Temporal perspective and parental intention to accept the Human Papillomavirus vaccination for their daughter

Abstract

Objective: A school-based vaccination programme to prevent infection with the Human Papillomavirus (HPV), the virus that causes cervical cancer, began in October 2008 in England. The present study evaluated the role of temporal perspective in the formation of attitudes and intentions towards the vaccine. Design: A cross-sectional correlational survey of 245 parents of 11-12 year old girls. Methods: Parents read a passage about the HPV vaccine containing information about benefits and concerns parents might have about the vaccine. They then completed a thought listing task and measures of attitude, vaccine efficacy, anticipated regret, intention and consideration of future consequences (Strathman, Gleicher, Boninger, & Edwards, 1994). Results: Parents with higher consideration of future consequences generated more positive relative to negative thoughts, held more positive attitudes, higher response efficacy, reported higher anticipated regret about not vaccinating their daughters and held more positive intentions. Mediation analyses suggested that the influence of thoughts generated on intention to vaccinate was partially mediated by attitude, perceived vaccine efficacy and anticipated regret if the vaccine were not taken up. Conclusion: Messages emphasizing efficacy of vaccination and anticipated regret are likely to promote vaccination uptake.
Introduction

Worldwide, cervical cancer accounts for approximately 10% of all new cases of cancer in women and 233,000 deaths, making it the second most common cancer among women (Parkin, Bray, & Devesa, 2001). The UK’s rate of cervical cancer is second only to Denmark within the European Union (Patnick, 2000). Recently, vaccines have been developed which prevent infection with the human papillomavirus (HPV), the virus known to cause cervical cancer. A school-based programme to provide routine HPV vaccination for girls aged 12-13 started in England in October 2008. Because the vaccination is to be given to minors, parental acceptance will be crucial to the success of the programme. The present study sought to investigate the implications of parental individual differences in consideration of future consequences (Strathman et al, 1994) for attitudes towards the HPV vaccine and intention to have a daughter vaccinated.

Parental Decision-making Regarding Vaccination of their Children

Colgrove (2006) suggested that parental opposition to HPV vaccination in the United States derived not only from religiously conservative parents concerned about promoting sexual promiscuity but from a broader suspicion that has been developing globally towards vaccines. In a UK study, although the majority of parents intended to vaccinate, 70% expressed concerns about the measles, mumps, rubella (MMR) vaccine (Ramsay, Yarwood, Lewis, Campbell, & White, 2002). Serpell and Green (2006) suggest that media coverage linking MMR with inflammatory bowel disease and autism increased safety concerns and consequently led to inflated perceptions of risk (availability heuristic; Tversky & Kahneman, 1982). Studies in various countries show generally positive attitudes towards HPV vaccination (Brewer & Fazekas, 2007; Marshall, Ryan, Roberton & Baghurst, 2007; Lenselink, Gerrits, Melchers et al., 2008). UK studies have found that 81% and 75% of parents said they would probably or definitely accept the vaccine for their daughter (Brabin, Roberts, Farzaneh, & Kitchener, 2006; Marlow, Waller, & Wardle, 2007). These studies found that parents with an older daughter, or who have experienced cancer in the family, who perceived the severity of HPV infection as higher, and who believed that significant others
were in favour of vaccine were more likely to report that they would accept the vaccine. Recently, data concerning actual vaccine uptake showed uptake of 71% for the first dose and 68% for the second (Brabin, Roberts, Stretch, Baxter, Chambers, Kitchener, & McCann, 2008), indicating that some 30% of parents may not be persuaded of the vaccine’s value. The present study extends current research by examining the role of temporal perspective in the development of parental attitudes and intention towards the HPV vaccine.

Temporal Perspective and Health Behaviour

The importance of time in relation to people’s thoughts, feelings and behaviours is increasingly being recognised and studied (Chapman, 2005; Sanna & Chang, 2006; Strathman & Joireman, 2005). Strathman et al. (1994) developed the “Consideration of Future Consequences” (CFC) scale, which measures the extent to which individuals consider the potential distant outcomes of their current behaviors, and the extent to which they are influenced by these potential outcomes. CFC might influence behaviour because an individual high in CFC is more aware of future consequences, or because an individual attaches more weight to future consequences in his or her decision-making (Joireman et al., 2006). Other approaches to temporal perspective include the Zimbardo Time Perspective Inventory (Zimbardo and Boyd, 1999). One of the five subscales of this inventory measures “future orientation” which is positively correlated with CFC ($r = .52$, $p < 0.001$) (Zimbardo and Boyd, 1999). Relatedly, “time preference” perspectives derived from discounted utility theory involve presenting people with monetary or health scenarios that involve choosing between immediate and delayed sums of money or other outcomes (Chapman, 2005).

Because health-related behaviours typically concern longer-term benefits, temporal perspective would seem to have obvious implications for health behaviors. For example, people with high CFC, indicating greater consideration of future consequences, report lower use of alcohol and cigarettes (Strathman et al., 1994), more frequent exercise (Ouellette, Hessling & Gibbons, et.al, 2005) and stronger intentions to engage in screening (Orbell, Perugini & Rakow, 2004; Orbell & Hagger, 2006) or use sunscreen (Orbell & Kyriakaki, 2008). Rothspan and Read
(1996) reported positive associations between scores on Zimbardo’s future orientation scale and delayed first sexual intercourse. However, our present concern is not simply with predicting behaviour but with modelling the implications of CFC for the process of decision-making about health. Chapman (2005) suggested that the costs involved in health behaviours tend to be immediate whereas the benefits are delayed, that is, the behaviour involves an inter-temporal trade-off. Some people therefore fail to engage in healthy behaviours because they devalue future benefits; rather, their decisions are influenced by the short-term considerations. An individual’s temporal orientation might therefore influence health-related decision-making by affecting the way in which he or she processes the negative short-term and positive long-term outcomes associated with a given behaviour. We investigated this possibility in the context of parental decision making about HPV vaccination for a daughter. In a study of flu vaccination, Chapman and Coups (1999) obtained a very small relation between time preference for health outcomes and acceptance of the influenza vaccine, such that those who accepted the vaccine discounted the future less steeply than those who did not. However, we were unable to locate studies that examined vaccination in childhood and adolescence, the primary aim of the present study. Moreover, research concerning temporal perspective has focused upon personal decision making; our present concern extends previous research by focusing on health decisions made ‘on behalf’ of a child.

**CFC and HPV Vaccination**

We presented parents with information describing cervical cancer and the HPV vaccine, much as they are likely to receive when invited to take part in the school-based vaccination programme. Because HPV vaccination reduces the long-term risk of cervical cancer, our first hypothesis was that parents high in CFC would be more likely to evaluate the vaccination positively and have positive intentions for their daughters to be vaccinated. We also sought to evaluate cognitive processes by which CFC impacts the formation of these intentions. According to the cognitive response approach (Greenwald, 1968; Petty et al., 1981), when presented with a persuasive communication, individuals elaborate upon the information and generate thoughts that
are either consistent with the message or counter to the message; the development of a positive attitude depends upon the balance of positive and negative thoughts generated. Because high CFC individuals are expected to attach greater weight to the long-term, we hypothesized that high CFC individuals would generate more positive and fewer negative thoughts about vaccination than would low CFC individuals.

Our third hypothesis was that cognitive responses generated after reading the message would mediate the effect of CFC on proximal attitudinal determinants of intention. We included three proximal determinants of intention in the study; attitude, perceived efficacy of the vaccine and two measures of anticipated regret. Attitude, from the theory of planned behavior (Ajzen, 1985) is an important proximal indicator of behavioural intention. Response efficacy from protection motivation theory (Rogers, 1983) refers to the perceived efficacy of the response (i.e., vaccination) in reducing risk of cervical cancer. Because high CFC parents are likely to be more attentive to long-term benefits, we anticipated that they would report higher response efficacy after reading the message. Anticipated regret refers to anticipated negative affect and is thought to influence intentions because regret is an emotion people wish to avoid (Gilovich & Medvec, 1995). In the present context, we included anticipated regret ‘if I get my daughter vaccinated’ (which might lead to regret if distress or soreness is experienced), as well as anticipated regret ‘if I do not get my daughter vaccinated’. We anticipated that high CFC parents would be more likely to anticipate regret if they did not act to prevent long-term risks of cervical cancer, whereas low CFC parents, who focus upon the short-term, might be more likely to anticipate regret if they did act.

Method

Participants and Procedure

We presented parents with information describing cervical cancer and the HPV vaccine, much as they are likely to receive when the school-based vaccination programme begins. This cross-sectional (correlation) study was conducted during summer 2007, one year prior to the introduction of the vaccination programme. The survey population consisted of parents or
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Guardians of girls aged 11-12 years at secondary school in three parliamentary constituencies in Mid and North Essex, representing the age group likely to be eligible for the vaccine when the programme was implemented. Head teachers of 28 eligible schools were contacted by letter and telephone until 10 agreed to participate. Five schools gave the questionnaire packs to the girls and four mailed them to parents; one school, after agreeing to participate, did not hand out the questionnaire packs. In total, an estimated 817 questionnaire packs were distributed (although it is not possible to determine with certainty how many of the packs distributed to girls were passed to parents).

Completed questionnaires were received from 200 households, resulting in a household response rate of 24.5% (200/817), similar to the figure of 22% obtained in Manchester (Brabin et al., 2006). Forty-five households returned 2 questionnaires and 155 returned a single questionnaire. The final sample comprised 245 parents or guardians (53 men, 190 women and 2 unknown).

Materials

Each questionnaire pack contained an explanatory letter asking for “Your views about HPV vaccination for girls aged 11-12”, 2 copies of the A5 (15 x 21 cm) questionnaire booklet, and a freepost return envelope.

Message. Pilot work indicated that HPV is not widely understood so the first part of the booklet contained 3 paragraphs information about cervical cancer, the prevalence of the HPV virus and its role in causing cancer, and information about the proposed vaccination programme, the known efficacy of the vaccine and known incidence of adverse reactions. This was followed by a paragraph giving balanced information regarding benefits and concerns some parents might have about the vaccine;

“Some parents feel that by getting their daughter vaccinated they will know that they are protecting her against HPV infection and that she is having the vaccine when it is most effective. They will also have the peace of mind of knowing that they are protecting her sexual and reproductive life and preventing her from getting cervical cancer. Some parents are concerned that their daughter might find the 3 injections within a one-year period painful or distressing or experience feverishness or soreness at the injection site. Some parents feel
concerns about whether their daughter will understand the issues underlying HPV infection and the vaccine. They may also have worries about whether booster injections might be needed and the fact that because the vaccine will not protect against all cervical cancers screening will still be necessary.”

**Thought listings.** After reading the message participants were asked to write down the thoughts that came to mind as they read the message. Thoughts were independently coded as positive, negative or neutral/irrelevant by two raters. Positive thoughts were defined as representing a positive evaluative orientation toward HPV vaccination for their daughter, and negative thoughts represented a negative evaluative response. Inter-rater reliability was satisfactory (Intra-class correlation coefficients = 0.75 & 0.74).

**Salience.** To assess prior levels of concern about HPV and cervical cancer, parents were asked; “Have you ever spoken to your daughter about cervical cancer/HPV?”.

**Attitudes, intentions, perceived efficacy and anticipated regret.** All items were operationalized in terms of “your daughter having the vaccination in the next year” and assessed on 6 point scales. Mean scores for each variable were calculated so that high scores indicated more positive attitude and higher regret. **Attitude** was assessed by 6 items with the stem; “For my daughter to have the HPV vaccination in the next year would be: ….. (worthwhile-worthless, necessary-unnecessary, bad-good, important-unimportant, pleasant-unpleasant, harmful-beneficial, desirable-undesirable, wise-unwise, α=0.85)”. **Intention** was assessed by three items: e.g. “I intend to agree to my daughter having the HPV vaccine in the next year if it is offered (strongly disagree-strongly agree, α=.77). Three items assessed **perceived vaccine efficacy**: e.g.“Having the HPV vaccine in the next year would reduce the chances of my daughter developing cervical abnormalities in the future (strongly disagree-strongly agree, α=.79)”. Two measures of **anticipated regret** were included to assess regret associated with effects of having the vaccination, and with not having the vaccination; “If my daughter has the HPV vaccine in the next year and experiences some distress/pain due to the injections I will feel ….”; “If my daughter does not have
the HPV vaccine in the next year and she has an abnormal smear in the future I will feel …….” (regretful-not regretful; sorry-not sorry; worried-not worried, αs=.85 & .91).

Consideration of future consequences. The final part of the questionnaire consisted of the 12-item CFC measure (Strathman et al 1994). Respondents endorsed the items using a 5-point Likert scale (extremely characteristic-extremely uncharacteristic). Example items include; “I only act to satisfy immediate concerns, figuring the future will take care of itself”; “I often consider how things might be in the future and try to influence those things with my day to day behaviour”. Responses were recoded such that higher scores indicated high CFC and mean scores were calculated for each respondent (α=0.84).

Demographics. Participants provided their age, sex, occupation, ethnicity, nationality, and religion. Postcode information was merged with the National Statistics Postcode Directory to provide an index of multiple deprivation (Office of the Deputy Prime Minister, 2004).

Results

Descriptive Data

Table 1 summarises the sociodemographic characteristics of parents or guardians included in the sample. Respondents were predominantly white European and less deprived than the British average. Women respondents were more likely than men to have spoken with their daughter about HPV or cervical cancer (30.1% versus 9.4%, χ² =9.27, p=.002). Consideration of future consequences scores ranged from 2.17 to 5.00 (median=3.75, M=3.67, SD=0.58) and were not associated with any of the socio-demographic characteristics (Table 2). However, those participants who had spoken to their daughters about HPV or cervical cancer had higher CFC (M=3.79) than those who had not (M=3.63) (F (1, 198) = 5.03, p=0.026).

Thought listings. Participants generated between 0 and 4 positive thoughts (M=1.42, SD=0.93), 0 and 4 negative thoughts (M=0.59, SD=0.79) and 0 and 3 neutral or irrelevant thoughts (M=0.23, SD=0.46). The most frequent positive thought related to protection of their daughters health; e.g.”If the vaccine helps prevent my daughter getting cervical cancer then I am all for it”.
Many parents also counter-argued information about possible discomfort or distress; e.g. “I did not feel worried about the injection. My daughter has had several injections without problems”; “I think a little soreness after the injection is a small price to pay for the benefits”. Negative thoughts concerned distress about the injection; “My daughter is terrified of needles” and a few thought that the injections would be into the cervix “I would be concerned about the injection being painful and distressing at the injection site which I presume is the cervix”. The most frequently mentioned concern was about vaccine safety; “Do they know the side effects for the long term? In 20 yrs could something happen which they didn’t know because its not been done before, like not being able to have children etc.”; “Good idea but is it tested enough like the controversy over MMR? Don’t trust government bodies”. Only two parents mentioned concerns about promiscuity; “My concerns are that the vaccine may give the wrong impression and that this gives them the power to have lots of unprotected sex with many different men”.

Attitudes, perceived efficacy, affect and intention. Table 2 shows that mean scores for attitudes, intentions and perceived efficacy (Ms=4.92, 5.13 & 4.72 respectively) were all above the scale midpoint (3.5) indicating positive motivation regarding the HPV vaccine. The mean for anticipated regret ‘if my daughter was not vaccinated’ (M=5.42) was much higher than for anticipated regret if the daughter was vaccinated (M=3.64).

Bivariate Association of CFC with Thought Listings, and Social-cognitive Measures.

We hypothesised that individuals high in CFC would evaluate the vaccine more positively than those low in CFC. Table 2 shows that people high in CFC generated more positive, fewer negative and more positive relative to negative thoughts. CFC was significantly positively correlated with intention, attitude, and perceived vaccine efficacy. Anticipated regret about having the vaccine was significantly negatively associated with CFC, indicating that low CFC parents were more likely to regret any short-term consequences such as soreness or distress.
Since, as shown in Table 2, no significant associations were obtained between sociodemographic variables and CFC or motivational measures, sociodemographic variables were not included in subsequent mediation analyses.

**Mediators of the Effect of Consideration of Future Consequences**

We hypothesized that CFC would impact upon parental decision making about the vaccination via thoughts generated when they read a message about the vaccine. Thus, we first considered the number of positive thoughts and the number of negative thoughts generated during the thought listing exercise as potential mediators of the effect of CFC on the participants’ stated intentions of having their daughters vaccinated. To establish whether the generated thoughts were mediators, the three criteria set out by Baron and Kenny (1986) were followed. The first criterion, that CFC significantly predicts the dependent variable (i.e., intention) was demonstrated by the correlation coefficient shown in Table 2. The second criterion, that CFC significantly predicts the potential mediators (i.e., positive and negative thoughts) was also demonstrated by the coefficients reported in Table 2. To test the third criterion, that the potential mediators remained significantly associated with the dependent variable when CFC was also included in the model, we followed the multiple-mediation procedure described by Preacher and Hayes (2008). As shown in Figure 1, when we regressed the intention variable simultaneously on the CFC variable, the positive thoughts variable, and the negative thoughts variable the direct effect from CFC to intention was no longer significant ($\beta = .06, p > .30$). We then employed the bootstrapping technique recommended by Preacher and Hayes (2004, 2008) for testing the significance of indirect paths in mediation models, as bootstrapping offers a better alternative to standard Sobel (1982) tests for analyzing indirect effects due to the skewed distribution of the indirect effect (Preacher & Hayes, 2004; Shrout & Bolger, 2002).

In the bootstrapping procedure, the original sample is used to create a specified number of additional samples by randomly sampling with replacement from the original data. The indirect effect is then estimated in each additional sample and a mean, standard deviation, and confidence
intervals of the bootstrapped estimates are computed. The analysis, which involved 1,000 bootstrap samples, confirmed that thought generation mediated the effect of CFC on intention such that the indirect effects through both positive thoughts (BCa 95% CI = .03, .18) and negative thoughts (BCa 95% CI = .05, .33) were significantly different from zero. Additionally, a contrast test of the two indirect effects revealed that they were not significantly different from each other.

In sum, figure 1 shows that the direct effect of CFC on intentions was fully mediated by the generation of positive and negative thoughts after reading a passage about HPV vaccination.

Our next mediation analysis was designed to test if the positive and negative thoughts generated by the parents mediated the effect of CFC on attitudes, perceived efficacy, and anticipated regret. Once again, the first two criteria for mediation set out by Baron and Kenny (1986), that CFC significantly predicts each of the dependent variables and that CFC predicts each of the potential mediators were met and can be seen in Table 2. To test the third criterion, that the potential mediators remain significantly associated with each dependent variable when CFC is also included in the model, we again followed the bootstrapping (1,000 resamples), multiple-mediation procedure described by Preacher and Hayes (2008), working with each of the dependent variables separately. As shown in Figure 2, when we regressed the attitude variable simultaneously on the CFC variable, the positive thoughts variable, and the negative thoughts variable the direct effect from CFC to attitude was no longer significant ($β = .09, p > .10$). The bootstrap analysis confirmed that thought generation mediated the effect of CFC on attitude such that the indirect effects through both positive thoughts (BCa 95% CI = .02, .14) and negative thoughts (BCa 95% CI = .02, .20) were significantly different from zero.

Regressing the perceived efficacy variable simultaneously on CFC, positive thoughts, and negative thoughts revealed that the direct effect of CFC was no longer significant ($β = .06, p > .30$), and the bootstrap analysis confirmed that thought generation mediated the effect such that the indirect effects through positive thoughts (BCa 95% CI = .01, .14) and negative thoughts (BCa
95% CI = .05, .32) were significantly different from zero. When we regressed anticipated regret ‘if I do vaccinate’ on CFC, positive thoughts, and negative thoughts the direct effect from CFC was no longer significant (β = -.07, p > .30), and the indirect effects through both positive thoughts (BCa 95% CI = -.20, -.03) and negative thoughts (BCa 95% CI = -.26, -.03) were significantly different from zero. Finally, when we regressed anticipated regret ‘if I do not vaccinate’ on CFC, positive thoughts, and negative thoughts the direct effect from CFC was no longer significant (β = .09, p > .15), and the indirect effects through both positive thoughts (BCa 95% CI = .01, .13) and negative thoughts (BCa 95% CI = .02, .28) were significantly different from zero.

Our final analyses were designed to test the full-mediation model, such that the direct effect of CFC on intention to vaccinate would be mediated by the positive and negative thoughts generated by participants, as well as their reported attitude, their perceived efficacy, and their anticipated regret regarding having (and not having) their daughters vaccinated. As with the previous models, we again employed the multiple-mediation procedure advanced by Preacher and Hayes (2008). As shown in Figure 3 (with only significant paths drawn, for ease of viewing), when we regressed intention on CFC, positive and negative thoughts, attitude, perceived efficacy, and the anticipated regret variables, the direct effect of CFC on intention was no longer significant (β = -.01, p > .90). Five of the six potential mediators significantly predicted intention, with anticipated regret ‘If I do vaccinate’ being the only variable that was no longer associated with intention (β = -.02, p > .60). Moreover, the generation of positive (β = .10, p < .05) and negative (β = -.12, p < .05) thoughts continued to have an independent, significant effect on intention, above and beyond the significant influence of attitude (β = .26, p < .01), perceived efficacy (β = .38, p < .01), and anticipated regret about not having the vaccination (β = .16, p < .01). Finally, we again relied on a bootstrapping technique (Preacher & Hayes, 2004; Shrout & Bolger, 2002) to test the significance of indirect effects. The procedure, with 1,000 bootstrapped samples, confirmed that the indirect effects of attitude, perceived efficacy, and anticipated regret ‘if I do not vaccinate’ were all significantly different from zero. Additionally, a contrast test of these indirect effects
revealed that the indirect effects of attitude (BCa 95% CI = .03, .20) and perceived efficacy (BCa 95% CI = .02, .22) were significantly different (i.e., larger) than the indirect effect of anticipated regret.

In sum, mediation analyses suggested that temporal perspective influenced positive and negative thoughts generated after reading a passage about HPV vaccination and that the influence of thoughts generated on intention to vaccinate was partially mediated by attitude, perceived vaccine efficacy and anticipated regret if the vaccine were not taken up.

Discussion

The goal of the research was to evaluate the likely implications of temporal perspective for parental decision-making about HPV vaccination. Consistent with our first hypothesis, people with a longer term temporal perspective, as evidenced by higher CFC, held more positive attitudes, perceived higher vaccine efficacy, anticipated more regret if they did not vaccinate, and held more positive intentions to accept the vaccine. A number of lines of previous research concerned with consideration of future consequences, future orientation or time preference have obtained evidence that preventive health behaviours are associated with concern or value for future outcomes (e.g. Ouellette, Hessling & Gibbons, et.al, 2005; Orbell & Kyriakaki, 2008; Rothspan & Read, 1996) The present results extend existing research by showing that CFC has implications for a vaccination behaviour and to a context in which people are making a decision on behalf of a child. While some previous research has suggested that future discount rates have only a very small relation to flu vaccination uptake (e.g. Chapman & Coups, 1999), it might be considered that while the flu vaccine has, typically only a single season preventive effect, the HPV vaccine seeks to prevent development of cervical cancer throughout a woman’s life and may therefore be more influenced by temporal perspective. Alternatively, parental, rather than personal decision making is likely to bring the future (of one’s child) into focus.

The present study also sought to examine thought processes associated with behavioural intentions. According to the cognitive response approach, attitudes towards a particular behaviour
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are a function of the relative number of positive and negative thoughts generated about it. After reading a passage that was balanced in terms of benefits and concerns about the HPV vaccine, those with higher CFC scores generated more positive and fewer negative thoughts than those lower in CFC. These findings support our second hypothesis.

Inspection of thoughts listed demonstrated that parents elaborated upon information provided in the passage and produced thoughts consistent with the benefits of vaccination, including countering or minimizing the possibility of soreness or distress. Some parents also produced counter-arguments to the potential benefits of vaccination, suggesting, for example, that rather than protecting their daughter’s health, the vaccine might be risky. Although the passage presented currently available information regarding adverse reactions, it did not specifically address risk of permanent or long term health damage arising from the vaccine because there is no available evidence in the context of HPV, which is a new vaccine, and information about long-term effects will not be available for some time. In this context it might be considered unethical to suggest such concerns. Nonetheless, these findings point to an inclination on the part of some parents to perceive vaccines as unsafe. Although studies in the United States have suggested concerns that the vaccine might lead to promiscuous sexual behaviour, we obtained little evidence in this UK study, of parental concerns about the effect of the vaccine on their daughter’s sexual behaviour. Clearly it is important that publicity emphasizes that the HPV vaccine does not protect against pregnancy or any other sexually transmitted infection in order to ensure continued effective use of barrier contraceptives. Finally, the decision to name the UK campaign “Arm against cervical cancer” may be helpful in negating beliefs that the injection site would be the cervix.

Our final aim concerned the mediation of the relation of CFC to behavioural intention by thoughts generated after reading a passage about HPV vaccination. The cross sectional design utilised here necessitates caution in drawing strong inferences about direction of causation. Notwithstanding this limitation, path analysis suggested that the generation of positive and negative thoughts after reading a message about HPV vaccination fully-mediated the effects of
CFC on intention. In common with Orbell and Hagger’s (2006) study of diabetes screening, the relation of cognitive responses to intention was partially mediated by social cognitive beliefs. The relation of positive and negative thoughts to intention to vaccinate was partially mediated by attitude, response efficacy, and anticipated regret about not vaccinating. Whilst low CFC individuals were more likely to focus upon negative consequences of vaccination, and to generate more regret about vaccinating, regret about vaccination was not a significant independent predictor of intention in the model. However, the findings do suggest that health education in this area should focus upon emphasizing benefits of vaccination in preventing cervical cancer and perhaps make use of messages that encourage anticipated regret about not vaccinating.

The importance of temporal perspective observed here also suggests that design of health communications in this area might benefit from consideration of the effects of manipulating the timeframe in which outcomes are presented to occur. For example, Orbell, Perugini and Rakow (2004) showed that people low in CFC, who generally might perceive preventive health behaviours as risky or costly, may be more persuaded by messages that take care to emphasize the short term positive benefits of action.

Notwithstanding variability due to CFC, parents in the present study held generally positive intentions to accept the vaccine for their daughter. Whilst it should be acknowledged that the response rate obtained here was relatively low, the present findings are consistent with those of Brabin et al., (2006) who obtained a response rate of 22% and found 81% of parents intended to accept the vaccine, and with Marlow et al. (2007) who obtained a 54% response rate but a similar 75% level of vaccine acceptability. Nonetheless, it is possible that response bias due to salience of the topic, social deprivation, or ethnicity might have influenced the findings.

In sum, parents were generally favourable towards the HPV vaccine. Efforts to persuade parents to accept the vaccine for their daughter should emphasise the efficacy of the vaccine and anticipated regret if the vaccine is not given. Efforts are also needed to combat the effect of the availability heuristic when assessing vaccine safety.
Footnote

1 BCa CI= bias corrected and accelerated confidence interval. In short, the BCa CIs have minor adjustments to remove some bias inherent in the bootstrapping procedure (Efron, 1987; Efron & Tibshirani, 1993), and when computation is possible, are generally recommended.
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References


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Association, 82, 171-185.


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Table 2 Bivariate correlation between socio-demographic indices, thoughts, and motivational variables

| Pearson Correlation Coefficients¹ | Mean  | sd    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|-----------------------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|
| Age                               | 42.2  | 5.52  |      |      |      |      |      |      |      |      |      |      |      |
| Sex                               | -     | -     | -33**|      |      |      |      |      |      |      |      |      |      |
| Deprivation (high score indicates greater deprivation) | 12.5  | 6.3   | -24**| .04  |      |      |      |      |      |      |      |      |      |
| CFC                               | 3.67  | .58   | .05  | -.09 | -.01 |      |      |      |      |      |      |      |      |
| Number of positive thoughts       | 1.42  | .93   | -.04 | .07  | .11  | .17* |      |      |      |      |      |      |      |
| Number of negative thoughts       | .59   | .79   | .07  | .07  | .08  | -.19**| -.28**|      |      |      |      |      |      |
| Attitude                          | 4.92  | .80   | -.01 | .03  | .07  | .19**| .47** | -.51**|      |      |      |      |      |
| Perceived vaccine efficacy        | 4.72  | 1.20  | .02  | -.04 | .02  | .15* | .27** | -.42**| .50**|      |      |      |      |
| Anticipated regret if daughter has the vaccine | 3.64  | 1.40  | .06  | -.04 | -.01 | -.13*| -.30**| .32** | -.35**| -.35**|      |      |      |
| Anticipated regret if does not have the vaccine | 5.42  | .96   | -.03 | -.03 | -.04 | .12+ | .25**| -.35**| .41**| .30**| -.08 |      |      |
| Intention                         | 5.13  | 1.04  | -.03 | .03  | -.02 | .16* | .41**| -.50**| .69**| .64**| -.34**| .45**|      |

¹ The point biserial correlation was calculated for sex, women coded as 1 and men as 0. * indicates p<0.05, ** indicates p<0.01, + indicates p=.06.

CFC = Consideration of future consequences. Higher scores indicate a greater future time perspective.
Figure Caption

*Figure 1.* Analyses for positive and negative thoughts as mediators of the direct effect between CFC and intention. Path weights are standardized. The path weight in parentheses does not control for the effect of the mediators. *p < .05. CFC = Consideration of Future Consequences.

*Figure 2.* Analyses for positive and negative thoughts as mediators of the direct effect between CFC, and attitude, perceived efficacy, and the two anticipated regret variables. Path weights are standardized. The path weight in parentheses does not control for the effect of the mediators. *p < .05, **p < .01. CFC = Consideration of Future Consequences.

*Figure 3.* Full mediation model of the relationship between CFC and intention. Only significant paths shown. Path weights are standardized. *p < .05, **p < .01. CFC = Consideration of Future Consequences.
A diagram illustrates the relationships between CFC, positive thoughts, negative thoughts, and intention. The arrows indicate the following relationships:

- CFC → Positive Thoughts: 0.17*
- Positive Thoughts → Intention: 0.29*
- CFC → Negative Thoughts: -0.19*
- Negative Thoughts → Intention: -0.41*
- CFC → Positive Thoughts: 0.06 ns (0.16*)

The asterisk indicates statistical significance.