised Move More Pack over a standard letter recommendation is in support of the findings by Vallance et al. (2007).

This randomised waiting list control trial investigates the impacts of the revised Move More Pack on the HRQOL and self-efficacy of cancer survivors. The revised Move More Pack does not improve self-efficacy over a standard letter recommendation. Both the revised Move More Pack and a standard letter recommendation report a positive trend in self-efficacy. The increases seen in self-efficacy are greater from receipt of the revised Move More Pack over a standard letter recommendation. It is favourable to note that self-efficacy may continue to rise, as shown by increases in the intervention arm of this trial between 12-weeks and 24-weeks.

The improvements in self-efficacy are small with the intervention arm showing an increase of just 0.95 over 24-weeks. Whilst many of the studies covered in the introductory section mention self-efficacy (Short et al., 2014; Vallance et al., 2007, Valle et al., 2013) none of them measure intervention impact on this outcome, an additional element that this study adds to the literature. As a secondary outcome measure, this study is not powered to pick up such small changes in self-efficacy.

Similar results are seen for HRQOL with a positive trend toward improvements in HRQOL for both the revised Move More Pack and the standard letter recommendation. However, no difference is seen in the HRQOL of cancer survivors between those receiving the revised Move More Pack over a standard letter recommendation. Within-group analysis does suggest that the standard letter recommendation significantly improves HRQOL, whereas improvements from the revised Move More Pack are just outside the level of significance ($p = .06$). However, it is favourable to note that HRQOL continues to increase between 12-weeks and 24-weeks with a significant improvement seen in HRQOL over 24-weeks in those receiving the revised Move More Pack.
Improvements in HRQOL, as per the improvement in self-efficacy, are small and this study is not appropriately powered to assess these small changes. These findings suggest that receiving a standard letter recommendation for physical activity may be more effective at creating small increases in HRQOL than the revised Move More Pack. These findings differ to those found by Short et al. (2014) who report a greater positive trend in HRQOL from tailored newsletters, and a physical activity workbook, over a standard letter recommendation, although not significant.

Vallance et al. (2007) report a 1.4% improvement in HRQOL from receipt of a standard letter recommendation, compared to a 5.8% improvement in those receiving a physical activity workbook in combination with a pedometer, a statistically significant positive treatment effect. This study reports comparable improvements in HRQOL in those receiving the revised Move More Pack of 5.6% over 12-weeks, however, unexpectedly, the standard letter recommendation improves HRQOL by 7.1% from baseline measures.

The reasons for the comparable increase in HRQOL from the revised Move More Pack and a standard letter recommendation are unclear and need further investigation. The baseline HRQOL scores in both arms of this trial are considered to be good with scores of 16.85 out of 28 in the intervention arm and 17.24 out of 28 in the waiting list control arm. The comparable HRQOL scores in those receiving the revised Move More Pack and those receiving a standard letter recommendation at 12-week follow-up may be due to a ceiling-effect resulting from the already good HRQOL scores at baseline. These baseline measures of HRQOL may be indicative of the cancer survivors interacting with Macmillan Cancer Support from whom the trial sample was recruited.

**COST-CONSEQUENCE**

The cost of the revised Move More Pack is estimated to be £8.19 per person. This is 8.6 times higher than the cost of receiving a standard letter recommendation in the mail at £0.95. It is suggested that six-point-two-nine cancer survivors need to receive the revised Move More Pack for one to improve physical activity above that of a standard letter recommendation over 12-weeks, a cost of £45.13 per improvement in physical activity. It is not possible to directly compare the cost of this intervention and its outcomes to similar interventions as no evaluations of this kind have been reported in the previous literature. Only Short et al.
(2013b) report costs associated with their intervention; however, these are related to intervention development rather than ongoing operation.

The intervention cost of £8.19 per person compares to a crude amount of £286.43 per person for delivery of a face-to-face physical activity service as presented within chapter one of this thesis (Get healthy get active project summaries, n.d.), a difference of £278.25 per person. It is acknowledged that comparisons between these two figures must be handled with caution, however, these cost comparisons do give an indication of potential costs savings that could be achieved from a remote-based intervention without one-to-one support. These potential cost savings may allow for the better use of scarce resources to ensure that such face-to-face services are delivered to those that need such support.

**PREDICTING CHANGE**

This study aimed to investigate the possible predictors of change from receipt of the revised Move More Pack of pre-diagnosis physical activity levels and baseline self-efficacy. As a low-intensity intervention, it was hypothesised that those who identify as physically active individuals (identified as those physically active pre-diagnosis), would be more likely to respond to the revised Move More Pack. Further, those with a higher baseline self-efficacy score would also be more likely to respond to the revised Move More Pack. However, this is not the case with neither pre-diagnosis physical activity nor self-efficacy a predictor of physical activity improvement in those receiving the intervention.

The revised Move More Pack may influence the physical activity of cancer survivors regardless of levels of self-efficacy, and in those that do and do not identify as physically active individuals. The process evaluation, covered in the following chapter, provides further explanation and discussion on who the revised Move More Pack is useful for and in what context, helping to explain these findings.

**STRENGTHS AND LIMITATIONS**

This study has many strengths. To the knowledge of this author at the time of writing, this is the first study to investigate a physical activity only intervention delivered remotely to UK cancer survivors without one-to-one support. In addition, this study includes all adult cancer survivors regardless of age, tumour site, cancer, or place in the cancer journey, rare in the extant literature. This study uses a randomised control design with a high retention rate,
above the generally accepted 80%. This research supports the use of broad reach remotely delivered interventions to influence physical activity in cancer survivors adding to the limited evidence-base in this area.

Many interventions described in the published literature report a named theory, but there is a lack of reporting of intervention development and the resulting behavioural change (NICE, 2014a). NICE recommend providing a detailed account of a multicomponent intervention, its components including detail of the theories, theoretical constructs, and BCT used. All of these NICE recommendations have been achieved in this study. Further, the inclusion of an economic analysis is recommended by NICE (2014a, 2014b); the inclusion of a cost-consequence analysis in this study further sets it apart from other studies in this area.

This study is not without its limitations. Whilst the sample in this study is of a similar size to other studies in this field of research (Short et al., 2014; Vallance et al., 2007), a larger sample would have powered the study to identify small changes in HRQOL and self-efficacy. This study would have benefited from a third-arm, being usual care, as the use of a standard letter recommendation as the control comparison itself significantly improves physical activity.

The sample is over-representative of females, physically active individuals, and cancer survivors of a younger age. It can be said with some confidence that the findings are generalisable to those engaging with Macmillan Cancer Support. The generalisability of the findings to the wider UK cancer population cannot be confirmed; however, this study offers the best available evidence to support a print-based intervention with Internet-based tools to increase physical activity in UK cancer survivors.

This study investigates change over 24-weeks which is more than Vallance et al. (2007) who assessed change at 12-weeks, but less than Short et al. (2014) who assessed change at 10-months. NICE (2014a) recommend follow up for at least 12-months for behavioural change interventions. Therefore, should this intervention be rolled out at scale, measures to follow up users of the revised Move More Pack over at least 12-months should be put in place, which will also assist in the ongoing evaluation of the intervention. The distribution of the e-newsletters over 12-months as outlined in Table 21 could support this aim.

A limitation of this study is the use of a self-reported measure (the GLTEQ) to assess and evaluate participants’ physical activity. However, the GLTEQ is a validated and reliable
measure and has been used in previous research with cancer survivors (Amireault et al., 2015). The use of an objective measure of physical activity may have been preferable, however, this would have introduced an additional BCT. The revised Move More Pack aims to enable cancer survivors to monitor their physical activity by directing them to a pedometer app; introduction of an objective measure could have influenced the use of this component of the revised Move More Pack.

**CONCLUSION**

The revised Move More Pack significantly increases physical activity over a standard letter recommendation over 12-weeks, but not self-efficacy or HRQOL. The cost of the revised Move More Pack is £8.19 per person offering a potential cost saving over one-to-one physical activity support services for cancer survivors. It is suggested that six-point-two-nine cancer survivors need to receive the intervention for one to improve levels of physical activity over a standard letter recommendation.

It was hypothesised that pre-diagnosis levels of physical activity and baseline self-efficacy would be predictors of physical activity improvement from receipt of the revised Move More Pack, however, this was found not to be the case.
CHAPTER FOUR
STUDY THREE: A PROCESS EVALUATION OF THE MOVE MORE PACK

This chapter presents the findings from a process evaluation embedded within the randomised waiting list control trial presented in chapter three. The following paper has been published from the research presented within this chapter:


CHAPTER FOUR CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>168</td>
</tr>
<tr>
<td>Method</td>
<td>170</td>
</tr>
<tr>
<td>Results</td>
<td>174</td>
</tr>
<tr>
<td>Discussion</td>
<td>201</td>
</tr>
</tbody>
</table>
INTRODUCTION

The literature on remote-based interventions to improve physical activity in cancer survivors is covered in the introduction section of chapter three. Therefore, the introduction to this chapter will remain brief. Of the literature covered in this aforementioned section, only Forbes et al. (2015), Rabin et al. (2011), Short et al. (2013), and Valle et al. (2013) conduct evaluations related to the use, and usefulness of their remote-based interventions to improve physical activity in cancer survivors.

Rabin et al. (2011) assess satisfaction of their Internet-based intervention to improve physical activity in young adult cancer survivors using a 5-point-Likert scale. Only seven participants evaluate the intervention developed by Rabin et al. with 71% satisfied with the intervention; 57% finding the goal-setting section helpful; 71% finding the recording of their physical activity helpful; 43% finding the exercise tips helpful, and 71% finding details of local activities helpful. These results should be interpreted with caution because of the very low participant numbers. Valle et al. (2013) assess satisfaction of their Facebook intervention using a 7-point-Likert scale, with most of the 66 cancer survivors evaluating the intervention, agreeing that they would recommend the intervention to others.

Short et al. (2013) make use of a 5-point-Likert scale across a multiple statement questionnaire to rate their print-based intervention. Of 92 cancer survivors responding to this questionnaire, 73% feel that the intervention is at least somewhat relevant to them, and 64% state that the intervention helped them change their physical activity behaviour. Responses to open-ended questions included in the questionnaire by Short et al. suggest that cancer survivors find their intervention beneficial although too big; others state that the intervention did not acknowledge their physical limitations. Forbes et al. (2015) report that on average cancer survivors use their online intervention once-a-week over a nine-week period. In addition, Forbes et al. report that 73% are satisfied with their intervention and 51% find the use of online videos useful.

These evaluations of intervention use and usefulness by Forbes et al. (2015), Rabin et al. (2011), Short et al. (2013), and Valle et al. (2013) only make use of survey responses, collecting in the main quantitative data with the inclusion of some open text boxes. None of these evaluations situate intervention use, usefulness and impact within a broader social context, representing a gap in the existing knowledge. This gap in knowledge is also
recognised by NICE (2014a) across behavioural change interventions. Understanding the context of intervention implementation and what works for whom is important, yet under-theorised and under-investigated (Michie et al., 2011, 2013).

**STUDY AIMS**

The aim of this process evaluation is to contextualise the use and perceived usefulness of the revised Move More Pack at influencing physical activity behaviour change.
METHOD

DESIGN

The process evaluation was embedded within the randomised waiting list control trial presented in chapter three. The reader is asked to refer to the methods section of chapter three for detail of the revised Move More Pack intervention, the trial registration, data management, recruitment, and ethical considerations. Recruitment specifically to this process evaluation is covered in the procedures section which follows.

The process evaluation combined quantitative and qualitative methods to understand intervention use and experiences, taking an interpretivist approach through a contextualist lens.

PROCEDURES

The procedures used in the collection of quantitative and qualitative data in support of this process evaluation are now covered in turn.

QUANTITATIVE DATA COLLECTION

Use of each component of the revised Move More Pack was assessed using a 4-point Likert scale of often, sometimes, rarely, and never. The 4-point Likert scale was included as part of the questionnaire administered to the intervention arm participants at 12-weeks and the waiting list control arm participants at 24-weeks (Appendix 7). For assessment of use, the components of the revised Move More Pack were categorised as follows:

- Guide to becoming active – Getting started.
- Guide to becoming active – Setting goals and staying active.
- Physical activity and cancer booklet.
- Activities in daily life - activity leaflet.
- Gardening information - activity leaflet.
- Swimming information - activity leaflet.
- Walking information - activity leaflet.
- Getting back into sport - activity leaflet.
- Pull-out wall chart.
• DVD.
• Online forum – talk about being active.
• Online forum – ask the physio.
• Digital apps.
• Find activities near you.
• DVD (Internet-based).

Participants were asked to indicate on a 7-point Likert scale their agreement with the statement *The e-newsletters were helpful in getting me more active*, with 1-being strongly disagree, and 7-strongly agree; an eighth option of *I did not read the e-newsletters* was also available. All participants had the opportunity to comment on the use and the perceived usefulness of the revised Move More Pack in an open-text field included in the follow-up questionnaire (Appendix 7). Detail of the components of the revised Move More Pack are presented in Tables 21 and 22 in chapter three.

**QUALITATIVE DATA COLLECTION**

At the 12-week time point, participants from the intervention arm of the randomised waiting list control trial were stratified into two groups. These two groups consisted of those insufficiently active before diagnosis, and those classified as moderately active or active (combined) before diagnosis. This stratification was to ensure coverage of those that identified as physically active individuals and those that did not, based on the hypothesis that active individuals were more likely to respond to the intervention, as presented in chapter three. The aim was for five participants from each stratified group to be randomly selected and interviewed by phone within two weeks of the 12-week time point, to gain a deeper understanding of their interaction with, and views of, the revised Move More Pack.

It was assumed that not all participants invited to take part in an interview would accept; therefore, ten participants from each stratified group were invited with the hope of achieving a 50% take up. Five insufficiently active participants and seven moderately active or active participants were recruited and interviewed within two weeks of the 12-week time point in the intervention arm.

The process outlined was repeated in the waiting list control arm of the trial at 24-weeks. Despite attempts to balance recruitment only three insufficiently active participants, and two moderately active or active participants were recruited from the waiting list control arm and
interviewed within two weeks of the 24-week time point. Therefore, in total 17 participants were interviewed, eight insufficiently active pre-diagnosis, and nine moderately active or active pre-diagnosis.

Interviews were conducted over the phone not to restrict take-up by location. The interviews followed a semi-structured format and were conducted by this author. The semi-structured format was selected to ensure that data was collected on the central topic areas of use and perceived usefulness of the components of the revised Move More Pack, whilst not restricting the flow of the conversation. The responses to the quantitative survey on use of particular sections of the revised Move More Pack were used in support of the phone interviews, allowing for questions specific to the participants use of the intervention.

The interviews aimed to gather data to situate the experience of using the revised Move More Pack within a broad social context. Questions were open-ended to encourage participants to discuss and raise issues important to them in relation to physical activity and the revised Move More Pack. The interview topic guide, developed by this author, was purposely kept brief and included prompts to ensure coverage of the aims of the process evaluation, specifically on the use and usefulness of the revised Move More Pack. No assumptions were made a priori in regard to the context of use of the intervention. Therefore, no prompts were included in the interview topic guide in regard to the context of intervention use. By following a flexible, non-rigid format in the interviews greater exploration of the context of use was possible as the conversation developed. The interview topic guide is included as Appendix 9.

DATA ANALYSIS

The interviews conducted as part of the process evaluation were recorded and transcribed verbatim by this author. The interview transcripts and the qualitative comments made by the participants as part of the questionnaires administered at the 12-week and 24-week time points were thematically analysed ensuring that identified themes were grounded in the original data.
The thematic analysis followed six stages, as identified by Braun and Clarke (2006), being:

1. Transcription of the interviews
2. Familiarisation with the data involving reading and rereading the interview transcripts and qualitative comments
3. Initial coding
4. Theme identification
5. Theme review and development of higher level candidate themes
6. Identification of relationships and patterns, checked against the original data

These steps were completed with the research aim firmly in mind, ensuring the data was analysed to understand the use and perceived usefulness of the revised Move More Pack in context. These steps were not followed in a linear fashion; rather, this author moved back and forth through these steps to identify candidate themes, sub-themes, patterns and relationships.

The thematic analysis was completed on the data set as a whole, not by stratified group, taking an inductive approach to ensure that the candidate themes, sub-themes, patterns and relationships identified were grounded in the data.

The previous experiences of this author as a public health professional, a former employee of Macmillan Cancer Support, and of leading the redevelopment of the revised Move More Pack, are acknowledged and embraced within the qualitative analysis. These experiences allowed for a richer in-depth understanding of the data, supporting analysis of the use and perceived usefulness of the revised Move More Pack in context. However, to ensure that the experiences of this author did not skew the coding process, a second researcher, Ms. Jenna Stockwell, supported the initial coding of the data. Ms. Stockwell is also a former employee of Macmillan Cancer Support but was not involved in the redevelopment of the Move More Pack nor the research protocol. Ms. Stockwell has an advanced knowledge of physical activity and cancer. The involvement of at least two researchers in the analysis of qualitative data is recommended by NICE (2014b).

Ms. Stockwell reviewed and initially coded five randomly selected interview transcripts, as did this author. The coding completed by Ms. Stockwell was compared to that of this author with differences discussed to identify any preconceived ideas that might have influenced this authors coding. This author then coded all remaining transcripts in light of these discussions with Ms. Stockwell making sure that each data item was given equal attention. This author
completed all remaining steps of the thematic analysis, supported by the use of NVivo™ software version 11.

IBM’s™ SPSS statistics package version 24 was used to analyse the quantitative data. Exploratory analysis was conducted on use of the components of the revised Move More Pack, using stepwise multiple regression, to identify possible predictors of physical activity improvement from baseline to 12-weeks in the intervention arm, and from 12-weeks to 24-weeks in the waiting list control arm.
RESULTS

QUANTITATIVE ANALYSIS

One-hundred-and-eighty-one of the 207 waiting list randomised control trial participants completed the questionnaire on their use of the revised Move More Pack, 93 in the intervention arm at 12-weeks and 88 in the waiting list control arm at 24-weeks. The frequency of use of the components of the revised Move More Pack including ranking is presented in Table 34. Data on the helpfulness of the e-newsletters is presented in Table 35.

Multiple regression suggests that use of the Guide to Becoming Active – Goal-Setting section may predict physical activity improvement in the intervention arm ($F(1, 11) = 8.51, p = .004, R^2 = 0.08$) over 12-weeks. No other component of the revised Move More Pack was identified as a possible predictor of physical activity improvement in the intervention arm or the waiting list control arm.

QUALITATIVE ANALYSIS

Seventeen participants took part in a semi-structured phone interview lasting between 19-minutes and 55-minutes with an average duration of 35-minutes. The participant characteristics are included in Table 36. Pseudonyms are provided for the 17 cancer survivors interviewed, to bring the qualitative extracts to life. Of the 104 participants included within the intervention arm, 49 participants provided an open text comment 12-weeks after receipt of the revised Move More Pack. Seven of 103 participants in the waiting list control arm provided an open text comment at 24-weeks, 12-week following receipt of the revised Move More Pack, giving a total of 56 open text comments. Extracts from the open text responses given in support of this research are presented with the age, gender, type and cancer status of the respondent.

Initial coding comparison of five randomly selected transcripts between this author and Ms. Stockwell identified only minor differences. This author continued with the initial coding of the 17 interview transcripts. During the initial coding process, 194 codes were created (Appendix 10). The coded interview transcripts are available as Supplementary Files 19A.
through Q\textsuperscript{15}. Each coded transcript was reviewed, and an initial map of the codes created for each transcript, organising the codes into groupings to facilitate the creation of themes (the initial code maps for all 17 interviews are available as Supplementary File 20)\textsuperscript{15}. The initial codes were grouped in relation to the aim of this research, specifically those relevant to contextual factors; those relevant to the mechanism of change being the revised Move More Pack and its use and usefulness; finally, those relevant to the impacts and outcomes resulting from the intervention.

From the initial code groupings, three candidate themes were identified with thematic maps created for each (available as Supplementary File 21\textsuperscript{15}). The identified candidate themes and the relationships and patterns within and between them were checked against the original transcripts and the 56 open text responses. This review resulted in the identification of a further candidate theme. The final four candidate themes were:

1. **Capitalising on a teachable moment**: Those that deemed the revised Move More Pack as useful and highly relevant to them, having a positive impact
2. **Not sure it’s for me, but it’s useful**: Those that found the revised Move More Pack useful but not really for them as they felt past the stage where they needed such support
3. **Thanks, but no thanks**: Those that immediately disregarded the revised Move More Pack as they felt that they were already highly active, and it was not for them
4. **Physical activity is not for everybody**: Those that were not in a place, able, or interested in becoming physically active, and therefore did not use the revised Move More Pack

A descriptive narrative supported by data extracts for each of these four candidate themes and associated sub-themes is now provided, with reference to contextual factors, use and usefulness, and impact of the revised Move More Pack. An analytical narrative in relation to the extant literature is provided in the Discussion section. Additional data extracts by candidate theme and sub-theme are provided as Appendix 11.

\textsuperscript{15} Supplementary Files are available at https://drive.google.com/open?id=1JzW0y6ZRUq_evgaZz1mNSefGTKmXuE3.
Table 34. Use of the components of the revised Move More Pack

<table>
<thead>
<tr>
<th>Revised Move More Pack component</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never – n (%)</td>
</tr>
<tr>
<td><strong>Printed resource</strong></td>
<td></td>
</tr>
<tr>
<td>Guide to becoming active – Getting started</td>
<td>51 (28.2)</td>
</tr>
<tr>
<td>Guide to becoming active – Goal-setting</td>
<td>58 (32.0)</td>
</tr>
<tr>
<td>Physical activity and cancer booklet</td>
<td>39 (21.5)</td>
</tr>
<tr>
<td>Activity leaflet: Activities of daily living</td>
<td>72 (39.8)</td>
</tr>
<tr>
<td>Activity leaflet: Gardening</td>
<td>102 (56.4)</td>
</tr>
<tr>
<td>Activity leaflet: Swimming</td>
<td>128 (70.7)</td>
</tr>
<tr>
<td>Activity leaflet: Walking</td>
<td>65 (35.9)</td>
</tr>
<tr>
<td>Activity leaflet: Getting back into sport</td>
<td>108 (59.7)</td>
</tr>
<tr>
<td>Pull-out wall chart</td>
<td>103 (56.9)</td>
</tr>
<tr>
<td>DVD (inserted)</td>
<td>107 (59.1)</td>
</tr>
<tr>
<td><strong>Internet-based tools</strong></td>
<td></td>
</tr>
<tr>
<td>Online forum: Talk about being active</td>
<td>151 (83.4)</td>
</tr>
<tr>
<td>Online forum: Ask the physio</td>
<td>161 (89.0)</td>
</tr>
<tr>
<td>Digital apps</td>
<td>148 (81.8)</td>
</tr>
<tr>
<td>Find activities near you</td>
<td>120 (66.3)</td>
</tr>
<tr>
<td>DVD (web-based)</td>
<td>141 (77.9)</td>
</tr>
</tbody>
</table>

Never use was coded as 0, Rarely 1, Sometimes 2, and Often 3

Table 35. Rating of the helpfulness of the e-newsletters in getting participants more active

<table>
<thead>
<tr>
<th>The e-newsletters were helpful in getting me more active</th>
<th>Strongly disagree – n (%)</th>
<th>Disagree - n (%)</th>
<th>Somewhat disagree - n (%)</th>
<th>Neither agree nor disagree - n (%)</th>
<th>Somewhat agree - n (%)</th>
<th>Agree - n (%)</th>
<th>Strongly agree - n (%)</th>
<th>I did not read the e-newsletters - n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>18</td>
<td>54</td>
<td>28</td>
<td>30</td>
<td>11</td>
<td>20</td>
<td>(5.5)</td>
</tr>
<tr>
<td>(5.5)</td>
<td>(5.5)</td>
<td>(9.9)</td>
<td>(29.8)</td>
<td>(15.5)</td>
<td>(16.6)</td>
<td>(6.1)</td>
<td>(11.0)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 36. Characteristics of the participants taking part in a semi-structured telephone interview

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Gender</th>
<th>Age</th>
<th>Cancer</th>
<th>Time since diagnosis (years)</th>
<th>Time since treatment completion</th>
<th>Treatment response</th>
<th>Pre-diagnosis</th>
<th>Baseline</th>
<th>12-weeks</th>
<th>Baseline Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linda</td>
<td>Female</td>
<td>51</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>&lt; 3 months</td>
<td>Not known</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>John</td>
<td>Male</td>
<td>63</td>
<td>Bowel</td>
<td>&lt; 1</td>
<td>&lt; 3 months</td>
<td>Remission</td>
<td>Moderate</td>
<td>Active</td>
<td>Active</td>
<td>Moderate</td>
</tr>
<tr>
<td>Zara</td>
<td>Female</td>
<td>50</td>
<td>Breast</td>
<td>1 to 3</td>
<td>1 to 3 years</td>
<td>Remission</td>
<td>Insufficient</td>
<td>Active</td>
<td>Active</td>
<td>Low</td>
</tr>
<tr>
<td>Penny</td>
<td>Female</td>
<td>47</td>
<td>Skin Lymphoma</td>
<td>1 to 3</td>
<td>In treatment</td>
<td>Cancer present</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>Lucy</td>
<td>Female</td>
<td>28</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>In treatment</td>
<td>Not known</td>
<td>Active</td>
<td>Insufficient</td>
<td>Active</td>
<td>Low</td>
</tr>
<tr>
<td>Helen</td>
<td>Female</td>
<td>49</td>
<td>Breast</td>
<td>1 to 3</td>
<td>In treatment</td>
<td>Not known</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>Nigella</td>
<td>Female</td>
<td>58</td>
<td>Non-Hodgkin’s Lymphoma</td>
<td>&lt; 1</td>
<td>Not treated</td>
<td>Cancer present</td>
<td>Insufficient</td>
<td>Insufficient</td>
<td>Insufficient</td>
<td>Low</td>
</tr>
<tr>
<td>Serena</td>
<td>Female</td>
<td>45</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>&lt; 3 months</td>
<td>Remission</td>
<td>Insufficient</td>
<td>Moderate</td>
<td>Active</td>
<td>Moderate</td>
</tr>
<tr>
<td>Claire</td>
<td>Female</td>
<td>58</td>
<td>Skin Melanoma</td>
<td>1 to 3</td>
<td>In treatment</td>
<td>Not known</td>
<td>Insufficient</td>
<td>Insufficient</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Ellen</td>
<td>Female</td>
<td>50</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>&lt; 1 year</td>
<td>Remission</td>
<td>Insufficient</td>
<td>Insufficient</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Katherine</td>
<td>Female</td>
<td>50</td>
<td>Ovary</td>
<td>1 to 3</td>
<td>1 to 3 years</td>
<td>Remission</td>
<td>Insufficient</td>
<td>Insufficient</td>
<td>Active</td>
<td>Low</td>
</tr>
<tr>
<td>Danielle</td>
<td>Female</td>
<td>58</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>In treatment</td>
<td>Not known</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Moderate</td>
</tr>
<tr>
<td>Anthony</td>
<td>Male</td>
<td>68</td>
<td>Bladder</td>
<td>1 to 3</td>
<td>&lt; 3 months</td>
<td>Remission</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Moderate</td>
</tr>
<tr>
<td>David</td>
<td>Male</td>
<td>67</td>
<td>Leukemia</td>
<td>&gt; 5</td>
<td>&gt; 5 years</td>
<td>Remission</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Moderate</td>
</tr>
<tr>
<td>Becky</td>
<td>Female</td>
<td>48</td>
<td>Breast</td>
<td>&lt; 1</td>
<td>&lt; 3 months</td>
<td>Remission</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>Hilary</td>
<td>Female</td>
<td>80</td>
<td>Liver</td>
<td>&gt; 5</td>
<td>&gt; 5 years</td>
<td>Remission</td>
<td>Insufficient</td>
<td>Active</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>Carmen</td>
<td>Female</td>
<td>51</td>
<td>Pancreas</td>
<td>1 to 3</td>
<td>&lt; 1 year</td>
<td>Cancer still present</td>
<td>Insufficient</td>
<td>Moderate</td>
<td>Active</td>
<td>High</td>
</tr>
</tbody>
</table>

Baseline data for participants from the waiting list control arm relates to the 12-week time point as the point of receipt of the revised Move More Pack, and 12-week data relates to the 24-week time point 12-weeks after receipt of the revised Move More Pack; this applies to Becky, Claire, Ellen, Hillary, and Penny.

Self-efficacy (out of 10): 1 to 3 = low; 4 to 7 = moderate; 8 to 10 = high
CANDIDATE THEME 1: CAPITALISING ON A TEACHABLE MOMENT

Cancer survivors related to this candidate theme regularly used the revised Move More Pack and found it useful. The sub-themes related to contextual factors for those cancer survivors that could be associated with this candidate theme, were timing and having a positive attitude. The sub-themes that could be related to the use and usefulness of the revised Move More Pack included a lot to read, but very useful; the DVD is a great starting point; online is not for me; and I want advice and the Pack. A sub-theme was identified relating to the impact of the revised Move More Pack and named moving more. Each of these sub-themes will now be covered in turn.

TIMING

I do think the timing of when all this is given to a person is probably quite critical really. (Zara)

There was a clear view from the majority of respondents that the revised Move More Pack was suited to those who were at the start of their cancer journey. Some thought that the revised Move More Pack should be given at the point of diagnosis as a coping mechanism, for example, Zara said: “I definitely would have picked it up or liked it at the stage when I was as I say diagnosed and going through treatment”, a view supported by Linda.

It definitely should be given from day, after the diagnosis. Because I just think it all helps for you to read everything of how you can cope and how you can go about dealing with what you’re dealing with, so definitely. (Linda)

A few disagreed, stating that the point of diagnosis is a time encapsulated by fear and worry and that the revised Move More Pack might somehow add to that burden. It was suggested by a few respondents that at the end of treatment might be more beneficial, as highlighted by Helen who said:

I think it needs to be timed correctly. I think if it’s done during diagnosis when there’s all that trauma, fear present then you know it might be detrimental. I mean every person is different, every patient is different…I think for myself, post-surgery would have been a good time to emphasise it. (Helen)

Nearly all of those interviewed across all candidate themes discussed the physical and mental impacts of cancer, with many identifying the period of treatment as when they first
experienced the intensity of these impacts. Most suggested that the revised Move More Pack would have been most useful when going through, or at the completion of treatment. Whilst this was seen as a time when the physical impacts of cancer were felt strongly, with cancer survivors being physically knocked back, it was also a period where there was more time to review information and guidance. Even if cancer survivors felt unable to become active at this time, receiving the revised Move More Pack prompted an intention to become active when the consequences of cancer treatment were less severe.

If somebody says to you, you’re going to have chemotherapy, you’re going to be feeling a little bit low, take this Pack and this will give you some guidance, help to keep your fitness going sort of thing, to keep your energies up. (Carmen)

Because you’ve got more time I think to absorb information then. And you are looking to, during treatment when you’re having chemotherapy you can’t really do any exercise, or not much, but you’re thinking to the future when you might start doing it. (Danielle)

Some felt that the end of treatment was a difficult time as the support that had been available suddenly stopped, and that this might be a time when the revised Move More Pack might also be beneficial. Zara said:

I felt like I was suddenly like abandoned if you know what I mean. After suddenly months and months of treatment, hospital appointments, this, that and the other it was all of a sudden, right OK come back in three months and it was like, oh right OK, where do I go from here and probably at that point, that’s when things like this would have been really good.

Whilst not as common, the revised Move More Pack may capitalise on teachable moments that occur later in the cancer journey, continuing to help recovery both physically and mentally. For example, a survey response from a 61-year-old male in remission for over one year from non-Hodgkin’s lymphoma stated that “Having cancer can make you become isolated and the Pack was an encouragement to look further than your front door”. This was supported by Serena, who said: “I don’t know it just came at the right time, I think I was feeling a bit low and depressed and I felt overweight, sluggish and I think I just needed to read that sort of thing.”

Many spoke of the impacts of treatment accumulating over time, and how if they had their time again, they would have become more active earlier, emphasising the importance of giving the revised Move More Pack early within the cancer journey to help overcome or decrease the impact of cancer and its treatments.
It was quite obvious that my body slowed up. And with the breathlessness and I could hardly walk, and I’ve said for some reason, whether it’s because there’s everything else is going on, it’d only really homed on me that day my husband tried to take me for a walk and I couldn’t walk. But obviously that didn’t happen overnight, but it had been happening for a bit, but I hadn’t realised it…I’d say, people need to be given that [the revised Move More Pack] a lot earlier, than when they decide [to become active], because when you get to that [decision], [the] need to do something about it stage, you’ve often got to the point of where you shouldn’t be anyway. (Ellen)

**POSITIVE ATTITUDE**

You might want something like that [the revised Move More Pack] to almost help you feel that you are physically fighting it in some way. (Becky)

The cancer survivors who benefited most from the revised Move More Pack were those where it arrived at an appropriate time, a time when health was salient, coupled with a positive approach to fighting cancer. The positive approach to fighting cancer was sometimes born out of fear, for example, Serena said: “I was really frightened I’d done it to myself and I was disappointed and upset that I’d got this. So, I thought well I’ve got to get fit.” Serena went on to say: “I think once you have [been] diagnosis you think, well, what should I be doing, what can I do.”

Participants also spoke of wanting to do all that they could to get back to normal, with many identifying a return to work as a common motivation for becoming more active, for example, Carmen said: “One of my goals was I wanted, I especially wanted to get back to work because I’ve always worked, and I needed to get back to work because you need that interaction with colleagues and friends”.

**A LOT TO READ, BUT VERY USEFUL**

A positive approach to fighting cancer created an openness to receiving printed information. When discussing the use of the revised Move More Pack respondents related to this candidate theme spoke of using the various components of the printed resource.

“It’s a proactive person so anything, and I look, and I like reading, so obviously any sort of, anything written I’m interested in…You could just identify with all the bits it’s trying to point at…all the key things like setting your targets, getting access to information and don’t give up and then all the literature and how you can plot and plan things. I can’t remember what I used, I used a combination of it. (Ellen)
I read it once through at the time when I got it… I completed it all, I remember sitting there in one session and doing it… I sat down I read the whole booklet and I remember sitting and answering every question, saying what I wanted to achieve and the goals, yeah, everything… I didn’t refer to it afterwards, I put the wall chart up and used that and I know where it is though if I wanted to look at it again. (Serena)

The printed resource was considered to be large, containing lots of information. This resulted in time having to be set aside to review the revised Move More Pack, with some finding it a little daunting. Danielle said: -

Well, just I think it looked like a lot to read, because it was quite a big booklet, so I probably thought, oh, I’ll put that to one side and read it when I’ve got a bit more time. I did sit down and read it eventually… It’s the sort of booklet that you kind of, you skim read it first and then you come back to it later. (Danielle)

I thought there was quite a lot of information in it, so it will, it was, I can’t say I read it all. So, in a way it was quite daunting to get it all, although a lot of the content seemed really useful. (Katherine)

The Pull-Out Wall Chart and the activity diary (included within the Guide to Becoming Active – Goal-Setting section) proved useful to many respondents related to this candidate theme serving as a prompt and a reminder to be active, as-well-as a record of physical activity and a visual representation of progress and achievements.

I found useful the…weekly charts, where you can, where you start and then you can just at a glance see your progression… The weekly diary, I found that useful. Then you can just flip back, and it’s just look. It’s just a case of recording what I did, and it says, I’ll reward myself by, I didn’t reward myself in any way like with a bar of chocolate or anything like that, I just rewarded myself with a smile, yeah I’ve done that, I can do that… I would engage with the Pack quite regularly because obviously I was recording. (Carmen)

I found the wall chart hugely beneficial. It really motivated me to see my progress at a glance. I was quite sorry when I realised I was filling in the final week! I have so enjoyed using the Macmillan logging sheet for my exercise. I still use it - it is a visible reminder on the side of my fridge and a source of encouragement, simple and effective. (Survey respondent, 54-year-old female with breast cancer still in treatment)

The breakdown of types of physical activity included within the Physical Activity and Cancer booklet, and detail of different ways to become active with signposting proved beneficial to some respondents. The goal-setting section in the Guide to Becoming Active was also
popular with some respondents related to this candidate theme. The identification of physical activities supported the development of goals for some, with the monitoring tools of the Pull-Out Wall Chart and the activity diary (included within the Guide to Becoming Active – Goal-Setting section) supporting the achievement of these goals.

[It] gave me ideas about different activities I could participate in and where and how to access them. It is a good reminder of activities and also as you can keep a record of personal activity, you can monitor when you are doing well or not so well. I like the goal-setting and the tips. I have referred to it throughout the last 12 weeks. (Survey respondent, 54-year-old female in remission from cancer of the uterus)

**THE DVD IS A GREAT STARTING POINT**

I’ve started putting on the DVD and I did it about a few times a week. I could just about manage to do that, like building up to it, I’ve started doing the, I think it was the warm-up and then I could do a bit of the cardio, which was, it is nothing when I look back now, but at the time it was very, very huge, I could hardly do these exercises. (Ellen)

The use of the DVD varied, but most felt that the exercises on the DVD provided a gentle starting point, useful for those going through, or just completing treatment, as highlighted by Carmen who said:

Well the DVD, I felt very beneficial [it] goes through all the different exercises which I think is good for somebody who’s going, perhaps just had surgery or going through chemotherapy where their levels of activity aren’t quite so high, they’re gentle and it’s just a build-up and I think that’s very good. It certainly helped me anyway. (Carmen)

**ONLINE IS NOT FOR ME**

I spend so much of my working life online, I elected not to track my health in that way. (Survey respondent, 54-year-old female in-treatment for breast cancer)

The printed components of the revised Move More Pack were well received by those cancer survivors related to this candidate theme; however, the Internet components were less well received with very few stating that they had used the Internet-based tools.

The Move More Pack is an excellent publication - I was pleased to receive it and read it. I am sorry to say that I have not accessed the online tools – yet (Survey respondent, 81-year-old female in remission from Bowel cancer)
For some, even though they did not use the Internet-based tools, there was an intention to do so. However, most did not acknowledge the Internet-based tools. Respondents spoke of the printed Move More Pack being something tangible, that could be seen and touched. The cancer survivors that could be related to this candidate theme read the printed elements of the revised Move More Pack when it arrived in the post before storing it in an accessible place for easy access if and when required. However, the motivation to spend time accessing and exploring the Internet-based tools just was not there. There was also a feeling that as they had the printed resource, they had the information that they needed to hand and therefore there was no need also to access the Internet-based tools.

I assumed that they [the online tools and information] would be the same as the booklet, but online…I do often go online for information. But if I had the information in the booklet, then I tend not to refer to it online as well. (Danielle)

I think it’s better to have it in the post than just online because you’ve got it there, it’s tangible. I mean I’ve still got it, still got it, in a box, in actually our little letterbox and I was thinking about that the other day actually. It’s something you can pick and put down. (Penny)

Some did not use the e-newsletters, for example, Ellen said: “I’ve not read the newsletters”, and Serena said: “I don’t remember seeing any newsletters”, although this was not the case for everyone. For example, a 70-year-old male survey respondent in treatment for bowel cancer said: “There is a motivation in receiving the newsletter and in setting personal daily goals.” This was also the case for a 45-year-old female survey respondent who had recently completed treatment for breast cancer and was now in remission who said: “I do hope that I will be able to get more physically active in the near future. I find that regular prompts such as the newsletter encourage me to do this.”

**I WANT ADVICE PLUS THE PACK**

You really need somebody to say, put it in your hand and make you read it. Because otherwise you’re waiting for it to be picked up on the shelf and from my experience you don’t pick it up until it’s too late really. (Ellen)

The majority of all respondents stated that they had not before received advice on physical activity, for example, Danielle said: “I don’t think I received any advice, because the medical team don’t seem to do, they don’t seem to refer to exercise. And I don’t think I’ve had any advice from anyone else about it”. This is supported by Ellen who said:
So, talking about exercise is a lot like a lesser thing really. But looking back now, I wish they [the healthcare team] had of done because I’d have probably took more note of it then and done something about it. (Ellen)

Advice on physical activity would be welcomed early in the cancer journey, with consultants, nurses, plastic surgeons, psychologist, physiotherapists, and GPs identified by the respondents as possible healthcare professionals who could provide such advice, with the revised Move More Pack supporting such discussions, for example, Lucy said: “I was doing physio, they said try get your 10,000 steps in a day. So, I was choosing the weekly chart thing, that was just on the fridge."

Macmillan Cancer Support was identified as a trustworthy source of physical activity information and support by respondents, for example, Penny said: “My experience of Macmillan has been brilliant, so they’ve just been great”. Nigella agreed saying “I would class Macmillan as the people that really know, because they’re in contact with all the different types of cancer, because they support everybody, they have my trust.”

MOVING MORE

The respondents that relate to this candidate theme benefited from receiving the revised Move More Pack with the Pack positively impacting upon their knowledge, attitudes, and beliefs regarding physical activity and cancer. The revised Move More Pack increased the importance of physical activity, creating intentions to be more active in some, and changing physical activity behaviour in others, including some family members and work colleagues.

The whole process was extremely inspirational and informative. It gave me the motivation and confidence to move more and get fitter. The knock-on effect has been a huge improvement in my routine and eating habits ... but not just my own habits! My husband was coerced into joining me in this quest, we are both feeling fitter and healthier. I have now been inspired and motivated to change that for the better! (Survey respondent, 61-year-old female in remission for over three-years from breast cancer)

I thought it was a really good motivational tool. I read the booklet and I just thought yeah, it’s time that I really do start to look after myself a bit better…We [work colleague] go out at lunchtime and that’s, we power walk round the park and we go round twice, we’re sweating, when we first started out we couldn’t really talk to each other we were that out of breath, but now people have come with us and they can’t keep up with us. So, we are getting faster and I know we get back quicker. So, we’ve made our walk a little bit longer. (Serena)
The revised Move More Pack also by proxy raised the importance of other lifestyle behaviours.

Yes, it brought to the fore of my mind the positives of doing, being more active overall, what good things that I can get out of being more active… Reading the book it’s made me more aware of not only activity but also diet (Carmen)

Those that increased their physical activity were grateful for receiving the intervention, and some now felt that they no longer needed this support to help them become active, as said by Ellen: “I’ve moved well past that now [use of the revised Move More Pack], I’m quite a fit person.” This was also emphasised by Serena who said: “I think it’s just the comfort of knowing where it is, because now I’m in a routine, I’m doing the exercise now, I don’t feel I need it… it really did help me, I’ve lost weight and I feel good because of it.”

**SUMMARY**

When delivered at the right time when health is salient, possibly during treatment, to those with a positive attitude to fighting cancer, the revised Move More Pack is likely to result in cancer survivors, and their family and friends moving more. If these cancer survivors receive advice from a healthcare professional, plus the Pack, this may enhance its use and impact. Cancer survivors related to this candidate theme think the printed pack is big, but very useful, and that the DVD is a great starting point, but the online tools are not for them. Figure 12 presents how the sub-themes in this candidate theme relate to the research aim of understanding the context, use, and impact of the revised Move More Pack.

**CAPITALISING ON A TEACHABLE MOMENT**

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>USE</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Timing (sailence of health)</td>
<td>• A lot to read but very useful</td>
<td>• Moving more (with family and friends)</td>
</tr>
<tr>
<td>• Positive attitude to fighting cancer</td>
<td>• The DVD is a great starting point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Online is not for me</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• I want advice plus the Pack</td>
<td></td>
</tr>
</tbody>
</table>

Figure 12. The identified sub-themes within the capitalising on a teachable moment candidate theme and how they relate to context, use, and impact of the revised Move More Pack
CANDIDATE THEME 2: NOT SURE IT’S FOR ME, BUT IT’S USEFUL

The cancer survivors related to this candidate theme were not sure that the revised Move More Pack was for them, and this influenced their use and the perceived usefulness of the intervention. A sub-theme related to the use of the revised Move More Pack was named *not sure it’s for me, but it’s useful* (the same name as that given to the candidate theme). A second sub-theme was identified in relation to the use and usefulness of the revised Move More Pack, named *I do use some digital support*. An identified contextual factor was that these cancer survivors had already made the decision to be active, identified as sub-theme *already moving*. A sub-theme identified in relation to the impact of the revised Move More Pack was named *reinforcing my decision to become active*.

ALREADY MOVING

Those that could be related to this candidate theme thought that the revised Move More Pack was not for them as their decision to become active had already been made. In support of the *timing* sub-theme in the *capitalising on a teachable moment* candidate theme, a teachable moment was suggested to be around the time of diagnosis and treatment. Those related to this candidate theme had acted on this teachable moment, as Zara said:

“I think most people with a diagnosis either think what can I do to make life a bit better while I'm dealing with it or afterwards what can I do to stop this thing ever coming back and the physical activity is in there.” (Zara)

The respondents that could be related to this candidate theme felt that they were past the point where they needed support and guidance, such as that provided by the revised Move More Pack, however, they still found it useful. Respondents had a strong belief in physical activity as stated by Helen who said: “I just felt that it didn’t apply to me a great deal because I already had a strong belief of exercise being healthy and helpful, mentally as well as physically, so I felt there was less to convince.” This belief in physical activity did not relate to pre-diagnosis levels of physical activity. Some had always been active, but other related to this candidate theme only considered themselves physically active individuals following a teachable moment when health and physical activity had become salient. For example, Claire said: “I had made the decision that if I came off it [treatment] I wanted to get more active.” Zara and Katherine made similar decisions for becoming more active.
I’d got into a bad situation where I wasn’t being active, and I think I kind of knew that for my own health that to get back to being active was going to be a good thing, was going to be a positive thing. (Zara)

“Ever since my cancer diagnosis I’ve been doing yoga…it was more for mental health at the beginning, but then I realised that yoga actually helps with balance and strength and things, so I’ve continued with it.” (Katherine)

One reason for being physically active for those that were physically active before diagnosis, was maintaining or getting back to some normality, as physical activity was part of family life, for example, Penny said: “My husband and I we do walk a lot together like proper walking…but I was really struggling with those [walks] and getting back into them now.” (Penny). This is supported by a comment from Lucy who said: -

Keeping fit was an importance for me before diagnosis anyway just because I try and lead a healthy lifestyle. And then during, when I just felt like I didn’t have much energy to do anything, but I knew that I wanted to try and keep up because of how important it was… It’s difficult to get up and go when you’re just on your own. Walking the dog, I had to do so that was quite helpful for me because it meant that I did get out every day. (Lucy)

Some respondents related to this candidate theme had returned to work which in itself had increased levels of physical activity, especially for those physically active when at work. Linda said:

I went back to work six months after being diagnosed because I just wanted to get back to normal but that’s me, you see. Lots of people said, oh you perhaps went back too soon, but I didn’t for me… When I was at work I was doing lots of walking. I’m not sitting at a desk all day. (Linda)

For some, work created a time barrier for physical activity, but cancer survivors related to this candidate theme prioritised being active and attempted to find time, for example, Linda said: “I get busy at work and [when] work takes over it’s harder then, to find that time, but I do feel since I’ve been diagnosed it’s important to find that time now.”

Respondents related to this theme had felt the consequences of cancer and its treatments but had also felt the benefits of physical activity in improving them, such as improving fatigue, physical function, tackling weight gain, and improving mental well-being. Being physically active helped cancer survivors related to this candidate theme cope, providing a time when they could escape and forget their diagnosis for a short period.
I know it sounds a bit daft to say this, but you feel more alive, you feel like you can function on a higher level somehow… When I was going through my chemo I tried to keep as active as possible and I could see even that was helping me. And then the radiotherapy, because people said, oh it makes you so, so tired, and yes it did but if you can push through that tiredness it makes you feel so much better. (Linda)

That’s what you don’t realise about cancer, you don’t realise it’s other things that are on top of it and that’s why keeping active is important because being active, going out for a walk or whatever helps you clear your mind and I think the more, the more we become aware of how our mental health is so important. (Penny)

Similar to the positive attitude sub-theme from the capitalising on a teachable moment candidate theme, respondents expressed a positive attitude to fighting cancer. Respondents related to this candidate theme already understood the importance of physical activity specifically as a way of fighting back against cancer, being as active as their abilities would allow.

I thought whatever happens I’m going to fight this for as long as I can, so I can be with my son, though I will do whatever I need to do. And I could see that [physical activity] helped me…I wouldn’t push myself if I was feeling poorly or not very well… I’m coming out of the other side of the cancer and the treatment I can do that more and more and that’s what I will, that’s my goal is to be really active and not just do it on a whim like do it for a month and then not do it. I’d really want to keep that going. (Linda)

Respondents had already found the support and tools that they felt that they needed to become physically active, for example, some had joined physical activity classes or groups; Claire said: “[I joined] a Walking for Health group so it was something that I knew was designed for people who were ill, like me”. Others were physically active at a time and place convenient to them, overcoming the barriers that presented themselves.

I don’t really, really enjoy swimming, but it’s easy to go to, it’s not too expensive, I can do it in the daytime when my husband is at work, my son is at school, so I’m not taking up…the evening time. I’m better in the mornings, I can get tired, I’m more tired in the evenings, and a lot of my classes are in the evening, evening classes, so yeah, swimming was just easy to do. (Katherine)

Some identified physical activity as a way of reducing the worry of family members, showing them that they were ok, putting on a show of defiance. Linda said: “being active and putting on a… brave face because you don’t want them to get upset or worried or concerned, so you push through that. And being active, it was all part of that.” Whilst supportive family
members were drivers of physical activity, they could act as a barrier to being active, particularly in those seen to run the household. However, a positive attitude to physical activity meant that this was another barrier that could be overcome as shown by Zara who said:

> The difficulty is, being a working mum, everything else tended to take priority and not me and I suppose the diagnosis made me realise that actually there are times when maybe I do need to be a bit more selfish and like now, I just say to everyone, I'm sorry in 15 minutes I'm going out for my class and that's it. Sometimes the family will groan and moan but I'm strong enough because of that diagnosis to say, no this is for me and it’s important. (Zara)

**I DIDN’T USE ALL OF IT, BUT I DID USE SOME OF IT**

This sub-theme has been given the same name as the candidate theme as it encompasses the views on the use and usefulness of the revised Move More Pack as considered by the cancer survivors that could be related to this candidate theme. The respondents related to this candidate theme wanted to receive as much information as possible with Nigella stating: “I’m an information eater”. Information was a way of coping with cancer.

> So, I was primarily hunting for information for that [my cancer] but also picking up all the other stuff at the same time, which I found extremely helpful, for me it was [what] I needed, information, in order to cope with the whole situation. (Nigella)

The openness too, and gathering of, information did mean that the cancer survivors related to this candidate theme read the print-based components of the revised Move More Pack particularly the Physical Activity and Cancer booklet. However, the revised Move More Pack was lost, by some, amongst all of the other information booklets. Lucy said: “You do get so many publications and information and things. And they are all really helpful, but it is another pack in the bunch if you know what I mean”. Lucy went on to say:

> You get a diagnosis you get so many leaflets and packs on so many different things that you end up reading it the once and they just pile up. So, that’s why I think just a couple of things stick from each booklet you get which is why I said, what I do remember is the wall chart and that quote about how important it is. (Lucy)

However, Katherine said that the structure of the revised Move More Pack was such that it did stand out from other booklets.
It was nice having the little extra bits that you could take out like the wall chart and the CD [the DVD] and whatever because then I guess you can separate them from just the pile of booklets and think, right I want to use that. (Katherine)

Cancer survivors related to this candidate theme, as identified in the first candidate theme, thought that this was for cancer survivors who were in treatment, who had lost physical function, but also those who might have been inactive before their cancer diagnosis. Katherine felt that the revised Move More Pack was not for her but that it would have been relevant if received earlier; she said: “I just thought, well that maybe it was aimed more at people who had been like me a year before rather than I had spent one year trying to do more.” Helen said: “I feel [it was] a little bit…irrelevant now, because of how I am, and how I’ve been and I’m not obese, never have been. I’m not unfit, never have been.”

Whilst considering the revised Move More Pack as not for them, respondents related to this candidate theme still found elements of the revised Move More Pack useful.

I thought it was very useful. I think it harks back to how I’ve approached my own diagnosis and treatment etc, is just trying to keep as positive and keep as active as possible, and I could throughout it all, so I think it just aided all that really. (Linda)

As mentioned, cancer survivors related to this candidate theme were open to information. When the revised Move More Pack arrived, respondents “flicked through it…put it down and then came back to it at another time” (Katherine). After an initial review, the revised Move More Pack was revisited occasionally and stored somewhere close and memorable. Penny said: “I like the fact that it is in a little box on our kitchen table…and I can just pick it up when I want too, and I have control to do that.”

Even though the view of the cancer survivors related to this candidate theme was that the revised Move More Pack was not for them, the general view of the intervention was positive.

I just thought they [the printed components] were very informative…what I liked about it was the approach, it wasn’t, you must do this you’ve got to do this, it was all very, these are things you can do and all those small little targets that you can achieve. And I thought that was done very well. (Linda)

Claire, for example, found the links to identify local activities as included within the Physical Activity and Cancer booklet particularly useful.
I think that’s a good booklet really and it’s what made me look up about walking netball because I would have never of thought about it. I, wouldn’t have even occurred to me and so that was, I think that was a good booklet. (Claire)

Danielle commented: “They [the printed components] have been helpful and I will definitely keep them and come back to them. Reading through them, they sometimes felt a bit repetitive”. Others also identified the repetitiveness of the revised Move More Pack, for example, Nigella said: “it could just do with being condensed a little bit more, less repetitive sections”; this also supports the sub-theme *a lot to read but very useful* as identified in the first candidate theme.

Linda said: “I thought it was well worded and very clear and it gave you, as you say, goals and things to manage and achieve.” Use of the action planning, and goal-setting sections, and the Pull-Out Wall Chart to plan and monitor activity proved useful for some respondents related to this candidate theme.

Yeah, I filled in the action plan, to say that I wanted to lose weight and get fit and I put to do this I’m going to do yoga, swim, walk and, things that might get in my way are time and I’ll overcome it by scheduling. I did use the chart and I can see that I’ve put week starting, and I’ve put all the dates in and then I’ve put some targets in. (Katherine)

A 59-year-old male survey respondent in treatment for Bowel cancer also found the goal-setting useful, but also expressed how he quickly moved on to other support tools to monitor and track his progress, specifically digital technologies:

I didn't use the wall chart, but I did set myself goals each week like walk to the corner then progressed to walk to the post office, moving the goal posts a bit further each time. When I was more confident I switched to using my Fitbit to keep tracking progress. (Survey respondent, 59-year-old male in treatment for bowel cancer)

Other respondents spoke of using digital technologies to monitor their physical activity, influenced by receipt of the revised Move More Pack; Lucy said: “I started picking up running again, I just downloaded Strava…[It’s] just nice to keep track of how far you’re going.”
I DO USE SOME DIGITAL SUPPORT

The previous comments from Lucy and the 59-year old male in treatment for bowel cancer, demonstrate that many cancer survivors related to this candidate theme made use of online apps to monitor and track their physical activity. However, most did not use the Internet-based tools related to the revised Move More Pack, as also identified in the first candidate theme; Zara said: “I did find the leaflets and the physical things very, very useful and I think that, I didn’t want to get my laptop out, log in, think that I was going to see anything from work.” Some did make use of the Internet-based tools, for example, Lucy used the Find Activities Near You tool but with little success; Lucy said: -

For me, I was trying to look at free exercise classes or something, in the area, that was going to help me go to. But, and this won’t be anything to do with the Pack, there isn’t much around here… maybe if there was some sort of exercise class or something in the local area that I knew I could go to. That might have helped. (Lucy)

The usefulness of the video case studies did receive some mention with a 59-year-old female survey respondent in treatment for breast cancer stating that they were motivating: “The videos where other people explained how they got back to exercise were motivating - more of these would be great.”

The views on the e-newsletters were mixed with some, like Zara, becoming frustrated by the sheer volume of emails received from multiple sources; Zara said: “I just thought oh, more emails, like I have hundreds of emails at work in the day and then I go home and I’ve got more emails from the school and more emails from this and it’s like, urgh.”

Others found the e-newsletters more useful, and in Katherine’s case prompted a review of the revised Move More Pack. On receipt of the e-newsletter Katherine thought, “I’ve got a newsletter from Macmillan, so I ought to do something more. I ought to go in there, pull the Pack out”. This was echoed by Claire, who said: “I thought that was quite motivating really to have those emails and I did click on the links.”

REINFORCED MY DECISION TO BECOME ACTIVE

Cancer survivors related to this candidate theme stated that the revised Move More Pack reinforcing their decision to become or stay active, and also gave them permission to be active, particularly when faced with advice to rest as said by Helen: “I just read it and
absorbed what it was saying and then just carried on with what I was doing, feeling a little bit reassured really. This was echoed by Nigella who said:

It was OK to keep going and I was picking that up in various bits and pieces and I think that’s where your information, what it’s given me the back up to know that, that’s OK, because it’s the opposite to what everybody around you tends to think, as soon as you say you’ve got a cancer they go oh my god, what are you doing, sit down you must rest and you’re thinking hang on a minute, no, I don’t need that but I do need to come down a peg or two and that’s really what I did. It was good from that point for me because, it made me realise that yes, I did make the right choice.

(Nigella)

The revised Move More Pack raised the importance of physical activity for cancer survivors, for example, Lucy said: “It was basically saying that it can reduce recurrence. So, I was just like, right that just shows how important it is…That just really stuck in my mind.” This increased importance of physical activity was echoed by Linda, who said: “I definitely feel reading your Pack that…I can see it now… how it’s helped me. It certainly wasn’t front of mind…it did join the dots for me.”

The revised Move More Pack created a motivation to increase physical activity. Katherine said: “Looking at how much activity I should be doing, is really useful, it’s a recap, it is really useful. And it might motivate me again to add to what I’m already doing”. Katherine went on to say: “I need to do more, so it did get me back into swimming once a week”. This is further supported by a comment from a 54-year-old male survey respondent in remission for over one year from prostate cancer who said: “I think it was more of a push to get me started”. The influence of the revised Move More Pack, as was the case in the first candidate theme, also extended to family members. Linda said:

I think this is an influence of your Pack, is although I love swimming I also am going to go into the gym and get a personal trainer, so I can tone my body up and I think I’m more, much more aware of, from that perspective as well. I said to my husband, because we’ve got a teenage son as well and we’re all going to do it together. And I think that’s important. And I think it’s important as well and we’ve said this, that we must keep it going, we must make time. (Linda)

The written exercises within the Guide to Becoming Active were mentioned by Zara as helping to influence family members in regard to physical activity. Further, the Physical Activity and Cancer booklet was also helpful in overcoming the fears of family members in regard to the safety of physical activity for people with cancer.
I thought it was really good that it had bits that you could fill in and activity charts and things that you could involve the family in as well, because I did actually talk to them about it and said about different things and I tried to get them to come on a run with me….My husband said to me, oh should you be doing that and it’s quite handy to say to him, yes look, this is what the advice [says], because obviously then he, he’s sometimes concerned about what I'm doing. (Zara)

The revised Move More Pack helped redefine physical activity for these cancer survivors.

I think the individual, one-off sheets about the different types of activity…I looked again at gardening this morning and I thought well I do quite a bit of gardening some days. (Katherine)

One of the things you said was, strength, one of the exercises is a strengthening and it was carrying shopping bags, well we never take the car to the supermarket, we always just get what we can carry, and we do a couple of shops a week…it really makes you feel better psychologically because you think, oh I am actually doing something. (Penny)

The redefining of physical activity also prompted an increase in physical activity, making it more achievable to incorporate into daily life. Penny continued on to say:

I think that’s a really good message, sort of incorporating it into your everyday life so it’s not another thing you’ve got to find time for. So, I think that’s what people can think so my husband and I think, well we have a 15-minute walk to a train station and both of us have about 20-minutes the other side so we’re getting quite a bit of walking in just through our daily living. (Penny)

**SUMMARY**

Cancer survivors related to this candidate theme have decided to become physically active and plan to keep on moving. These cancer survivors have found the online support tools to help them become active, but rarely use the Internet-based tools provided as part of the revised Move More Pack. This decision to become and stay physically active results in these cancer survivors thinking that the revised Move More Pack is not really for them. However, these cancer survivors still make use of the revised Move More Pack and find elements useful, particularly the printed components. The revised Move More Pack is likely to be impactful for these cancer survivors, raising the importance of being physically active in relation to cancer, and reinforcing their decision to move more. Figure 13 presents how the sub-themes in this candidate theme relate to the research aim of understanding the context, use, and impact of the revised Move More Pack.
### Candidate Theme 3: Thanks, But No Thanks

Cancer survivors related to this candidate theme shared similarities with those included in the second candidate theme, in that they had a strong belief in physical activity. These cancer survivors already considered themselves as highly active individuals, resulting in the development of the *I am very active* sub-theme. It was because of this strong belief that they were already completing enough physical activity or would soon, that these cancer survivors disregarded the revised Move More Pack. Each of these sub-themes will now be covered in turn.

#### I Am Very Active

Well basically if I don’t exercise I feel it. With being active all my life, if I don’t exercise, if I sat in a chair all day, I’d be, I wouldn’t be in a good place. (David)

The cancer survivors related to this theme identified themselves as highly active individuals even if their current levels of physical activity did not necessarily suggest so. There was a strong internal belief that they were doing enough physical activity or knew exactly where they needed to be and how to get there, not needing additional help or support.

I just knew that for me, I knew what I could do and what I wanted to do and what I had been doing and that’s where I wanted to get back to and I didn’t really need the additional support to do that. I had the kind of resources and I knew where to find them and what fitted in around my lifestyle already, and that’s what I wanted to do, and I needed to be self-motivated to get on and do that. (Becky)
As demonstrated by Becky, cancer survivors related to this candidate theme had a high level of motivation to be active, not necessarily related to the diagnosis of cancer, with Becky stating: “the diagnosis didn’t motivate me it was to get back, to try and get back to that fitness level because I think I was slightly frustrated”. This was also highlighted by David who said: “I tend to exercise anyway, so I think, I mean I don’t lack motivation, it’s just something I’ve always done so it’s something I carry on doing.” The motivation for these cancer survivors was to get back to normal, as physical activity was part of their self-identity and their daily lives.

Cancer survivors that could be related to this candidate theme were confident that they could find the resources and opportunities that they needed to get active. They knew where to go to access these resources and opportunities and did not need additional support, for example, a 57-year-old female survey respondent in remission for breast cancer said: “Sorry for not using your tools but I already have my own toolkit that works well for me.”

Some were in remission and felt that they were now past cancer, for example, a 42-year-old female survey respondent in remission for over three years from cancer of the head and neck said: “Other than glancing through the documents, I haven’t really taken part in this as I already regularly exercise, and I have been in remission for three-years so don’t believe I have any ongoing issues after cancer”.

The cancer survivors that could relate to this candidate theme had experienced the debilitating consequences of cancer and its treatments as identified within the first and second candidate themes. They shared the same drive towards physical activity as those included within the second candidate theme, keeping active as a way to get back to normal and to fight back against cancer. However, cancer survivors within this candidate theme raised few barriers to physical activity. When these cancer survivors felt the impacts of cancer they kept going and maintained their physical activity as best they could, as demonstrated by Becky who said:

I was just kind of tired, slightly fatigued. I could do things and even on the worst days I forced myself to do everyday activities like housework and stuff like that, but it was at a much slower pace. And just it was difficult if I moved much beyond a standard walking pace. Breathing was a bit harder and stuff like that, so it was mostly energy levels went down during that period [during treatment] …my motivation was mostly of trying to keep life as normal as possible and not really giving in to it. (Becky)
This reiterates that cancer survivors related to this theme saw being active very much a part of who they were with this the main reason for keeping moving. There was also a desire to be outdoors as identified by John who said: “I am by nature an active person and find outdoor activities - walking, gardening, cycling to be enjoyable and therapeutic”. John went on to say:

My wife and children are very good at saying, well come on we’re going for a walk, encouraging me to go. Plus, I didn’t need that huge amount of persuading because just that, come on we’re going for a walk come with us. So, it’s, right OK. And that was that, we were off. You just needed a few positive words which give you the encouragement and don’t give you an excuse.

There was a trust placed in close family members to identify when these active and motivated cancer survivors were overdoing it, with an acceptance that these family members sometimes know what is best for them.

Sometimes your family or friends see something in you that you don’t see yourself. The ability to look in the mirror and say, I need to go for a walk or need to go to bed and have a lie-down, fight it rather than going to do it that’s all. My wife says, why don’t you just go to bed and lie down for a couple of hours then you’ll feel better. So, off I trot instead of fighting it. But it’s one of those things I think people are not very good at recognising themselves. (John)

DISREGARDED

The cancer survivors included within this candidate theme gave the revised Move More Pack a cursory glance and disregarded it outright. Hillary started she “found it too tame”. A 52-year-old female survey respondent, who was still in treatment for breast cancer said: “I would like to see more advice to people who had exercised to a high level prior to the illness; the move more was too easy for me”, a sentiment with which John agreed:

I read through the Pack upon receipt and found that my activity levels on a daily basis were far in excess of the Move More Pack, so it provided me with no inspiration or motivation to do more than already doing.

John gave the revised Move More Pack a “single read through”. John went on to say: “It’s just been put away, it was single use. I did grasp it again a few days later. But in fact, I actually looked, just scanned it and dismissed.” Anthony said: “I didn’t go as far as going online to find any more of this, I didn’t watch the DVDs because none of it fits me, if you understand. I’d never pick the thing up”, However, Anthony did recognise that “a few people would benefit from this kind of stuff, but I’m not one of them.”
The cancer survivors related to this candidate theme felt that using this intervention would be tantamount to slowing down, some expressing shock at the low level that was being asked of cancer survivors in regard to physical activity. As said by Hillary: “I read it through thoroughly. I went over bits and I thought, good god how do you slow down to do those things?” John agreed with this, saying: “I’ve read through all information that had been given to me. And, I was quite surprised as to how little some people are moving or are motivated to move about.”

**SUMMARY**

Cancer survivors related to this candidate theme are already highly active or know how to be highly active when they feel able. They do not need additional support and therefore disregard support such as the revised Move More Pack after giving it a cursory glance. Figure 14 presents how the sub-themes to this candidate theme relate to the research aim of understanding the context, use, and impact of the revised Move More Pack.

**THANKS, BUT NO THANKS**

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>USE</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• I am very active</td>
<td>• Disregarded</td>
<td>• No mention of impact</td>
</tr>
</tbody>
</table>

Figure 14. The identified sub-themes for the *thanks, but no thanks* candidate theme and how they relate to context, use, and impact of the revised Move More Pack

**CANDIDATE THEME 4: PHYSICAL ACTIVITY IS NOT FOR EVERYBODY**

Physical activity was not for everybody. Cancer survivors associated to this candidate theme were *physically not capable* of taking part in physical activity, with other cancer survivors *not being in the right place* mentally to move more, with the sub-themes named as such.

**PHYSICALLY NOT CAPABLE**

It was identified in the first candidate theme that *timing* of the revised Move More Pack was important. The first candidate theme suggested that the intervention was likely to be most useful for those towards the start of their cancer journey, during or just after treatment, at a
time when health was salient. The cancer survivors related to this *physical activity is not for everybody* candidate theme had experienced, or were experiencing, particularly harsh consequences of treatment, putting physical activity out of mind. The focus of these cancer survivors was on managing their energy just to get through their day. Cancer survivors related to this candidate theme felt physically incapable of being physically active stating that they did not have the energy to do so.

During the research I was undergoing chemo and had to prioritise how I used what little energy I had. Showering, getting dressed and having breakfast wore me out. I did not have the energy or motivation to use my energy for anything more than my basic human needs. (Survey respondent, 65-year-old female with returning cancer of the Ovaries, still in treatment with the outcome unknown)

Since the cancer has come back I’m not at my best as I am having chemo every week now and have to have my stomach drained every few weeks which involves a hospital stay, so I can’t be as active as I would like, just getting through the day is enough for now. (Survey respondent, 63-year-old female in-treatment for Peritoneal cancer, with the outcome unknown)

The feeling of being physically incapable of being active was exacerbated for some by other long-term conditions, for example, a 67-year-old male survey respondent, in remission for over two-years from Bowel cancer said: “My health is not good… I have been diagnosed with Polymyalgia which makes me tired and in constant pain. My involvement in any exercise is practically nil”.

**NOT IN THE RIGHT PLACE**

There was a suggestion that some cancer survivors withdraw when informed of a diagnosis of cancer, thinking that the outcome is outside of their control. For example, John said: “I think some people, just don’t want to engage. They don’t really realise what that information is trying to give them or trying to help them”. This sentiment was echoed by Linda who said: “I think a lot of people don’t, when they, when you say you’ve got cancer they think, oh I can’t do anything. And I think trying to get people out of that mindset sometimes is a bit difficult”. This mindset was identified in the comments of some of the survey respondents, stating that they lacked motivation, experienced low mood, and that dealing with cancer was enough with no room for anything else. Being inactive before diagnosis and then experiencing these additional barriers created from a diagnosis of cancer, made becoming active very hard to achieve.
When you were sedentary before [diagnosis] it’s hard to be motivated even though you are scared of recurrence. I was inactive before cancer and now cancer adds a feeling of low mood so that doesn't motivate you. You always have a fear it will come back. Insomnia doesn't help. It takes all your energy to keep going day to day. (Survey respondent, 53-year-old female, in remission from cancer of the uterus)

Cancer survivors in this candidate theme stated that they need additional support to become physically active, for example, a 54-year-old male survey respondent, in remission for over one-year from prostate cancer stated:

I think if you are lazy (like me) prior to your cancer then you are going to be lazy afterwards unless there is a real incentive to eat less, drink less and exercise more... The booklet is good but once again, without support, it is too much like hard work

Nigella emphasised caution when informing those that could be related to this candidate theme to become more active saying: “Telling people to exercise when they can’t or when they don’t enjoy it only makes them feel guilty or depressed”.

**SUMMARY**

Some cancer survivors feel that they are physically or mentally not able to become physically active. The revised Move More Pack is unlikely to be useful to these cancer survivors. Additional support is likely to be required to support such cancer survivors to become active. Figure 15 presents how the sub-themes in this candidate theme relate to the research aim of understanding the context, use, and impact of the revised Move More Pack.

| PHYSICAL ACTIVITY IS NOT FOR EVERYBODY |
|-----------------|-----------------|-----------------|
| **CONTEXT**     | **USE**         | **IMPACT**      |
| • Physically not capable | • No mention of use | • No mention of impact |
| • Not in the right place |

Figure 15. The identified sub-themes for the *physical activity is not for everybody* candidate theme and how they relate to context, use, and impact of the revised Move More Pack
DISCUSSION

An embedded process evaluation aimed to situate the use of the revised Move More Pack in a broader social context, understanding its use and for whom it may useful. Four clear candidate themes were established in the data from 17 qualitative interviews and 56 open text responses.

It is acknowledged that the identified candidate themes appear to present categories of cancer survivors, however, these candidate themes and sub-themes are not categories to which participants were assigned. In many cases several different themes were expressed by the same participant. Each identified candidate theme will now be discussed.

CONTEXTUALISING THE USE OF THE MOVE MORE PACK

The first candidate theme is titled capitalising on a teachable moment relating to those likely to benefit the most from receiving the revised Move More Pack. The second candidate theme is titled not sure it’s for me, but it’s useful relating to those that have already made a decision to be active and therefore feel the revised Move More Pack is not for them, but who still find it useful. The third candidate theme is titled thanks, but no thanks and relates to cancer survivors who considered themselves as highly active individuals and not in need of any support, disregarding the revised Move More Pack. The final candidate theme is titled physical activity is not for everyone and relates to cancer survivors that are not able or interested in moving more, and who may need more support.

Cancer survivors speak of how cancer and particularly its treatment turns their lives upside down, with health for many becoming more salient as a result. It is this increased salience of health that when combined with the revised Move More Pack can capitalise on a teachable moment. This increased salience of health following cancer diagnosis supports the conclusion of Clifford et al. (2018) that cancer is a motivator for physical activity behaviour change.

The revised Move More Pack could support conversations between healthcare professionals and cancer survivors about physical activity, potentially creating and capitalising on a teachable moment. The teachable moment, whilst suggested to be toward the start of someone’s cancer journey, can be created throughout treatment and beyond supporting the findings of Rabin (2009). It is argued that advice on physical activity should be given at
every appropriate opportunity, at the initiation of treatment, throughout treatment, and on treatment completion, making every contact count. As identified in chapter two, a wide range of healthcare professionals could provide this physical activity advice, signposting to the revised Move More Pack.

The process evaluation confirms that cancer survivors and their family members would welcome advice from healthcare professionals supporting previous findings from this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016) and Anderson et al. (Anderson, Steele, & Coyle, 2012; Anderson et al., 2013). It is suggested however, that the giving of physical activity advice by healthcare professionals is not common practice, with most cancer survivors stating that they had not received such advice, supporting the findings of Fisher and Williams et al. (2015) and this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016).

Possible motivators for physical activity identified in this process evaluation that may be incorporated into the advice from healthcare professionals include the impact on recurrence and survival, improving physical function to support a return to work, improvements in fatigue, improvements in mental well-being, as well as giving permission to become active. This supports the previous work by this author and colleagues (Webb & Foster et al., 2016; Webb & Hall et al., 2016). Healthcare professionals could improve the distribution of the revised Move More Pack, identifying those for whom it may be useful, and providing permission to become and stay active at the outset, overcoming barriers created by physical activity screening, as identified in chapter three.

Those most likely to benefit from the revised Move More Pack are those during the early stages of their cancer journey, during treatment seemingly the most appropriate time to receive the intervention. Vallance et al. (2015) report no improvement in physical activity when delivering a physical activity workbook to breast cancer survivors still in treatment, offering little explanation for these results. However, the results from this process evaluation may help clarify these findings. The qualitative data suggests that cancer survivors in treatment may not change their behaviour immediately from receipt of an intervention, but an intervention received at this time may create an intention to be more active when they feel ready.
A positive approach to fighting cancer and an openness to lifestyle advice and support is required. Cancer survivors in this context when offered the revised Move More Pack could change their physical activity behaviour or create an intention to become active when they feel able. Such cancer survivors are identified in the capitalising on a teachable moment candidate theme and should be offered the revised Move More Pack as standard practice.

There is evidence that the revised Move More could capitalise on a teachable moment occurring later in the cancer journey, helping those socially isolated, supporting the findings of Robins et al. (2018). This further emphasises the importance of healthcare professionals promoting physical activity at every appropriate opportunity to ensure that such teachable moments are not missed.

The cancer survivors identified in the candidate theme not sure it’s for me, but it’s useful have similar contextual factors to those in the first candidate theme, capitalising on a teachable moment, both expressing a positive attitude to fighting cancer. Those related to this second candidate theme are further on in their stage of change having had a teachable moment, holding strong beliefs for the benefits of physical activity, with the decision to be active made and acted upon. Cancer survivors in this candidate theme speak of physical activity helping them cope with cancer and the consequences of treatment, supporting the findings of Courneya and Friedenreich (1997) and Peddle et al. (2007). The revised Move More Pack is still useful and impactful for the cancer survivors related to this candidate theme, however, they would have preferred it earlier in their cancer journey.

The DVD is seen as a good starting point to becoming active for those in the capitalising on a teachable moment candidate theme. Forty-point-nine per cent of cancer survivors use the DVD at least once, with 21.0% using it sometimes or often. The DVD may help overcome some of the physical barriers to becoming active, increasing self-efficacy, and supporting learning and behaviour change through observation.

The qualitative data suggests that the goal-setting and monitoring tools in the Guide to Becoming Active – Goal-Setting section, and the Pull-Out Wall Chart, are useful to many of the cancer survivors related to the capitalising on a teachable moment and the not sure it’s for me, but it’s useful candidate themes. Use of these resources highlights the importance of self-regulation supporting the findings of Short et al. (2013a). The Pull-Out Wall Chart is a useful tool to track physical activity, as-well-as providing a prompt to be active and a
reminder to use the revised Move More Pack; however, only 21.5% of cancer survivors use the Pull-Out Wall Chart sometimes or often. This use is far less than the 71% of cancer survivors who find recording their physical activity useful identified by Rabin et al. (2011). With only seven cancer survivors involved in the evaluation of the intervention developed by Rabin et al. it is suggested that the findings of this process evaluation are far more reflective of use of such tools in the real-world.

The Find Activities Near You section of the online tools is used sometimes or often by just under a fifth of cancer survivors (19.9%). The process evaluation data suggests that the Find Activities Near You section is likely to be most useful for the cancer survivors related to the not sure it’s for me, but it’s useful candidate theme. It is stated in the qualitative data that a lack of local opportunities is a barrier to physical activity, but this is not seen as related to the revised Move More Pack, just a reality of the local environment.

The e-newsletters are well received by some cancer survivors with 38.2% at least somewhat agreeing that they were helpful in supporting improvements in physical activity. This process evaluation suggests that the e-newsletters prompt use of the revised Move More Pack and the setting of physical activity goals, supporting the findings of Short et al. (2013a). The tailoring of the e-newsletters could be improved based on the findings of this process evaluation with identification of users by candidate theme. It is suggested that those identified in the capitalising on a teachable moment candidate theme should receive the e-newsletters currently for those never or rarely active before diagnosis, as they are in an earlier stage of change. Further, those in the not sure it’s for me, but it’s useful candidate theme, should receive the e-newsletters currently for those sometimes or often active before diagnosis, as they are in a later stage of change. The e-newsletters are presented in Table 21. It is acknowledged that some (11.0%) do not use or even see the e-newsletters with them getting lost amongst other emails.

There is a clear preference towards print-based materials over online tools with most in the capitalising on a teachable moment and not sure it’s for me, but it’s useful candidate themes stating that they rarely use the Internet-based tools. The quantitative data supports this with the five Internet-based tools appearing in the last six ranking positions.

Not all cancer survivors find the revised Move More Pack useful. There are some who might be experiencing the severe impacts of cancer and its treatments, not able or interested in
becoming physically active, identified by the *physical activity is not for everyone* candidate theme. These cancer survivors lack the motivation to become physically active, likely to have poor mental well-being, just coping day by day, findings in support of previous work from this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016) and Vallance et al. (2015). These cancer survivors are likely to be inactive before diagnosis of cancer, having never taken part in physical activity. It is emphasised that pre-diagnosis inactivity is not exclusive to this group, with some cancer survivors related to the other candidate themes also inactive. The revised Move More Pack is unlikely to be enough to help these cancer survivors become physically active, with more support required. This further supports the distribution of the revised Move More Pack through healthcare professionals who have a relationship with their patients and can identify those requiring such additional support, signposting accordingly (if such services exist).

Some cancer survivors, those relatable to the *thanks, but no thanks* candidate theme, do not want or need additional support in regard to physical activity, as they are either already highly active or identify as being a highly active individual. These cancer survivors can meet their own support needs and overcome the barriers they face to becoming active. These cancer survivors should not be offered the revised Move More Pack as they are likely to disregard it. Healthcare professional advice should focus on managing the expectations of such cancer survivors, ensuring that they do not push themselves too hard. This advice should also be provided to family members as they are the referent individuals that these cancer survivors look to for approval in regard to physical activity.

---

**POTENTIAL IMPROVEMENTS TO PACK DESIGN**

Previous literature has called for, not just better reporting of interventions for clarity and replication, but also a better understanding of what BCT techniques bring about change (Bourke et al., 2013; Michie et al., 2013). This is problematic in a multicomponent intervention such as the revised Move More Pack. Cancer survivors engage with different elements of the Pack and therefore, it is not possible to assess the impact of each BCT individually, nor combinations of BCTs.

It is possible to assess the use of specific sections of the revised Move More Pack and the relationship of these to 12-week physical activity improvement score. The goal-setting and self-monitoring section of the revised Move More Pack is the only section, within the
intervention arm of the randomised waiting list control trial, that is statistically shown to be impactful on physical activity improvement, in support of the findings of Rabin et al. (2011) and Vallance et al. (2007). It is noted that the goal-setting and self-monitoring section of the revised Move More Pack is not a significant predictor of physical activity improvement in the waiting list control arm participants, whereas it is for the intervention arm participants. This non-significant result may be due to the increases in physical activity seen from receipt of the standard letter recommendation before receipt of the revised Move More Pack. Forty-four-point-two per cent of cancer survivors use the goal-setting and self-monitoring section of the revised Move More Pack at least sometimes, the fourth most used component of the intervention.

The potential impact of the other sections and the BCTs included within this intervention should not be diminished. In addition to goal-setting and self-monitoring, some BCTs included within the intervention can be directly related to the findings from the process evaluation. The identified BCTs include improving knowledge of health and emotional consequences, action planning, reframing physical activity, providing a prompt or cue to be active, engaging families as practical social support, the DVD providing instruction, demonstration, and graded activities, and Macmillan Cancer Support being seen as a credible source. Unfortunately, it is not possible to draw comparisons to the wider literature because of the limited scope of the evaluations conducted in this area as presented in the introduction to this chapter.

Each element of the revised Move More Pack is used by at least some cancer survivors; even the least used component, the Online forum: Ask the physio is used by 11.0% of cancer survivors. Therefore, removal of whole sections or use of the BCTs included is not recommended, as this goes against the variability in cancer survivors who, as identified in the data, use different sections of the intervention with varying intensities. The different sections, combination of sections, and BCTs are likely to be used in different ways from one cancer survivor to the next. However, some suggestions can be made for potential improvements to the revised Move More Pack.

It is identified that some information in the Physical Activity and Cancer booklet is repeated in the printed Guide to Becoming Active. This duplicated information could be removed. The size of the Guide to Becoming Active is off-putting to some as it creates a view that the Pack is going to take some time to complete, a view also held by cancer survivors in receipt of the
print-based intervention developed by Short et al. (2013b). Removal of the repeated information will help reduce the size of the Guide to Becoming Active.

The least well used online components are the Digital Apps webpage, used by only 2.5% of cancer survivors sometimes or often; the Ask the Physio online forum, used sometimes or often by only 2.8% of cancer survivors, and the Talk About Being Active online forum, used sometimes or often by only 5.5% of cancer survivors. It may be better to link cancer survivors to existing, established general forums rather than create specific physical activity forums. As the Digital Apps webpage, and consequently the included pedometer apps are poorly used, consideration should also be given to the inclusion of a physical pedometer with the revised Move More Pack. Previous literature has shown a pedometer combined with a print-based intervention to be effective at improving physical activity in cancer survivors (Vallance et al., 2007). It is acknowledged that the inclusion of a physical pedometer will increase intervention costs, and therefore this should be carefully considered and evaluated for impact. Cancer survivors who have already become active seem able to find their own apps to support the monitoring of their physical activity.

It is suggested by Stull et al. (2007) that 39% of cancer survivors would like to receive physical activity support over the Internet, and Vallance et al. (2015) call for greater use of online tools to support cancer survivors to become physically active. However, the findings from this study suggest that a print-based intervention is more useful and tangible to cancer survivors than an Internet intervention. This finding is in support of Golsteijn et al (2017) who also conclude that cancer survivors are more likely to engage with print-based interventions.

It is acknowledged that all of the Internet-based tools are used by at least some cancer survivors. Therefore, despite the low usage of the Internet-based tools, it is suggested that they remain in any future developments of this intervention as if they help even one cancer survivor to become active then they have value. As identified by Demark-Wahnefried et al. (2007), Noar, Benac, and Harris (2007), and Short et al. (2013a), tailored multi-component interventions are likely to be most effective in affecting physical activity behaviour change in cancer survivors. The links from the printed sections of the revised Move More Pack to the Internet-based tools should be strengthened and made more explicit to encourage use and to ensure cancer survivors are aware of the different tools available.
STRENGTHS AND LIMITATIONS

Some physical activity interventions described in the cancer specific literature report a named theory for intervention development, but there is a lack of reporting on how said theory is used and the resulting behavioural change (Bourke et al., 2013). There is also a lack of reporting on how interventions work, for whom and in what context (NICE, 2014a). This lack of reporting is apparent in the existing literature on the use of remote-based physical activity interventions for cancer survivors from Forbes et al. (2015), Rabin et al. (2011), Short et al. (2013b) and Valle et al. (2013). This process evaluation of the revised Move More Pack contextualises intervention use, usefulness, and impact ensuring that this study helps to overcome this gap in the existing literature.

A further strength of this process evaluation is the inclusion of 17 in-depth interviews with cancer survivors in receipt of the intervention, plus the gathering of open text comments from 56 cancer survivors, coupled with 181 responses on the use of the revised Move More Pack. The inclusion of such a large number of cancer survivors, with data collected in multiple ways, sets this process evaluation apart from other literature in this area. The inclusion of all adult cancer survivors regardless of cancer stage or tumour site allows for a broad contextual understanding for whom the revised Move More Pack might be a useful and impactful intervention.

A possible limitation of this process evaluation is that participants are included across both the intervention and waiting list control arms of the randomised waiting list control trial. Receipt of the standard letter recommendation first by the participants in the waiting list control arm may have influenced their use of the revised Move More Pack, however, this was not identified in the qualitative data.

CONCLUSION

The revised Move More Pack is likely to be most useful and impactful for those with a positive attitude to fighting cancer, who are towards the start of their cancer journey at a time when health is more salient. The treatment phase is identified as an appropriate time for the revised Move More Pack to be distributed. The printed component of the revised Move More Pack is particularly useful for these cancer survivors, however, the Internet-based tools less so. The DVD provides a useful starting point for physical activity.
Cancer survivors who have already made a decision to become more active but who do not consider themselves as highly active individuals, may not see the revised Move More Pack as specifically for them, but they are still likely to find it useful. Those who consider themselves to be highly active individuals are likely to disregard the revised Move More Pack after giving it a cursory glance. Some cancer survivors feel not physically capable or not mentally in the right place to become physically active. These cancer survivors are likely to need more support if they are to increase their physical activity.

Cancer survivors would like to receive advice on physical activity from healthcare professionals. Healthcare professionals are well placed to distribute the revised Move More Pack identifying those that are likely to benefit from its use and signposting others to appropriate support as required.
Chapter five of this PhD thesis will discuss the findings from across the three included studies, the theoretical contributions, implications for future research and practice, including a discussion on intervention scaling considerations.

**CHAPTER FIVE CONTENTS**

Influencing the Determinants of Physical Activity 211

Practical Contribution 214

Theoretical Contributions 218

Future Research Possibilities 221

Summary 222
The body of research included within this thesis set out to enhance the development and evaluation of evidence-based interventions, achieving the standards outlined by NICE (2014a) and the MRC (Craig et al., 2009), to improve physical activity in cancer survivors. The research presented in this thesis applies behavioural science through a public health lens, with the aim of developing interventions that can influence population-level change, understanding what works and for whom.

To achieve population-level change, it is important to understand the many influences on behaviour. The determinants of physical activity in cancer survivors have been identified from the existing literature, reviewed using the TPB (Ajzen, 1991) and the SCT (Bandura, 1989; McAlister et al., 2008) within a socio-ecological framework (McLeroy, Bibeau, Steckler, & Glanz, 1988) to ensure complete understanding. Two interventions have been under investigation in this thesis; (1) a training intervention to influence healthcare professional practice to give physical activity advice to cancer survivors, and (2) a remote print-based intervention supported by Internet-based tools to intervene with cancer survivors directly.

This discussion section will identify how the interventions under investigation in this thesis can influence the identified determinants of physical activity in cancer survivors. This discussion section will identify the theoretical contributions made by this body of research, the practical implications of the findings and the application to future practice. Discussion of the practical implications will also include considerations for the scaling-up of these interventions to ensure these findings do not fall foul to the know-do gap (WHO, 2006). Future research possibilities will also be identified.

The revised Move More Pack influences many of the determinants of physical activity in cancer survivors, reframing physical activity, increasing knowledge and confidence, engaging family members, and signposting to local opportunities. The candidate themes identified in the process evaluation, presented in chapter four, highlight that the barriers and facilitators to physical activity take on a greater or lesser meaning based on the context in which people find themselves.
The process evaluation suggests that use of the revised Move More Pack varies by candidate theme. Cancer survivors that can be related to the thanks, but no thanks and the physical activity is not for everyone candidate themes are likely to disregard the revised Move More Pack almost immediately giving it only a cursory glance. Those that can be related to the capitalising on a teachable moment and not sure it’s for me, but it’s useful candidate themes, express greater use of the revised Move More Pack, more so in the former.

The Physical Activity and Cancer booklet is the most used component of the revised Move More Pack with 55.2% of cancer survivors using it either sometimes or often. The process evaluation suggests that the Physical Activity and Cancer booklet is read in full, then for reference purposes. Cancer survivors relatable to the capitalising on a teachable moment and not sure it’s for me, but it’s useful candidate themes talk of improved knowledge of physical activity in relation to cancer from use of this booklet.

This improvement in knowledge reinforces the decision or intention to become active or stay active, relating to the outcome expectation construct of the SCT (Bandura, 1989; McAlister et al., 2008) and the attitude construct of the TPB (Ajzen, 1991). This improved knowledge also raises the importance of physical activity for cancer survivors. This is in support of the findings from Clifford et al. (2018) who identify that the expected outcomes of improving physical health and mental well-being from becoming more active as the most frequently reported facilitators of physical activity in cancer survivors.

Family members are referent individuals with their impact on physical activity evident across the capitalising on a teachable moment, not sure it’s for me, but it’s useful and the thanks, but no thanks candidate themes. A positive impact from family members is evident in the provision of support, encouragement, and someone to be active with, supporting the findings from this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016), Barber (2012) and Craike et al. (2013). Some cancer survivors relatable to the not sure it’s for me, but it’s useful candidate theme also speak of getting back to normal if they had previously been active as part of family time, emphasising the importance of family members as referent individuals. The qualitative data from the process evaluation suggests that the revised Move More Pack influences family members, engaging them in physical activity and helping to overcome any safety concerns that they may have, creating a collective-efficacy.
The revised Move More Pack reframes physical activity for cancer survivors relating to the *capitalising on a teachable moment* and the *not sure it’s for me, but it’s useful* candidate themes, from exercise for exercise sake to moving more, with something considered better than nothing. The reframing of physical activity makes becoming active more achievable, manageable, and easier to fit into daily life. These findings are in support of previous findings by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016), Hefferson et al. (2013) and Clifford et al. (2018) who identify control and self-efficacy over health as a facilitator to becoming active. The activity leaflets included within the revised Move More Pack support the reframing of physical activity. The activity leaflets for gardening, activities of daily living, and walking are well used with 26.5%, 35.9%, and 47.6% of cancer survivors respectively using them sometimes or often. Further, this suggests that walking is a popular activity with cancer survivors, in support of previous findings from this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016).

Henriksson et al. (2016), Clifford et al. (2018) and previous findings by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016) identify that a lack of local physical activity opportunities is a barrier to moving more. Conversely, the availability of local physical activity opportunities is a facilitator to becoming active. The revised Move More Pack facilitates the finding of local opportunities for some, where such opportunities exist, potentially increasing control over moving more.

Cancer survivors relatable to the *thanks, but no thanks* candidate theme, already hold a positive attitude toward physical activity, with physical activity likely to be habitual. Being active, for those relatable to this candidate theme, is driven by getting back to normal, supporting the findings of Clifford et al. (2018). In addition, these findings are in support of Larsson et al. (2008) and Maley et al. (2013) who identify taking back control as a driver of physical activity, and the finding of Peddle et al. (2007) who identify a sense of self as a driver for physical activity. Those in the *thanks, but no thanks* candidate theme, also speak of finding their own resources to monitor their physical activity. This monitoring of physical activity provides positive reinforcement, supporting the previous findings by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016).

Cancer survivors relatable to the *physical activity is not for everyone* candidate theme, do not hold a positive attitude towards physical activity, almost seeing it as a burden, and in some cases, it being completely out of mind. For many cancer survivors in this candidate theme,
coping from the severe consequences of treatment is enough to deal with. Side-effects, lack of enjoyment, and no motivation are pertinent barriers to physical activity in cancer survivors identified by Clifford et al. (2018).

The process evaluation suggests that cancer survivors want advice from healthcare professionals, and the revised Move More Pack could help facilitate these discussions. These findings are in support of the conclusions of McBride and Emmons (2003) who suggests that healthcare professionals can create a *teachable moment*. This also supports the work of Park et al. (2015) who suggest that a package of support materials should accompany physical activity advice. Cantwell et al. (2017) identify a lack of physical activity opportunities as a barrier to the giving of physical activity advice by healthcare professionals; the revised Move More Pack could help overcome this barrier.

Healthcare professionals are referent individuals, relating to the *subjective norm* construct of the TPB (Ajzen, 1991), and they have the opportunity to create and capitalise on a teachable moment. Intervening to influence the practice of healthcare professionals to give advice on physical activity to cancer survivors has the potential to influence many of the determinants of physical activity. Advice from a trusted healthcare professional can improve knowledge and confidence, influence family members, with signposting onwards to appropriate support opportunities. The training intervention presented in chapter two of this thesis has the potential to increase the giving of physical activity advice to cancer survivors across a wide range of healthcare professionals.

**PRACTICAL CONTRIBUTIONS**

Michie et al. (2009) suggest that few public health and healthcare behaviour change interventions report their impact in practice. Michie et al. (2009) also report that less than 30% of public health and healthcare behavioural change interventions describe their content using theory and BCTs in enough detail for replication. The interventions under investigation in this thesis do not fall foul to these criticisms.

**THE TRAINING INTERVENTION**

The training intervention is described in the level of detail required by NICE (2014a). As outlined by Milat et al. (2014) before scaling up an intervention, a scalability assessment should be completed. The feasibility and acceptability of this training intervention have been
confirmed previously (Webb & Hall et al., 2016). The possible impact of the training intervention by delivery mode has been reported in this service evaluation. The service evaluation identifies the reach of the intervention and who adopts the intervention, all required when making scaling decisions (Milat et al., 2014).

Milat et al. (2014) place intervention reach and adoption at the heart of scalability. The online training intervention has the potential to reach a large number of healthcare professionals, as shown by the reach of 7,682 healthcare professionals over an 11-months period. Actions should be taken to improve the poor reach to registration ratio, and the registration to completion ratio for the online training intervention. The completion of the online training intervention by healthcare professional group should be continuously monitored to ensure widespread take-up, with further investigation taking place into non-engaging professions. In addition, the impact of the training by profession should be monitored, with further investigation into those that do not improve their physical activity discussion frequency as a result.

The reach of the face-to-face training intervention is limited by the availability of local representatives to create partnerships and training opportunities. A train-the-trainer or cascade model may be considered to build local capacity to support the roll-out of this training intervention. It is suggested that measures are put in place to monitor the reach of local promotional activity, and the take-up of face-to-face training intervention delivery, with identification and investigation of healthcare professions not reached.

Milat et al. (2014) identify that for interventions to succeed they must alight to policy priorities, demonstrating an effect-size of policy significance. The importance of giving advice on physical activity in a healthcare setting is recognised at an international level by the WHO (2015), at a UK level by Public Health England (Varney et al., 2014), Public Health Wales (2017), and the Scottish Government (2014). A specific policy drive has focused on making every contact count and the giving of lifestyle advice at every available opportunity (Public Health England, NHS England, & Health Education England., 2016). The giving of very brief advice using an ask, advice, and act framework is supported by NICE (2014a) and is encouraged in cancer-specific policy in pursuit of World class cancer outcomes (Independent Cancer Taskforce., 2014).
The training intervention for healthcare professionals on the giving of physical activity advice to cancer survivors is suitable for scaling up to a population-level in the UK. With the results of the service evaluation of the training intervention, the feasibility study (Webb and Hall et al., 2016), the results of the randomised waiting list control trial and process evaluation of the revised Move More Pack, it is argued that the scaling of the training intervention coupled with the revised Move More Pack could be of political significance, even when considering the limitations in the service evaluation data. The case for political significance is further supported by the existing literature from Fisher and Williams et al. (2015). The training intervention and the revised Move More Pack could support the implementation of the NHS (2014) cancer recovery package.

If this training intervention across delivery modes is to be taken to scale, it is suggested that the central monitoring and evaluation of this service should continue, addressing the poor lost-to-follow-up percentage. The inclusion of a baseline COM-B questionnaire should be considered to more accurately monitor change, as should the inclusion of a waiting list control to more accurately assess effectiveness. Follow up should be repeated at 24-weeks to assess maintenance of physical activity discussions, and measures should be considered to assess implementation of advice using an ask, advise, and act framework across settings and professions. It is noted that it is likely that tens of thousands of healthcare professionals will need to be reached to bring about improvements in the giving of physical activity advice across UK healthcare settings and professions, therefore, a combined approach of face-to-face and online delivery is required.

**THE MOVE MORE PACK**

The revised Move More Pack as presented in chapter three is in a level of detail required to achieve the standards set out by NICE (2014a). The randomised waiting list control trial demonstrates that the revised Move More Pack has the potential to increase physical activity across adult cancer survivors regardless of age or tumour site. Therefore, the revised Move More Pack should be considered an effective intervention to support physical activity behaviour change in cancer survivors.

Macmillan Cancer Support is seen as a trusted source of information and an appropriate source to deliver an intervention such as the revised Move More Pack, supporting the findings of Williams et al. (2015). The randomised waiting list control trial suggests that 64%
of cancer survivors, able to become active without prior medical approval, may increase their physical activity from receipt of the revised Move More Pack. This is in support of the findings by Short et al. (2013b) who also find that 64% of cancer survivors report an improvement in physical activity from a print-based physical activity intervention. It is important to identify those that are likely to benefit from the revised Move More Pack to ensure its effective distribution. In order to achieve population-level change, interventions found to be effective in research and evaluation should be scaled up, with a focus on those for whom the intervention has been shown to be useful and impactful (Milat et al., 2014).

The correct identification of cancer survivors by the identified candidate themes is likely to ensure the effective distribution of the revised Move More Pack to those most likely to benefit from it. In addition, identification of cancer survivors by candidate theme could help identify those in need of more support in regard to physical activity, and those whose expectations may need to be managed.

Additional support is likely to be needed for the cancer survivors related to the physical activity is not for everyone candidate theme. Therefore, it is suggested that members of this candidate theme are identified, and an intervention co-created following a relevant theory or theories, and a recognised intervention development framework, with appropriate testing of effectiveness.

Whilst cancer survivors relatable to the thanks, but no thanks candidate theme state that they do not need advice or support, some advice should be provided. This advice should manage their expectations, as they may not be able to achieve a level of activity that they had previously been used to, as highlighted by previous work by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016).

The timing of delivery of the revised Move More Pack is important and linked to the earlier stages of the cancer journey, supporting the role of healthcare professionals in its distribution. The revised Move More Pack is impactful and most useful for those cancer survivors related to the capitalising on a teachable moment candidate theme. Whilst useful and impactful for those related to the not sure it’s for me, but it’s useful candidate theme, consideration should be given to the modification of the intervention to better cater for these cancer survivors.
The scaling up of the revised Move More Pack to cancer survivors relatable to the *capitalise on a teachable moment* candidate theme should now be considered. The revised Move More Pack could support change on a population level, increasing physical activity across tumour sites, important in light of the benefits (Speck et al., 2010) and the possible cost savings to the NHS (Albrecht & Taylor, 2012; Sebio Garcia et al., 2016; Singh et al., 2013). As mentioned, discussion of physical activity by healthcare professionals provides an opportunity to make judgements related to these candidate themes, distributing (or signpost to) the revised Move More Pack accordingly, and providing additional advice and support as necessary. Identification of cancer survivors by candidate theme should be incorporated into the training intervention presented in chapter two. The next steps in a scaling process would be to complete a situational and stakeholder analysis to determine who should be involved in taking these combined interventions to scale, their role, with a plan to spread the intervention horizontally across geographies, and vertically for inclusion in policy and guidance documents (Milat, et al., 2014).

**THEORETICAL CONTRIBUTIONS**

The development and testing of the training intervention and the revised Move More Pack supports the use of relevant theories upon which to base intervention development and evaluation. Developing interventions based on theory or theories is called for by researchers (Bourke et al., 2013; Michie et al., 2009, 2013) and also within intervention development guidance (Craig et al., 2009; NICE, 2014a). Identification of relevant theories and frameworks provides a useful approach to thinking around intervention development, encouraging intervention designers to consider each construct and how specific BCTs may bring about change. However, it should not be assumed that as an intervention meets all of the identified theoretical constructs it will therefore facilitate change in all members of a population; this is demonstrated by the differences identified in the four candidate themes in their use (or not) of the revised Move More Pack, and the non-engagement of oncologists in the training intervention.

The service evaluation enhances knowledge on the application of the COM-B model and the BCW (Michie et al., 2011) to the development and evaluation of interventions in the field of implementation science. Further, the service evaluation enhances knowledge on the application of the RE-AIM framework (Glasgow et al., 1999) for the evaluation of public health interventions in real-world settings. The theories used to develop the revised More
More Pack are the TPB (Ajzen, 1991), the SCT (Bandura, 1989; McAlister et al., 2008), and the physical activity stage of change model as offered by Marcus and Forsyth (2009).

A comparison can be drawn from the four candidate themes identified in the process evaluation to the stages of physical activity behaviour change offered by Marcus and Forsyth (2009). The capitalising on a teachable moment candidate theme can be related to the stage of thinking about doing more activity or being open to thinking about moving more. The not sure it's for me, but it's useful candidate theme can relate to the doing some activity stage. The thanks, but no thanks candidate theme corresponds to the doing enough physical activity stage (or knowing how to do enough physical activity) and the making physical activity a habit stage. Finally, the physical activity is not for everyone candidate theme can relate to the not thinking about becoming active stage.

Marcus and Forsyth (2009) proffer a four-item questionnaire to categorise people into an associated stage of physical activity change. It is possible that an adaptation of this questionnaire could help categorise cancer survivors by candidate theme, supporting not just the effective distribution of the revised Move More Pack by healthcare professionals, but also better tailoring of the e-newsletters included as part of the revised Move More Pack. Suggestion for the adaptation of the stage of physical activity change questionnaire is presented as Figure 16; it is acknowledged that this requires further assessment before use.
At every appropriate opportunity, but particularly at the start, during, and at the end of cancer treatment, provide person-centred physical activity advice in relation to the benefits to cancer survivors. Identify if the cancer survivor is meeting the physical activity guidelines?

Do you intend to increase your physical activity?

Yes

I have already started

No

Do you consider yourself a sporty person, or someone that is highly physically active?

No

Yes

No

Yes

Related to theme 1: Capitalising on a teachable moment – Signpost to the revised Move More Pack

Related to theme 3: Thanks, but no thanks - Manage expectations and signpost to monitoring tools/apps

Related to theme 2: Not sure it’s for me, but it’s useful – In the absence of an intervention specifically for this group, signpost to the revised Move More Pack

Related to theme 3: Thanks, but no thanks - Manage expectations, and signpost to monitoring tools/apps

Related to theme 4: Physical activity is not for everybody - Additional support likely to be needed

Figure 16. Adapted physical activity stage of change questionnaire to support the distribution of the revised Move More Pack by healthcare professionals
FUTURE RESEARCH POSSIBILITIES

It is observed that the training intervention regardless of the mode of delivery did not engage any oncology consultants, the professional group that most cancer survivors (76%) consider to be the experts for physical activity and their condition (Webb, 2016; Webb & Smerald et al., 2016). The reasons for this are unclear and warrant further investigation. Daley et al. (2008) identify a need for educational strategies specifically for oncology clinicians. The process followed in the previous work by this author and colleagues (Webb and Foster et al., 2016) in designing the training intervention should be repeated for oncology consultants alone, starting with a behavioural diagnosis using the COM-B model.

The application of theoretical models is context specific, and this should receive prominence in future research into physical activity behaviour change in cancer survivors. In addition to the call for better reporting of the application of theory and BCTs to intervention development, it is advanced that it is equally important to call for improvements in reporting for whom interventions work, or not, and in what context. Understanding what works and for whom will improve the distribution of interventions and allow for the development of new interventions for populations not reached or influenced.

Research and evaluation should continue, using the best available designs, to assess the ongoing maintenance and implementation of the giving of physical activity advice by healthcare professionals to cancer survivors. Research and evaluation should continue, using the best available designs, to understand the impact of remote-based interventions on physical activity intentions (not just physical activity levels), self-efficacy and HRQOL in cancer survivors. Further, the design and evaluation of evidence-based interventions should continue for the cancer survivors in need of additional support to improve physical activity, again to the standards expected by NICE (2014a) and the MRC (Craig et al., 2008).

The use of the Internet-based tools requires additional analysis as they are currently underutilised, and in general terms, the use of Internet-based tools to change physical activity behaviour in cancer survivors is still developing and is currently under-researched. It may be that pre-existing digital apps, online forums, and activity databases are suitable for use by cancer survivors.
The scarcity of face-to-face physical activity support services for cancer survivors highlights the need to work with community physical activity providers. There is a need for greater access by cancer survivors to appropriate local physical activity opportunities supporting the findings of Kampshoff et al. (2014) and the previous work by this author and colleagues (Webb, 2016; Webb & Smerald et al., 2016). A range of physical activities are mentioned within the process evaluation qualitative data that may be appropriate such as walking, running, cycling, gardening, yoga, swimming, as-well-as attending physical activity classes.

Supporting cancer survivors within the existing UK physical activity infrastructure is supported at a policy level (Varney et al., 2014). Cancer survivors want access to local physical activity opportunities (Clifford et al., 2018) where they are supported by physical activity leaders understanding of their needs with the ability to adapt sessions accordingly (Albrecht & Taylor, 2012), and free from the fear of social stigma (Webb, 2016; Webb & Smerald et al., 2016). However, the barriers and facilitators to physical activity leaders supporting cancer survivors to become or stay active have not before been investigated. Understanding the views of physical activity leaders is the first step in making local physical activity opportunities more accessible to cancer survivors.

**SUMMARY**

The revised Move More Pack significantly improves physical activity in cancer survivors, however, it does not improve physical activity for all. The process evaluation identifies for whom the revised Move More Pack it is likely to be effective, those in treatment where health is salient and who have a positive attitude to fighting their cancer. Equally important is the identification of those that do not find the revised Move More Pack useful or impactful; those who already consider themselves as highly active individuals not in need of additional support and those, at the other end of the spectrum, who do not feel that they are in the right place mentally or physically to change.

The revised Move More Pack intervention can be linked to the training intervention presented in chapter two, with healthcare professionals supporting its effective distribution to those likely to benefit from its use. The results of the service evaluation support the use of the training intervention to influence a range of healthcare professionals to give advice on physical activity to cancer survivors.
There is a clear rationale for scaling up the training intervention and the revised Move More Pack as the aims of both interventions are in support of recent policy to improve cancer outcomes in UK cancer survivors (Independent Cancer Taskforce., 2014). Further, the training intervention and the revised Move More Pack could complement the NHS (2014) cancer recovery package. The next steps are to disseminate the findings to key stakeholders and national decision makers in the UK to facilitate and influence the scaling of these two interventions.

In summary, this thesis has reported the results of three studies. The first study, a service evaluation, suggests that a training intervention for healthcare professionals has a board reach, with a suggested positive impact on the giving of physical activity advice to cancer survivors. The second study, a randomised waiting list control trial with a cost-consequence analysis, shows that the revised Move More Pack can significantly improve physical activity in cancer survivors at a cost of £45.13 per improvement over a standard letter recommendation. Finally, the third study, a process evaluation of the revised Move More Pack, shows that the Pack is likely to be most useful for those in treatment with a positive attitude to fighting cancer.
REFERENCES


Anderson, R. T., Kimmick, G. G., McCoy, T. P., Hopkins, J., Levine, E., Miller,


Blanchard, C. M., Courneya, K. S., & Stein, K. (2008). Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life:


http://doi.org/10.1200/jco.2006.06.6175


http://doi.org/10.1038/bjc.2011.418


http://doi.org/10.1158/1055-9965.EPI-04-0620

and standardizing evaluation reports of web-based and mobile health interventions.  


barriers to and facilitators of being physically active during adjuvant cancer treatment. 

http://doi.org/10.1016/j.pec.2016.01.019


http://doi.org/10.1016/j.jsat.2011.04.005

http://doi.org/10.1080/09638280410001724816

http://doi.org/10.1634/theoncologist.12-S1-4

http://doi.org/10.1001/jama.293.20.2479

http://doi.org/10.1097/NCC.0b013e3182479984


http://doi.org/10.1111/j.1365-2702.2012.04322.x


Macmillan Cancer Support. (2011). Online survey of 400 health professionals who deal with cancer patients (100 GPs, 100 practice nurses, 100 oncologists, and 100 oncology nurses, of whom 52 were oncology nurse specialists). Survey results are unweighted.


https://www.youtube.com/playlist?list=PL4YhGgVzlOXjhg6UYbX7iSDYcPX5PRy9
National Research Ethics Service. (2013). Defining research. NRES guidance to help you decide if your project requires review by a research ethics committee. London: Health Research Authority.


http://doi.org/10.1007/s11764-011-0197-3

https://doi.org/10.3928/0022-0124-20040501-08


http://doi.org/10.1093/icvts/ivw152


http://doi.org/10.1249/01.MSS.000038974.76900.92


http://doi.org/10.1177/1090198106287693


APPENDICES

APPENDIX 1. CONFIDENTIALITY AGREEMENT WITH MACMILLAN CANCER SUPPORT (CHAPTER TWO)

CONFIDENTIALITY AGREEMENT

THIS AGREEMENT is made the 20th day of February 2017
BETWEEN:-

(1) Macmillan Cancer Support, registered in England and Wales as a company limited by guarantee (number 2400969) and a charity (number 261017,) registered in Scotland as a charity (number SC039907), whose registered office is at 89 Albert Embankment, London SE1 7UQ (“Macmillan”); and

(2) Mr Justin Webb, [15 Loudwater Road, Lower Sunbury, TW16 6DB]

WHEREAS:-

(1) Macmillan wishes to share certain anonymous information, in the form of anonymous responses to a survey, with Mr. Webb to be analysed and reported as part of Mr. Webb’s PhD and publication in an academic journal (the “Project”).

(2) During the course of such Discussions and the Project it is anticipated that confidential information of Macmillan will be released verbally, in writing, or using magnetic or electronic media, or will otherwise be acquired by Mr Webb.

NOW IT IS HEREBY AGREED as follows:-

1. DEFINITION OF CONFIDENTIAL INFORMATION

Whether or not Macmillan designates specific information as confidential or proprietary, subject to the exceptions set out below, Mr. Webb shall regard all information or materials obtained from Macmillan as confidential and/or proprietary. Confidential and/or proprietary information and material obtained from Macmillan, together with extracts there from, summaries, analyses, compilations, and studies thereof that Mr. Webb generates during the course of Discussions or the Project, are considered and referred to in this Agreement as “Confidential Information”.

Confidential Information does not include information or documents that are: (a) now or subsequently become generally available to the public other than through negligent or intentional disclosure by Mr. Webb; (b) already rightfully in Mr. Webb’s possession; (c)
independently developed by Mr. Webb without the use of Macmillan’s Confidential Information; or (d) obtained by Mr. Webb from a third party which is not an agent of Macmillan and which has the right to transfer or disclose the information or documents; (e) is disclosed or published pursuant to the term of this.

During the course of the Project, it is acknowledged that certain Confidential Information shall be published within (i) Mr. Webb’s PhD research project, and (ii) academic journal(s). Any such publication shall only be deemed pursuant to the terms of this Agreement if Mr. Webb properly acknowledges Macmillan within the publication and where Macmillan has given their written consent to the publication (not to be unreasonably withheld) (“Permitted Uses”).

2. **TREATMENT OF CONFIDENTIAL INFORMATION**

2.1 Mr. Webb will keep Macmillan’s Confidential Information strictly confidential, will not disclose or reveal such Confidential Information to anyone other than those who have been identified by Macmillan as needing to know Macmillan’s Confidential Information for the purposes of the Discussions or the Project, or as otherwise required by law or government order (and treat such Confidential Information with the same care that they would accord to their own proprietary or confidential information).

2.2 Mr. Webb shall take all reasonable steps (including any security measures proposed by Macmillan from time to time) to safeguard the Confidential Information from unauthorised disclosure or use.

3. **DURATION OF OBLIGATIONS**

Mr. Webb shall treat such Confidential Information as strictly confidential and otherwise abide by the obligations set forth in clause 2 in perpetuity, except to the extent that one of the exceptions set forth in clause 1 subsequently applies to particular Confidential Information.

4. **NO WAIVER**

Failure to exercise, or any delay in exercising, any right or remedy provided under this agreement or by law shall not constitute a waiver of that or any other right or remedy, nor shall it preclude or restrict any further exercise of that or any other right or remedy.

5. **INTELLECTUAL PROPERTY**

All Intellectual Property Rights in Confidential Information shall be owned by Macmillan. Macmillan grants a royalty-free, fully paid up, perpetual non-exclusive licence to Mr. Webb to use and copy, with a right to sub-license to third parties (subject always to suitable terms of confidentiality), the Confidential Information for the Permitted Uses.

6. **ACKNOWLEDGEMENT**

Mr. Webb acknowledges that damages alone would not be an adequate remedy for the breach of any of the provisions of this agreement. Accordingly, without prejudice to any other rights and remedies it may have, Macmillan shall be entitled to seek the grant of equitable relief (including without limitation injunctive relief) concerning any threatened or actual breach of any of the provisions of this agreement by Mr. Webb.
7. ENTIRE AGREEMENT, GOVERNING LAW AND JURISDICTION

This Agreement constitutes the parties’ entire agreement with respect to Confidential Information disclosed for the purposes of the Project, supersedes all prior understandings concerning Confidential Information disclosed for the purposes of the Project, and may not be amended except by a written agreement signed by authorised representatives of both parties. This Agreement will be governed by and construed in accordance with English law and the parties submit to the exclusive jurisdiction of the English Courts.

IN WITNESS whereof the parties or their duly authorised representatives have executed this Agreement on the day and year first before written.

Signed by
Ms. Jo Foster
for and on behalf of
MACMILLAN CANCER SUPPORT

Signed by
Mr. Justin Webb
### APPENDIX 2. NATIONAL RESEARCH ETHICS SERVICE GUIDANCE FOR SERVICE EVALUATIONS (CHAPTER TWO)

**Differentiating clinical audit, service evaluation, research and usual practice/surveillance work in public health**

<table>
<thead>
<tr>
<th>RESEARCH</th>
<th>SERVICE EVALUATION</th>
<th>CLINICAL AUDIT</th>
<th>SURVEILLANCE</th>
<th>USUAL PRACTICE (in public health)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The attempt to derive generalizable new knowledge including studies that aim to generate hypotheses as well as studies that aim to test them.</td>
<td>Designed and conducted solely to define or judge current care.</td>
<td>Designed and conducted to produce information to inform delivery of best care.</td>
<td>Designed to manage outbreak and help the public by identifying and understanding risks associated.</td>
<td>Designed to investigate outbreak or incident to help in disease control and prevention.</td>
</tr>
<tr>
<td>Quantitative research - designed to test a hypothesis. Qualitative research - identifies explores themes following established methodology.</td>
<td>Designed to answer: &quot;What standard does this service achieve?&quot;</td>
<td>Designed to answer: &quot;Does this service reach a predetermined standard?&quot;</td>
<td>Designed to answer: &quot;What is the cause of this outbreak?&quot;</td>
<td>Designed to answer: &quot;What is the cause of this outbreak?&quot; and &quot;What?&quot;</td>
</tr>
<tr>
<td>Addresses clearly defined questions, aims and objectives.</td>
<td>Measures current service without reference to a standard.</td>
<td>Measures against a standard.</td>
<td>Systematic, statistical methods to allow timely public health action.</td>
<td>Systematic, statistical methods may be used.</td>
</tr>
<tr>
<td>Quantitative research - may involve evaluating or comparing interventions, particularly new ones. Qualitative research - usually involves studying how interventions and relationships are experienced.</td>
<td>Involves an intervention in use only. The choice of treatment is that of the clinician and patient according to guideline, professional standards and/or patient preference.</td>
<td>Involves an intervention in use only. The choice of treatment is that of the clinician and patient according to guideline, professional standards and/or patient preference.</td>
<td>May involve collecting personal data and samples with the intent to manage the incident.</td>
<td>Any choice of treatment is based on clinical best evidence or professional consensus.</td>
</tr>
<tr>
<td>Usually involves collecting data that are additional to those for routine care but may include data collected routinely. May involve treatments, samples or investigations additional to routine care.</td>
<td>Usually involves analysis of existing data but may include administration of interview or questionnaire.</td>
<td>Usually involves analysis of existing data but may include administration of simple interview or questionnaire.</td>
<td>May involve analysis of existing data or administration of interview or questionnaire to those exposed.</td>
<td>May involve administration of interview or questionnaire to those exposed.</td>
</tr>
<tr>
<td>Quantitative research - study design may involve allocating patients to intervention groups. Qualitative research - uses a clearly defined sampling framework underpinned by conceptual or theoretical justifications.</td>
<td>No allocation to intervention: the health professional and patient have chosen intervention before service evaluation.</td>
<td>No allocation to intervention: the health professional and patient have chosen intervention before audit.</td>
<td>Does not involve an intervention.</td>
<td>May involve allocation to control group to assess risk and identify source of incident but treatment unaffected.</td>
</tr>
<tr>
<td>Normally requires REC review. Refer to <a href="http://www.nres.nhs.uk/applications/approval-requirements">www.nres.nhs.uk/applications/approval-requirements</a> for more information.</td>
<td>Does not require REC review.</td>
<td>Does not require REC review.</td>
<td>Does not require REC review.</td>
<td>Does not require REC review.</td>
</tr>
</tbody>
</table>

* Service development and quality improvement may fall into this category.*
To print your result with title and IRAS Project ID please enter your details below:

Title of your research:
Understanding the reach, adoption, and effectiveness of a training intervention to influence the behaviour of healthcare professionals to provide physical activity advice to cancer survivors.

IRAS Project ID (if available):

You selected:
- 'No' - Are the participants in your study randomised to different groups?
- 'No' - Does your study protocol demand changing treatment/patient care from accepted standards for any of the patients involved?
- 'No' - Are your findings going to be generalisable?

Your study would NOT be considered Research by the NHS.
You may still need other approvals.
Researchers requiring further advice (e.g. those not confident with the outcome of this tool) should contact their R&D office or sponsor in the first instance, or the HRA to discuss your study. If contacting the HRA for advice, do this by sending an outline of the project (maximum one page), summarising its purpose, methodology, type of participant and planned location as well as a copy of this results page and a summary of the aspects of the decision(s) that you need further advice on to the HRA Queries Line at HRA.Queries@nhs.net.

For more information please visit the Defining Research table.

Follow this link to start again.

Print This Page.

NOTE: Using Internet Explorer please use browser print function.
Do I need NHS REC approval?

1. To print your result with title and IRAS Project ID please enter your details below:

   **Title of your research:**
   
   Understanding the reach, adoption, and effectiveness of a training intervention to influence the behaviour of healthcare professionals to provide physical activity advice to cancer survivors.

   **IRAS Project ID (if available):**
   
   You have answered 'No' to the question "Is your study research" which indicates that you do not need NHS approval.

   **Note:** Post Market Surveillance is NOT usually considered research. However, there are some circumstances where an NHS REC approval may be required. Please follow link below to start again and select YES at the first question to determine if your post market surveillance requires NHS REC approval.

   To understand how research is defined, please visit the [Is my study research?](link) decision tool.

   **Follow this link to start again.**

   [Print This Page]

   NOTE: If using Internet Explorer please use browser print function.
APPENDIX 3. PARTICIPANT INFORMATION SHEET (CHAPTER THREE)

This information sheet will be sent via email.¹⁶

UNIVERSITY OF SURREY

INFORMATION SHEET FOR PARTICIPANTS

VERSION 2.1 CREATED 8TH MARCH 2017

Title of Study: Understanding how health promotion information helps well-being in people living with and beyond cancer.

University of Surrey Ref: UEC/2017/023/FHMS

This study has been given a favourable ethical opinion by the University Research Ethics Committee. Date 15th March 2017

PLEASE KEEP THIS INFORMATION SHEET FOR FUTURE REFERENCE

Invitation

I am a PhD student at the University of Surrey from the Faculty of Health and Medical sciences. I would like to invite you to participate in this research study, which forms part of my PhD research. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. My details are at the end of this document.

¹⁶ The link to the participant information sheet sent to participants is available here - https://surreyfahs.eu.qualtrics.com/CP/File.php?F=F_e9fcmEpShYdo62x
Many thanks

Justin Webb

**What is the purpose of the study?**

The aim of this study is to understand the impact of different health promotion information on the well-being of people living with and beyond cancer.

This study will compare two different types of health promotion information; (1) provision of very brief well-being information plus guidelines, and (2) provision of very brief well-being information plus a pack of health promotion resources to support people living with and beyond cancer to change a lifestyle behaviour.

This study will allow for a greater understanding of the needs of people living with and beyond cancer, and how health promotion information can be better designed, developed, and distributed in the future.

**How is the project being funded?**

I am personally funding this PhD research project. The health promotion resources used in this study are already in the public domain and freely available to people living with and beyond cancer.

**Why have I been invited to take part?**

I am inviting you as someone who has had a cancer diagnosis, is aged over 18, with the ability to read and write English and provide informed consent. Others who meet these criteria have also been invited to take part. There are some however, that will not be able to take part in this study. You will be asked to complete a screening questionnaire before your involvement and if you are not able to take part, an explanation will be provided.

**Do I have to take part?**

Participation is voluntary. You do not have to take part. You should read this information sheet and if you have any questions, please ask me. You are free to withdraw from this study at any time, without giving any reason and without being disadvantaged in any way. You can
What will happen to me if I take part?

If you decide to take part, please follow this link add link to online consent form to provide your consent. I will then contact you to complete an online survey. This will involve providing information such as name, date of birth, gender, ethnicity, phone number and address details; some questions concerning your cancer, your cancer treatment, and your quality of life, as well as some well-being questions.

You will be assigned to one of two groups:

1. To receive very brief well-being information plus guidelines, or
2. To receive very brief well-being information plus a pack of health promotion resources to support people living with and beyond cancer to change a lifestyle behaviour.

These will be sent to you in the post. If you receive the guidelines, you will also receive the pack of health promotion resources 12 weeks later. You will be asked to complete a follow-up survey 12 and 24 weeks after your initial contact. Each survey should take no more than 15 minutes to complete. I ask that you complete all of the questions in the surveys, however, if you are unable or uncomfortable answering some of the questions, your incomplete surveys will still be accepted.

If you consent to do so, you may be invited to take part in a phone interview to gather your views on the health promotion information sent to you. This interview will last approximately 30 minutes and will be audio recorded and transcribed by me for review. You will be sent a copy of this transcription if you wish.

The information that you provide as part of this study will be published as a report, a copy of which will be sent to you on email. You are able to withdraw your data up to the point of publication. Your confidentiality and anonymity will be maintained, and it will not be possible to identify you in any publications. You will be offered the chance to take part in a debriefing phone call at the end of your involvement in the study should you wish. Your anonymised data may be used in future studies that have received all ethical, legal and
regulatory approvals. You may also be contacted in the future by University of Surrey researchers to invite you to participate in follow up studies to this project, or in future studies of a similar nature.

Please keep this document for future reference. If you require this document to be sent to you in the mail, please just let me know.

**What are the possible benefits and risks of taking part?**

As mentioned, this study will support a greater understanding of the needs of people living with and beyond cancer in regard to their well-being, and how health promotion information can be better designed, developed and distributed in the future. You will receive an electronic copy of the final report.

There are few risks from taking part in the study. You may find answering questions regarding your cancer distressing, and if so, I will be able to direct you to the support that you need. You will be provided with additional information to consider before making any changes to your lifestyle, to ensure that it is right for you.

**Will my taking part be kept confidential?**

Any data collected from you is regarded strictly confidential and will be held securely until the research is finished. All data for analysis will be anonymised. In reporting on the research findings, I will not reveal the names of any participants.

All project data (e.g. consent forms) will be held for at least six years and all research data for at least 10 years in accordance with University policy. Your personal data will be held and processed in the strictest confidence, and in accordance with the Data Protection Act.

All information gathered will be held on password-locked computers and University servers. Hard files will be kept in locked cabinets within the University. The online surveys will make use of Qualtrics™ software, which offers the highest levels of data security.

No identifiable data will be accessed by anyone other than me, members of the research team, and authorised personal from the University and regulatory authorities for monitoring purposes.
What will happen to the results of the study?

I will produce a final report summarising the main findings, which will be sent to you on email. I also plan to disseminate the research findings through publication and conferences.

Who should I contact for further information?

If you have any questions or require more information about this study, please contact me using the following contact details:

Justin Webb, Principal Researcher, School of Psychology (Room 23AC04), Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey, GU2 7XH. Email justin.webb@surrey.ac.uk

What if something goes wrong?

If you wish to make a complaint about the conduct of the study, you can contact Professor Chris Fife-Schaw, supervisor for this study using the details below:

Professor Chris Fife-Schaw, School of Psychology (Room 23AC04), Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey, GU2 7XH. Email c.fife-schaw@surrey.ac.uk. Phone 01483 68 6873

The University has in force the relevant insurance policies which apply to this study. In addition, the Sponsor has made arrangements, in the event of harm where no legal liability arises, for “non-negligent harm” claims. If you wish to complain or have any concerns about any aspect of the way you have been treated during the course of this study then you should follow the instructions given above.

Thank you for reading this information sheet and for considering taking part in this research.

If you decide to take part, please follow this link add link to online consent form to provide your consent
Dear

Thank you for being involved in this study.

Taking part in physical activity is important for everyone, including for people who have had a cancer diagnosis. Physical activity is about moving more.

The Macmillan Move More pack is enclosed. Please take the time to work your way through this pack. You will receive an e-newsletter to your email soon, and then once a month for the next three months. You can also access additional online tools at www.macmillan.org.uk/BeActive. Here you can, if you choose: -

- Post your questions, on a public forum, to a cancer specialist physiotherapist.
- Talk about being active on our online public forum.
- Watch the Move More DVD (included) online if you do not have a DVD player.
- Watch personal stories of others living with cancer who have become active.
- Download useful apps to your smartphone, including an app to help reduce your time spent sitting, and a pedometer app to help you count your daily steps.

It’s important to keep physically active and there are few risks. But you may need to be careful with the activities you choose. Please also take the time to read the information on page 19, and pages 30 to 34 of the enclosed Physical Activity and Cancer booklet. Remember to start slow and build up gradually. Contact your General Practitioner or your Cancer Care Team if you have any concerns.
Thank you for taking the time to complete the survey. I will contact you again via email in 12-weeks’ time with the next survey.

Yours sincerely

Justin Webb.
Thank you for being involved in this study.

Taking part in physical activity is important for everyone, including for people who have had a cancer diagnosis. Physical activity is about moving more. The guidelines for physical activity are enclosed.

It’s important to keep physically active and there are few risks. But you may need to be careful with the activities you choose. Please also take the time to read the general safety information enclosed.

Thank you for taking the time to complete the survey. I will contact you again via email in 12-weeks’ time with the next survey.

Yours sincerely

Justin Webb.
General safety information

Don’t exercise if you feel unwell, have an infection or high temperature, or have any symptoms that worry you. Wear well-fitting trainers and drink plenty of water so you don’t get dehydrated. Have a healthy snack such as a banana after exercising. Avoid uneven surfaces and activities that increase the risk of falling or hurting yourself, especially if you have bone problems. If you have another medical condition, such as heart or lung problems ask your doctor for advice.

Stop if you experience any sudden symptoms, including feeling dizzy, chest pain, a racing heart, breathing problems, feeling sick, unusual back or bone pain, muscle weakness or a persistent headache. Contact your doctor if you notice any of these, or any other symptoms.

Remember to start slow and build up gradually. Contact your General Practitioner or your Cancer Care Team if you have any concerns.

Specific information that may apply to you

If you are having chemotherapy

Chemotherapy lowers the number of cells in your blood. If your white cells are low you’re at more risk of getting infections. You should avoid public gyms and swimming pools until your white blood cells are back to a normal level.

If you have a peripherally inserted central catheter (PICC) line

If you have a central or PICC line, avoid swimming because of the risk of infection. Don’t do any type of vigorous upper body exercises that could possibly displace your line.

If your platelets (they help the blood to clot) are low, you are more at-risk bruising or bleeding. Only take gentle physical activity until your platelets recover.

If your red cells are very low (anaemia), you will feel very tired and sometimes breathless. Only do day-to-day activities until the anaemia improves.

If you have a skin reaction or redness due to the radiotherapy, avoid swimming as the chemicals in the water can irritate your skin. After treatment when any redness or skin reaction has gone it's no longer a problem.
If you have peripheral neuropathy (nerve damage)

Some chemotherapy drugs can damage the nerves. This causes numbness or tingling in your hands or feet, muscle weakness or difficulty with balance and coordination. If your feet or balance are affected, running or brisk walking especially on uneven surfaces, may not be the best activities for you. Cycling or swimming may be more suitable. Remember to check your feet regularly for cuts or blisters.

If you have lymphoedema

Always wear a compression garment when you exercise. Avoid doing lots of repetitive action with the affected limb. Swimming can be helpful if you have lymphoedema as it gently massages the lymphatic vessels. Build up the physical activity involving your arm or leg slowly.

If you are on medicines to thin the blood

If you’re taking medicine to thin the blood, avoid high-impact activities, for example, running, jogging, football, tennis, squash or hockey, that could result in bruising from a fall or blow.

If you have a stoma

Those with a stoma should avoid participation in contact sports and weight training unless first approved by a Doctor.
Physical activity guide for adults

**Be active**
Keep your heart and mind healthy

**Build strength**
Strengthen muscles, bones and joints

**Improve balance**
Reduce your risk of falling

**How often?**
- **150** minutes of moderate activity a week
- **75** minutes of vigorous activity a week
- **2** days a week
- **2** days a week

**Examples of activities:**
- Walk
- Run
- Gym
- Dance
- Gardening
- Sport
- Aerobics
- Tai chi
- Swim
- Stairs
- Carry bags
- Bowling

**Sit less**
Break up long periods of sitting down to help keep your muscles, bones and joints strong.

UNIVERSITY OF SURREY
WE ARE MACMILLAN CANCER SUPPORT
Dear Justin,

Thank you for registering with FACT! If you've registered for a translation of a FACT scale, we will contact you with the questionnaire via email. If you've registered to use an English version but require a letter of permission, please send an email to information@facit.org and we will respond. If you don't hear from us within five days, please send an email to information@facit.org. Below is a summary of your information:

Summary of web form submission:

Your Name
Justin Webb
Email Address
justin.webb@surrey.ac.uk
Case Number
13638905
Company
University of Surrey
Username
justin.webb@surrey.ac.uk
Password
******
Work Address
University of Surrey
Guildford
Surrey
GU2 7XH
United Kingdom

Cell Phone Number
07855943816

Terms of Use
I Accept the Terms of Use
Department within Company
Psychology
Study Type
Randomised waiting list control trial
Study Title
Understanding how health promotion information helps wellbeing in people living with cancer.
Funding Source
Self-funded
Total expected or actual number of study participants
198
Questionnaire(s)
FACT-G7
Countries or Language(s)
United Kingdom. English.
Thank you for your involvement in this research study. This study has been reviewed and received a favourable ethical opinion from the University of Surrey Ethics Committee. Please answer the questions below. Compulsory questions are marked with an asterisk.

1*. Name: ____________________

2*. Date of Birth:______/_______/_______

3*. Address: ___________________

4*. Telephone number: _______________

5. Gender:

☐ Male    ☐ Female    ☐ Unspecified ☐ Prefer not to say

6. What is / was the site of your primary cancer?

☐ Breast.

☐ Prostate.

☐ Lung.

☐ Bowel.

☐ Melanoma Skin Cancer.

☐ Non-Hodgkin Lymphoma.

☐ Kidney.

☐ Head and Neck.

☐ Brain, other CNS and intracranial.

☐ Bladder.

☐ Pancreas.

☐ Leukaemia.

☐ Uterus.
☐ Oesophagus.
☐ Ovary.
☐ Stomach.
☐ Liver.
☐ Myeloma.
☐ Thyroid.
☐ Cervix.
☐ Other: Please specify: ____________________

7. How long has it been since diagnosis of your primary cancer? Please state in years and months for example, 1-year and 5-months.

________________________________________________________________________

8. What treatment have you received for your cancer? Tick all that apply.

☐ Radiotherapy.
☐ Chemotherapy.
☐ Surgery.
☐ Immunotherapy.
☐ Hormone Therapy.
☐ Stem cell transplant.
☐ Active surveillance (close monitoring but no current intervention).
☐ I have not yet started treatment.
☐ Other: Please specify: ____________________
9. How long is it since you completed your treatment for your cancer?
- I have not yet started treatment.
- I am still having treatment.
- Less than 3-months.
- Between 3 and 12-months.
- Between 1 and 5-years.
- More than 5-years.
- Don’t know / Can’t remember.

10. What was the response to your treatment?
- I am in remission.
- My cancer has been treated but is still present.
- My cancer has come back since my initial treatment.
- My cancer was not treated.
- I am not sure.
- Don’t know / Can’t remember.

11. What is your ethnic group?
- White English / Welsh / Scottish / Northern Irish / British.
- White Irish.
- White Gypsy or Irish Traveller.
- Any other White background.
- White and Black Caribbean.
- White and Black African.
- White and Asian.
- Any other Mixed / Multiple ethnic background.
- Indian.
☐ Pakistani.
☐ Bangladeshi.
☐ Chinese.
☐ Any other Asian background.
☐ Black African.
☐ Black Caribbean.
☐ Any other Black / African / Caribbean background.
☐ Arab.
☐ Any other ethnic group.
☐ Prefer not to say.

12a*. Considering a normal 7-day period before your cancer diagnosis, how many times on average did you do the following kinds of exercise for more than 15-minutes during you free time (enter on each line the appropriate number).

<table>
<thead>
<tr>
<th>Exercise Type</th>
<th>Times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRENUOUS EXERCISE (HEART BEATS RAPIDLY) for example, running, jogging, cycling, vigorous individual or team sports, vigorous swimming.</td>
<td></td>
</tr>
<tr>
<td>MODERATE EXERCISE (NOT EXHAUSTING) for example, fast walking, easy bicycling, sports such as tennis, volleyball or badminton, easy swimming, dancing.</td>
<td></td>
</tr>
<tr>
<td>MILD EXERCISE (MINIMAL EFFORT) for example, yoga, pilates, bowling, fishing, golf, easy walking.</td>
<td></td>
</tr>
</tbody>
</table>

12b*. Considering a normal 7-day period before your cancer diagnosis, during your leisure-time, how often did you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

- OFTER
- SOMETIMES
- NEVER / RARELY

□  □  □
13a*. Considering a normal 7-day period **within the last month** (or since your cancer diagnosis if diagnosed less than a-month-ago), how many times on average did you do the following kinds of exercise for **more than 15-minutes** during you **free time** (enter on each line the appropriate number).

<table>
<thead>
<tr>
<th>Exercise Type</th>
<th>Times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRENUOUS EXERCISE (HEART BEATS RAPIDLY)</td>
<td></td>
</tr>
<tr>
<td>for example, running, jogging, cycling, vigorous individual or team sports, vigorous swimming.</td>
<td></td>
</tr>
<tr>
<td>MODERATE EXERCISE (NOT EXHAUSTING)</td>
<td></td>
</tr>
<tr>
<td>for example, fast walking, easy bicycling, sports such as tennis, volleyball or badminton, easy swimming, dancing.</td>
<td></td>
</tr>
<tr>
<td>MILD EXERCISE (MINIMAL EFFORT)</td>
<td></td>
</tr>
<tr>
<td>for example, yoga, pilates, bowling, fishing, golf, easy walking.</td>
<td></td>
</tr>
</tbody>
</table>

13b*. Considering a normal 7-day period **within the last month** (or since your cancer diagnosis if diagnosed less than a-month-ago), during your leisure-time, how often did you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>☐</th>
<th>☐</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFTER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SOMETIMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEVER / RARELY</strong></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Below is a list of statements that other people with cancer have said are important. Please mark one number per line to indicate your response as it applies to the past 7-days.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a lack of energy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I have pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I have nausea.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I worry that my condition will get worse.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am sleeping well.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am able to enjoy life.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am content with the quality of my life right now.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

On a scale of 1 to 10 where 1 = not at all confident, and 10 = very confident, how confident are you that you will be physically active in situations such as the following: feeling tired, bad mood, not having the time, on vacation, bad weather?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Thank you for completing this survey. We will be in touch again in 12-weeks-time. In the meantime, if you have any concerns please contact Justin Webb, Principal Researcher at justin.webb@surrey.ac.uk
FOLLOW-UP QUESTIONNAIRE

*Only those in the intervention arm complete questions 8 and 9 at 12-weeks. Questions 6 to 9 will not be asked of the intervention arm participants at 24-weeks.*

Thank you for your involvement in this research study. This study has been reviewed and received a favourable ethical opinion from the University of Surrey Ethics Committee. Please answer the questions below. Compulsory questions are marked with an asterisk.

1*. Name: ____________________

2*. Date of Birth:______/_______/_______

3a*. Considering a normal 7-day period *within the last month*, how many times on average did you do the following kinds of exercise for *more than 15-minutes* during your *free time* (enter on each line the appropriate number).

<table>
<thead>
<tr>
<th>Exercise Type</th>
<th>Times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRENUOUS EXERCISE (HEART BEATS RAPIDLY) for</td>
<td></td>
</tr>
<tr>
<td>example, running, jogging, cycling, vigorous</td>
<td></td>
</tr>
<tr>
<td>individual or team sports, vigorous swimming.</td>
<td></td>
</tr>
<tr>
<td>MODERATE EXERCISE (NOT EXHAUSTING) for example,</td>
<td></td>
</tr>
<tr>
<td>fast walking, easy bicycling, sports such as</td>
<td></td>
</tr>
<tr>
<td>tennis, volleyball or badminton, easy swimming,</td>
<td></td>
</tr>
<tr>
<td>dancing.</td>
<td></td>
</tr>
<tr>
<td>MILD EXERCISE (MINIMAL EFFORT) for example,</td>
<td></td>
</tr>
<tr>
<td>yoga, pilates, bowling, fishing, golf, easy</td>
<td></td>
</tr>
<tr>
<td>walking.</td>
<td></td>
</tr>
</tbody>
</table>

3b*. Considering a normal 7-day period *within the last month*, during your leisure-time, how often did you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

<table>
<thead>
<tr>
<th>Frequency</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OFTER</td>
<td></td>
</tr>
<tr>
<td>SOMETIMES</td>
<td></td>
</tr>
<tr>
<td>NEVER / RARELY</td>
<td></td>
</tr>
</tbody>
</table>

☐ ☐ ☐
4*. Below is a list of statements that other people with cancer have said are important. Please mark one number per line to indicate your response as it applies to the past 7-days.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a lack of energy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I have pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I have nausea.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I worry that my condition will get worse.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am sleeping well.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am able to enjoy life.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I am content with the quality of my life right now.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

5*. On a scale of 1 to 10 where 1 = not at all confident, and 10 = very confident, how confident are you that you will be physically active in situations such as the following, feeling tired, bad mood, not having the time, on vacation, bad weather?

<table>
<thead>
<tr>
<th>Scale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

6*. Had you used the Macmillan Move More pack and/or the online tools before your involvement in this study?

YES       NO

☐         ☐

6a. If yes, please provide more details as to when and how you used the Macmillan Move More pack and/or the online tools.
**7*. Did you make use of the Macmillan Move More pack and/or the online tools during the last 12-weeks? *Intervention arm* If no, please go to question 8. *Those in the control arm will not be asked question 7a, regardless of their answer to question 7.*

**YES**  
**NO**

☐  
☐

**7a*. If yes, please indicate in the tables below which elements of the Move More pack you used, and how often you used them.

**The Move More Pack**

<table>
<thead>
<tr>
<th>Element</th>
<th>I used this often</th>
<th>I used this sometimes</th>
<th>I used this but rarely</th>
<th>I did not used this</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Physical Activity and Cancer booklet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Wall Chart.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ‘Activity in daily life’ flyer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ‘Gardening’ flyer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ‘Swimming’ flyer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ‘Get Back into Sport’ flyer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ‘Walking flyer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Move More DVD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The printed elements of the Move More pack.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The ‘Getting started’ section.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The ‘Setting goals and staying active’ section.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### The Online Tools at [www.macmillan.org.uk/BeActive](http://www.macmillan.org.uk/BeActive)

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>I used this often</th>
<th>I used this sometimes</th>
<th>I used this but rarely</th>
<th>I did not use this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talk about being active – the online forum.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ask the experts about being active – The ‘ask a physio’ forum.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Find activities near you.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The video personal stories.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Move More DVD online.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The digital resources – apps to help you get active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8*. Please indicate how much you agree or disagree with this statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree Strongly</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>I did not read the newsletters</th>
</tr>
</thead>
<tbody>
<tr>
<td>The e-newsletters were helpful in getting me more active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. If there is anything else that you would like to add on your use of the Move More pack and/or online tools, please add it in the box below.

Thank you for completing this survey. If you have any concerns please contact Justin Webb, Principal Researcher at [justin.webb@surrey.ac.uk](mailto:justin.webb@surrey.ac.uk).
15 March 2017

Dear Justin

UEC ref: UEC/2017/023/FHMS

Study Title: A randomised waiting list control trial, with embedded process evaluation, to investigate the impact of health promotion information on the wellbeing of people living with and beyond cancer.

On behalf of the Ethics Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the submitted protocol and supporting documentation.

Date of confirmation of ethical opinion: 14 March 2017

The final list of documents reviewed by the Committee is as follows:

<table>
<thead>
<tr>
<th>Document</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics Application Form</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Study Protocol</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 1a: e-Newsletter month one</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 1b: e-Newsletter month two</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 1c: e-Newsletter month three</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 2: Participant information</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 3a: Brief health education information, and the physical activity guidelines, for those in the control arm</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 3b: Brief health education information, and the pack of health promotion information, for those in the intervention arm</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 4: Screening questionnaire</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 5: Baseline questionnaire</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 6: Follow-up questionnaire, administered 12 and 24 weeks from baseline</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 7: Interview topic guide</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 8: Risk assessment</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
<tr>
<td>Supplementary file 9: Participant consent form</td>
<td>1</td>
<td>21 Feb 2017</td>
</tr>
</tbody>
</table>
This opinion is given on the understanding that you will comply with the University’s Ethics Handbook for Teaching and Research and have completed mandatory Health and Safety training provided by the University of Surrey.

If the project includes distribution of a survey or questionnaire to members of the University community, researchers are asked to include a statement advising that the project has been reviewed by the University’s Ethics Committee.

If you wish to make any amendments to your protocol please address your request to the Secretary of the Ethics Committee and attach any revised documentation.

The Committee will need to be notified of adverse reactions suffered by research participants, and if the study is terminated earlier than expected with reasons. Please be advised that the Ethics Committee is able to audit research to ensure that researchers are abiding by the University requirements and guidelines.

You are asked to note that a further submission to the Ethics Committee will be required in the event that the study is not completed within five years of the above date.

Please inform me when the research has been completed.

Yours sincerely

[Signature]

Mr Andrew McClave
Clinical Research governance Officer
APPENDIX 9. INTERVIEW TOPIC GUIDE (CHAPTER FOUR)

Structure

These questions are to be used to lead discussion. They do not have to be rigidly followed and are for guiding purposes only. The interviewer is to use his judgement to ensure that information is gleamed from each topic area.

Introduction:

- Name and role
- Thank participant for their time
- Inform the participant that the interview is being recorded and explain how the data will be used
- Briefly recap the study aims and outcomes
- Ensure that participant is happy to continue

General questions:

- So, how have you found the last 12-weeks in regard to your physical activity?
- So, can you tell me about your use of the Move More pack including the online tools?
- Which elements have you found particularly useful?
  - Why? What did you like about it? What encouraged you to use that element? Which particular sections of this element did you find useful and why?

[Try and identify the specific element, section and behaviour change technique]

- Which elements did you not find useful?
  - Why? What was it that put you off using this element?

For elements not mentioned during the questioning above, and based on their response to questions 7a and 8 in the follow-up questionnaire, ask the following:

- Can you tell me why you used [element, including online tools] [often, sometimes, rarely]?
  - How did it help if at all? What did you like / dislike about it? What encouraged / discouraged you to use that element? Which particular sections of this element did you find / not find useful and why?

[Try and identify the specific element, section and behaviour change technique]

- Why did you not use the [element, including online tools]?
  - What was it that put you off using this element?
If not already covered:

- What are your views on the e-newsletters? How did they help you, if at all? What stood out? What can you remember of the newsletters?

Views of the Move More Pack as a whole:

- What did you think of this information overall? What would you change? Is there anything missing that you would like included?

Conclusion:

- Is there anything that you would like to add or talk about that you think is of relevance to this study?"

Thank participant for their time and inform them of the next steps.
### APPENDIX 10. PROCESS EVALUATION QUALITATIVE DATA: INITIAL CODING (CHAPTER FOUR)

<table>
<thead>
<tr>
<th>Initial codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barriers to physical activity</strong></td>
</tr>
<tr>
<td>Classes not suitable</td>
</tr>
<tr>
<td>Confidence</td>
</tr>
<tr>
<td>Consequences of cancer treatment</td>
</tr>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Disillusioned</td>
</tr>
<tr>
<td>Family</td>
</tr>
<tr>
<td>Fatigue</td>
</tr>
<tr>
<td>Fitness level</td>
</tr>
<tr>
<td>Guilt</td>
</tr>
<tr>
<td>Healthcare Professional</td>
</tr>
<tr>
<td>Inertia</td>
</tr>
<tr>
<td>Joint pain</td>
</tr>
<tr>
<td>Lack of knowledge</td>
</tr>
<tr>
<td>Lack of local activities</td>
</tr>
<tr>
<td>Lack of motivation</td>
</tr>
<tr>
<td>Low priority</td>
</tr>
<tr>
<td>Mental well-being</td>
</tr>
<tr>
<td>Motivation</td>
</tr>
<tr>
<td>Rest is best</td>
</tr>
<tr>
<td>Social isolation</td>
</tr>
<tr>
<td>Social stigma</td>
</tr>
<tr>
<td>Support</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>Weather</td>
</tr>
<tr>
<td>Weight gain</td>
</tr>
<tr>
<td>What is safe</td>
</tr>
<tr>
<td>Work</td>
</tr>
<tr>
<td><strong>Drivers of physical activity</strong></td>
</tr>
<tr>
<td>Active travel</td>
</tr>
<tr>
<td>Apps</td>
</tr>
<tr>
<td>Being outside</td>
</tr>
<tr>
<td>Body image</td>
</tr>
<tr>
<td>Commitment</td>
</tr>
<tr>
<td>Confidence</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Convenience</td>
</tr>
<tr>
<td>Activities of daily living</td>
</tr>
<tr>
<td>Coping</td>
</tr>
<tr>
<td>Dog</td>
</tr>
<tr>
<td>Enjoyment</td>
</tr>
<tr>
<td>Family support</td>
</tr>
<tr>
<td>Fear</td>
</tr>
<tr>
<td>Fighting back</td>
</tr>
<tr>
<td>General health benefits</td>
</tr>
<tr>
<td>Guilt</td>
</tr>
<tr>
<td>Healthcare Professionals</td>
</tr>
<tr>
<td>Knowledge</td>
</tr>
<tr>
<td>Local opportunities</td>
</tr>
<tr>
<td>Makes me feel normal</td>
</tr>
<tr>
<td>Mental well-being</td>
</tr>
<tr>
<td>Motivation</td>
</tr>
</tbody>
</table>
Overcome consequences of treatment
Physical function
Planning and listening to my body
Routine and habit
Someone to be active with
Structure
To lose weight
Turning point
Weight management
Well-being
Work

Context
Activated
Cancer journey
Fear of cancer coming back
Information overload
Information gatherer
Links to obesity
Mental well-being
Not working
Online support
Physical activity definition
Physical activity reduced due to cancer
Pack of information at diagnosis and treatment
Positive approach
Self-identity
Time to put my feet up
Treatment
Weight gain from cancer
Working

Move More Pack
Barriers to use
Book format
Digital overload
Don’t use digital
Get away from cancer
Lost in the noise
Physical activity low priority
Patronizing
Prescribed exercise
Remembering to use
Time
Too much info

Components
Action planning
Activities near me
Activity diary
Ask the expert
Barrier identification
Booklet
Case studies
Credible source
Digital apps
<table>
<thead>
<tr>
<th>Benefits</th>
<th>Action / Intention</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity suggestions</td>
<td></td>
<td>Feel the benefits</td>
</tr>
<tr>
<td>Continued activity</td>
<td></td>
<td>Routine</td>
</tr>
<tr>
<td>Fighting back</td>
<td></td>
<td>Weight loss</td>
</tr>
<tr>
<td>Guidance</td>
<td></td>
<td>With family</td>
</tr>
<tr>
<td>Involved family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level that is right for me</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raised importance of physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redefines physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforcing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removes pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stood out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstructured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campaign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professionals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General views</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relevance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – already active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – no treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – cancer type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – too late in journey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – too lazy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not for me – too simplistic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For inactive people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For unhealthy people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For those who need guidance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat relevant – lots of info not for me</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very relevant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types of physical activity</td>
<td>Who useful for and when</td>
<td>Activities of daily living</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Family</td>
<td>Gave away</td>
<td></td>
</tr>
<tr>
<td>Intention to use</td>
<td>Occasional use</td>
<td></td>
</tr>
<tr>
<td>Reference use</td>
<td>Regular use</td>
<td></td>
</tr>
<tr>
<td>Single use</td>
<td>Storage</td>
<td></td>
</tr>
<tr>
<td>Who useful for and when</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities of daily living</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dancing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise for exercise sake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home-based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and intensity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstructured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking sports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work-related activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise on referral</td>
<td></td>
<td>Classes</td>
</tr>
</tbody>
</table>
### APPENDIX 11. ADDITIONAL DATA EXTRACTS TO SUPPORT THE IDENTIFIED CANDIDATE THEMES (CHAPTER FOUR)

**Candidate theme: Capitalising on a teachable moment**

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Data extract</th>
</tr>
</thead>
</table>
| **Timing**         | I think it is important right at the first stage, almost as soon as there is a hint that unfortunately you’ve got something like this. (Nigella)    

Perhaps maybe following surgery or pre-surgery or pre-chemo treatment or radiotherapy treatment knowing that it’s going to knock you for six energy wise…so it would be worth having this ready. (Carmen)

It would have been really good to have had it at the beginning stages. It would have been good to have had that at the early stages…I wish it had been there earlier on, I'm really happy I've got it now. (Zara)

Probably during treatment. Because at diagnosis stage you're still, well I was, I was still trying to come to terms with it and just deal with actually the diagnosis and what was going to happen and everything else around me. So, it would have been probably during the treatment really that it would have been good. (Zara)

I thought it was, I don’t know, I suppose I thought it was just one of those first few months after having cancer and getting back into it. (Katherine)

Some people I would think might feel that their body had taken a bit of a battering and they were looking for a gentle way to kind of build it back up and I do think it would be helpful to a lot of the people (Becky)

I believe the Move More pack and online tools are an invaluable help to people recovering from cancer. (Survey respondent, 70-year-old female who had just completed treatment, less than three months previous, and was in remission for breast cancer) |
| **Positive attitude** | I wanted to be more active. (Danielle)    

[Treatment] was a real, real shock to my system and then I’ve tried, I tried to walk a couple of hundred yards, I’d get breathless and whatever, and so what I did I started setting myself goals and I used to try and walk around the garden. And it was a big achievement for me if I could round it ten |
| **A lot to read but very useful** | I like reading and I’m, you could just identify with all the bits it’s trying to point at…All the key things like setting your targets, getting access to information and don’t give up and then all the literature and how you can plot and plan things. I can’t remember what I used, I used a combination of it. (Ellen)

It was very relevant, yeah very good, yeah it had all the information in there, full of information, very beneficial…It stayed at home, so obviously at the end of the day or whenever when I would write that down I would always use it, it’s always close by me you know at home where I sit of an evening. (Carmen)

I know exactly where it is if I wanted to read it again. It’s on a table in the front room with a booklet that I got from the Macmillan Nurses. I keep all that sort of thing together. So, if I did want to re refer to it I know where it is. (Serena)

I did the 12-week activity chart. I started it back in July. I think I’ve still got some weeks to go. Yeah, I’ve still got a couple of weeks to go, this week and next week, and then I’ll have finished doing the 12-week activity chart. It’s useful just to keep as a diary, yeah, because you get a sense of achievement when you write things down, I think… I didn’t do any of the other written exercises, I just read things, but I didn’t actually write things in… I thought, oh I’m just doing it for myself, there’s no point, because I’m writing it down on the chart anyway. So, I didn’t do the diary. (Danielle)

I think I thought it was bigger than I thought it was going to be. (Claire)

I have been working with my NHS Physiotherapist and Occupational Therapist and used my Move More goals in tandem. (Survey respondent, 74-year-old female in remission from breast cancer) |
| **The DVD is a great starting point** | Even when you’re going through chemotherapy you can still do these light exercises from the DVD and if you’re indoors because a lot of the time you are indoors, if you’re tired and you haven’t got the energy to go out it’s nice just to be able to sit on a chair and just put the DVD on and just do what you can. (Carmen)

I could only just manage to do what they were doing anyway and had to build up to it… when I first started off, obviously I couldn’t do the lot, I could just start off with the warm up, and the next day I’d try and do a little bit more, and then before you know it you’re getting through the video |
without even thinking about it, in a very short space of time actually…I used it a lot because I was starting from [a low point]. (Ellen)

I thought it was really good, the fact that you got the DVD in it, I did briefly have a look at it, but I didn’t use it, I didn’t actually do the DVD, I did other exercise instead. But, I thought, for people that couldn’t get out of the house and go to the gym, or swim or anything that was a really, really good idea. (Serena)

I enjoy the DVD and do use it when time permits. (Survey respondent, 81-year-old female in remission from Bowel cancer)

<table>
<thead>
<tr>
<th>Online is not for me</th>
<th>I didn’t use the online forum …I didn’t do that because I didn’t think I needed that, I don’t need that, I was quite happy doing what I was doing myself. (Carmen)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I’m not very good with phones probably. (Ellen)</td>
</tr>
<tr>
<td></td>
<td>I didn’t even think about it to be honest. I’m so busy I think I’d just sooner go and do the exercise rather than mess around with technology, since I’ve got over 45 I’m not as interested in it as I used to be. (Serena)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I want advice and the Pack</th>
<th>If I, when I’d been getting cancer if I’d got that pack I’d have been really happy because actually I did use a lot of MacMillan packs while I was being treated and throughout the whole thing… I did look at the wallchart… I think it was quite a useful thing… I do think it’s, it is quite handy to have a record of things and also, I think it would be quite handy to see how you're building up, especially if you're told to build back up gradually (Zara)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I think that it is important that people understand activity is important and why it’s important for them. And then moving to help people improve their activity levels. But if they’re not understanding the first message, the second one doesn’t work. (John)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moving more</th>
<th>Reading all the stuff now about the benefits it gives for preventing recurrence, that’s probably my main motivation now. (Danielle)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I feel stronger, I feel happy, I feel like I’m more healthier in a way…I’ve still got a lot of things still wrong with my body through the chemotherapy and it all [physical activity] helps. So, I’m in less pain, not that I was in a lot of pain…I’m [in] less discomfort now, I’m happier, I’m healthier, I can move and I’m probably fitter now than I was before I was actually diagnosed, and that’s all through exercise. And it all started with a, the DVDs and the Macmillan pamphlets…I wish I’d have done it, I wish now,</td>
</tr>
</tbody>
</table>
I’d have looked back, I think I wouldn’t’ve got some, that myself, that my body wouldn’t have got in such a bad way. (Ellen)

It would give me the confidence to know that, should I have to go through treatment and when you are having trouble getting off the settee, let alone walking round the room, that it will improve if you just do a little bit each day, just keep pushing it, gradually you will get better. (Nigella)

I think we’ve all got that thing where we quite like to see what we’re doing, it motivates you a bit, doesn’t it and the fact that my husband was looking at what I was doing as well, it got him up and off his backside too. He could see how much more exercise I was doing. So, yeah, I think it just got us both moving and it’s a motivational thing. (Serena)

I think it’s just the comfort of knowing where it is, because now I’m in a routine, I’m doing the exercise now, I don’t feel I need it. (Serena)

I have joined the gym, and am enjoying swimming, Pilates, yoga and cardio. I feel so much better, it is helping my busy mind and also helping me sleep. (Survey respondent, 41-year-old female living with melanoma skin cancer)

Found the pack motivational. Gave me an idea of how much I should be doing. Then attended gym classes most days. (Survey respondent, 61-year-old female who has completed treatment for Bowel cancer within the last 3-months, outcome unknown)

They have been a great motivator for me to use during my cancer treatment. After my treatment finishes in the next week, I hope to build on the activities I have been involved in. (Survey respondent, 61-year-old female in treatment for breast cancer)

I have been going through a period of scans and tests and have found this a very stressful few months. I am just starting back with my exercise goals and hope to use the resources more readily as I go forward. I need to recognise and acknowledge that exercise can and does help whilst I'm going through challenging health worries. (Survey respondent, 39-year-old female in remission for over 2-years from breast cancer)

When you sent it, it encouraged me to do more (Survey respondent, 67-year-old female in remission for over one year from thyroid cancer)

They [the elements of the revised Move More Pack] have been a great motivator for me to use during my cancer treatment. After my treatment finishes in the next week, I hope to build on the activities I have been involved in. Exercising has become addictive in a good way. After I started
I just wanted to do more, it made me feel better and more confident. (Survey respondent, 62-year-old female with breast cancer still in treatment)

**Candidate theme: Not sure it’s for me, but it’s useful**

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Data extract</th>
</tr>
</thead>
</table>
| Already moving    | I’ve always said this, when you do exercise it makes you feel better. You have to sometimes push yourself to do it because it’s much easier to sit down and not do anything…I’d take my dog for a walk, or I’d just have a walk around the block or whatever. And I can really see how that exercise helped me not just physically but mentally, hugely mentally…I think it’s a huge, huge thing of how you cope with cancer is physical, the physical side of things and that definitely helps with the mental side of things. (Linda) It gave me normality. It made me feel like, and I can forget sometimes. You do forget. So, if I’m out in, hoovering or taking the dog, you forget about what’s actually happening to you and I think that does you good. (Linda) I’ve always loved the water. I find going swimming really relieves tension and also it focusses my mind, it helps me relieve a lot of stress. (Penny) I am still working and so for me, my activity was being able to keep going. (Nigella) Maybe it’s fear. Maybe it’s knowing that I need to keep moving and not wanting to stagnate. I think the more I sit and, I actually do a lot of meditation as well, so I do a lot of sitting but that inactivity is when some negative thoughts can creep in. (Helen) The exercise is sort of coincidental [from work]. And it also makes me feel very, very good, you know, obviously endorphins, and a feeling of having achieved something as well. (Helen) My team have told me not to worry about my weight but I’m still very sensitive about the fact that I have put on some weight, but I know that I am being active and giving my body the best shot really. (Penny) I do also walk my son to school most days, not every single day but most days. (Katherine) I am 81! I believe strongly that getting out of the house and into the fresh air is good for us all. So, I was converted before receiving and reading the
I didn’t use all of it, but I did use some of it

It's not that the information in them isn't useful, it's just that you lose them somewhere in paperwork and then forget about them...I probably revisited it about two or three times...I did write some goals in and I did put some daily activities in... There’s a chart and it tells you whether it’s balance or stamina or strength. So, they were really useful as well. (Katherine)

I’m a person who likes all the information and then I can filter through it on my, in my own time and digest it then make my own decisions...I opened it and I straightaway read it from [start to finish] and read all that was involved in it...So I have looked at it on occasion as well again and going back to stuff. (Linda)

So, I did give it a quick read through and I said right, OK, yeah, do that, do that, do that. I’m not sure how applicable it is so much for me, I might not be in the main type of patient you were aiming at... I did find that a lot is repeated. (Nigella)

I would say, this is a nice gentle read that you can pick up when you want. You can decide what you’re going to do. You’re not saying, right you’ve got to do this, this and this within this time...I’ve still got it, still got it, in a box, in actually our little letterbox and I was thinking about that the other day actually. It’s something you can pick and put down... a few times I’d read bits of it (Penny)

It had that table of how much to do which I feel is good and one reason why I suppose I filled in the activity chart as well. (Claire)

I did look at the wallchart... I think it was quite a useful thing... I do think it’s, it is quite handy to have a record of things and also, I think it would be quite handy to see how you're building up. (Zara)

That’s what I used [the wall chart] just to track what I was doing every day. ..It was just nice to have something visual isn’t it? To keep a record of what you’re doing. Otherwise you just go past weeks not really knowing. So, it was nice to see, and it made me see as well, the tired weeks where I wasn’t so much and yeah, just keep tracking really. (Lucy)

I must watch that DVD and it is there to be watched. (Karen)

As I’ve been doing this survey over the summer I've not made much use of the Move More DVD. But I would definitely use it when the weather is bad
or over the Winter months. (Survey respondent, 49-year-old female still in treatment for breast cancer)

I read the Move More booklet and enclosures through once. I agreed with the philosophy behind the materials. (Survey respondent, 53-year-old female in treatment for breast cancer)

<table>
<thead>
<tr>
<th>I do use some digital support</th>
<th>I probably would have used the chart if I didn't have a Fitbit. (Survey respondent, 49-year-old female still in treatment for breast cancer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I’ve gone back to using online tools that I used prior to my cancer. (Survey respondent, 54-year-old male in remission for over one year from prostate cancer)</td>
</tr>
<tr>
<td>Reinforced my decision to become active</td>
<td>I went through it, I thought right. OK, yeah that backs up what I have thought. (Karen)</td>
</tr>
<tr>
<td></td>
<td>It was a very positive reinforcing message for me personally, and to feel that I was on the right track. (Helen)</td>
</tr>
<tr>
<td></td>
<td>I think what I would say is that with the Pack I think it encouraged me I’m doing the right thing. It sort of cemented it really. It hasn’t said right you’ve got to some. It wasn’t forced but I think it just made me feel alright, it made feel I was doing OK. (Penny)</td>
</tr>
<tr>
<td></td>
<td>I remember reading and I was thinking, right I really do need to try and keep it up. (Lucy)</td>
</tr>
<tr>
<td></td>
<td>All those things come into what you’re trying to get across in your Pack is about staying healthy…It’s providing you the information to say, yeah, it’s better for you to keep going, staying healthy, staying fit. (Nigella)</td>
</tr>
<tr>
<td></td>
<td>Getting the Pack and regular newsletters certainly brought it home about the benefits of exercise. (Survey respondent, forty-eight-year-old female recently in remission for breast cancer)</td>
</tr>
</tbody>
</table>

**Candidate theme: Thanks, but no thanks**

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Data extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am very active</td>
<td>I’ve always been extremely active. Bags of exercise then you don’t get depressed. (Hillary)</td>
</tr>
</tbody>
</table>
Yeah, I’m not needing a motivating factor. I have my own motivations so, but that might be different to other people. (Helen)

All of that helps and of course as we all know, it’s support of family of friends around you that encourage you at the same time. (John)

I know that being physically active helps me to feel better. (Survey respondent, 48-year-old who finished treatment for breast cancer less than 3-months ago, the outcome unknown)

Disregarded

I dismissed it relatively quickly but not because I thought that there was anything wrong with it or it was a negative thing or whatever, but it just wasn’t a resource that I felt that I needed. (Becky)

I read it through a few times and I’ve given it away…I’ve given it to a lady that I met on the bus who lives around the corner…you see when we went for a walk once. (Hillary)

It was a single read through and I did look at the website as well. (John)

Well basically I only gave it a cursory glance to be honest. (David)

I have been exercising for many years so much of the info was a basic refresher. I also knew how to build progression into my exercise (mainly walking). (Survey respondent, 59-year-old female still in treatment for Bowel cancer)

Candidate theme: Physical activity is not for everyone

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Data extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physically not capable</td>
<td>As I have been having radiotherapy I have not felt well enough to do any exercise (Survey respondent, 65-year-old female in treatment for breast cancer)</td>
</tr>
<tr>
<td></td>
<td>I find doing anything I used to do physically very strenuous. I am frustrated because I used to be active, but now I feel absolutely drained after doing anything physical. (Survey respondent, 60-year old male, in treatment for bowel cancer)</td>
</tr>
</tbody>
</table>
Not in the right place

It’s taken me a year to get diagnosed and it’s still not 100%. That’s a lot of stress…sliding down into black holes pulling yourself back up…to achieve some kind of normality is a major assault course of adrenaline and despair in itself. For me thinking about trying to squeeze exercise or sport into all that was never going to happen. (Survey respondent, 58-year-old female waiting to start treatment for non-Hodgkin’s lymphoma)

I don't seem to have any motivation a lot of the time (Survey respondent, 53-year-old female with a stated ‘unknown’ cancer still present)

My future is uncertain, so my free time is spent doing things I enjoy. This could be being out and about being active or sat doing artwork or other hobbies. I try to be sensible what I eat. That is about as much as I want to deal with currently. (Survey respondent, 43-year-old male in treatment for stomach cancer)