The reading comprehension skills of adult students with dyslexia

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Thesis submitted for the award of Doctorate of Philosophy

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June 2009
Acknowledgements
I would like to thank John Everatt for his guidance and support throughout the research and writing of this thesis, Kathleen O'Neill for her advice and proofreading skills, Peter Brooks for his advice and support and all the students who participated in the various studies contained within this body of work.
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Abstract
This thesis examines the reading comprehension skills of adult dyslexic students within U.K. higher education. Initial data, based on a test standardisation process, indicated that the most defining feature when reading prose of students with educational difficulties was their slower speed of reading rather than difficulties in comprehension. An additional analysis of adult dyslexic students' pattern of learning highlighted weaknesses with reading speed, spelling, writing speed, underlying speeds of processing and auditory working memory. Regression analysis indicated that comprehension was influenced predominantly by verbal ability and speed of processing text (both reading and writing). Given the potential importance of speed in this profiling data, a further study was conducted with a group of 97 students with dyslexia. These data suggested that the majority were slowing their speed of reading down and maintaining comprehension. However, slow reading speed was not related to underlying speeds of processing, arguing for a strategy rather than an effect of an underlying deficit.

Further research investigated features of dyslexics' text reading. Analyses of comprehension question types between dyslexic and non-dyslexic students indicated that memory for specific text details was a particular difficulty for the dyslexic groups studied, which was in contrast to their ability to make inferences from the text. Similarly constraining time to read text lead overall to comprehension levels suffering specifically amongst the students with dyslexia. In contrast, analysis of oral compared to silent reading did not produce significant specific effects on the comprehension levels of the dyslexics compared to their non-dyslexic peers. These findings were consistent with evidence for effects of speed and memory on dyslexic's text reading.

A final study investigated teaching methods to support students with dyslexia. In contrast to decoding and text-to-speech techniques, meta-cognitive strategies proved to be more successful amongst the group of university students studied. These findings again were consistent with the evidence for dyslexics slowing reading down to support comprehension.
Summary

In Chapter 1 the thesis commences with an introduction into the area of reading, placing it in a social context, and examining the different perspectives within past and current literature regarding dyslexia. The key areas of a general dyslexic profile of weaknesses in phonology, speeds of processing and verbal working memory are highlighted. A review of the research literature is conducted, looking initially at theories of reading amongst child learners and an examination of a number of theoretical positions and models is undertaken. An understanding of reading comprehension is then explored, looking at a number of models and unravelled in more detail the role of working memory, speeds of processing, verbal ability and word decoding. The literature review ends via an overview of different teaching methods to improve comprehension skills amongst a variety of learners, with the focus on the development of comprehension skills amongst adult students with dyslexia.

Initial research in Chapter 2 is based on the development of an appropriate reading tool that was developed and standardised to enable more accurate analysis of prose reading skills, giving measures of accuracy, comprehension and speed. Data from the standardisation process are presented highlighting that those with educational difficulties are slower readers, but that their comprehension skills are not significantly weaker than the rest of the students recruited to the study. This standardized test is then used in a number of the studies reported in the thesis, starting with an overview or general profile of a 'typical' student with dyslexia. This analysis indicates particular weaknesses with speeds of reading, spelling, writing speed, speeds of processing and auditory working memory.
Research is reported in Chapter 2 that focussed on the issue of speed of reading and the relationship this may have with underlying processing speeds and levels of comprehension. Data on speed of reading and reading comprehension are used to sub-group the adult students with dyslexia. This analysis led to the majority of students with dyslexia being considered as displaying slow reading speeds but average to good levels of comprehension. When these data are compared to underlying speeds of processing, however, no relationship is found, indicating that the slow reading speed are not likely to be due specifically to an underlying deficit in speeded processing. The argument in this thesis is that this is a strategy employed by students with dyslexia to improve their accuracy and/or comprehension whilst reading.

The specific difficulties faced by adult learners with dyslexia are examined further in Chapter 3 of the thesis. This focussed, particularly, on the type of questions that dyslexic adult readers may find more problematic. The initial data reported indicate that recall of specific detail is harder for university students with dyslexia compared to their non-dyslexic counterparts. This supposition is further analysed by a specific study looking at the impact of question type (factual, inference from text and inference from general knowledge) as well as oral and silent reading. No impact is identified with regard to reading silently or aloud between different groups of students (those with dyslexia compared with controls) but a significant impact is identified between the two groups on ability to answer factual questions, with the control group outperforming the students with dyslexia.

The thesis then looks at the notion of giving students with dyslexia more time to read and explores the impact of constraining time on levels of comprehension. In the first of two studies, the impact of question type is included with results confirming that
questions requiring memory of specific detail are harder for adults with dyslexia compared with a group of controls. However, constraining time to read is seen to reduce levels of comprehension specifically amongst the dyslexics, whereas comparable comprehension levels are found between the two groups when time is not constrained. The data argue for the group of students with dyslexia to be able to improve their ability on generating inferences when given more time. The effects of time constraints on comprehension are confirmed in a subsequent study reported in this section. Again, comprehension scores between a group of learners with dyslexia and a group of controls are shown to be similar when time was not constrained but significantly lower for the students with dyslexia when time to read was reduced.

The final area of research reported in Chapter 4 involved the examining of a number of teaching strategies that might be used to improve levels of comprehension. Five strategies are included in the work: two related to decoding and three associated with the enhancement of meta-cognitive skills. A case study methodological approach is used to investigate the text comprehension performance of university students with dyslexia under conditions in which the strategies are taught. Overall the meta-cognitive strategies are seen to be more robust in improving comprehension. A comparison of the reading profiles the nine participants with their cognitive profiles shows inconclusive results, however. A number of conclusions are drawn from the studies undertaken in this thesis. It is suggested that the most defining feature of prose reading between those with dyslexia and those without is speed of reading rather than accuracy or comprehension. General comprehension levels between adult students with dyslexia and their non-dyslexic counterparts are not significantly different and that
slowing down reading may be an effective strategy for students with dyslexia to adopt. This assertion was reinforced by the studies that constrained time for learners to comprehend text as this enables the students with dyslexia to use other strategies, particularly meta-cognitive strategies to support their understanding. It is also asserted that reading for specific detail is more problematic amongst the dyslexic learners than making inferences and no overall effect was noted between reading aloud versus silently, although individual differences amongst students with dyslexia and those without cannot be ruled out.

Footnote
Throughout this thesis the terms dyslexic students, group of dyslexics and dyslexic learners are used. It is recognised that the most appropriate terminology, based on a social model, is students with dyslexia but the above terms are used for ease of writing.
Chapter 1

Introduction

The idea of having a literate population is a relatively new concept. The ability to read has been present within human civilisation for several thousand years, but the recognition that everyone should be able to read is now implicit within western capitalist society. This change has occurred within the last century, and has reflected a growing demand for a literate workforce that meets the needs of a rapidly changing economy. At the start of the 20\textsuperscript{th} century, universal education was available in the UK, but most people were employed in occupations that did not require literacy skills. After both the First and Second World Wars concerns were raised regarding the levels of literacy within the population and educational acts followed both periods of conflict. It was not, however, until the rapid technological developments of the last fifty years that increasing levels of illiteracy began to impinge upon the economic demands of the UK. A 1993 government report estimated that 60\% of all jobs required a reasonable level of literacy and that the cost of illiteracy within the UK workforce to the economy was estimated at over £10 billion per annum. (Stainthorpe, 2002). In a modern society, literacy skills are therefore necessary to gain employment, and this is reflected in the UK education system with greater emphasis being placed on these key skills. Those who experience difficulties in developing literacy skills, for whatever reason, find themselves at a significant disadvantage compared with their literate counterparts. Reading skills are particularly important for an individual to function effectively in society today. One such group of individuals faced with these ever increasing difficulties are those described as dyslexic.
In 1896, W. Pringle Morgan wrote in the British Medical Journal the first account of what has now become known as developmental dyslexia. (S. Shaywitz 06-06-00 www.sciam.com/1196issueshaywitz.html, accessed 10-10-2004) Since that time the arguments, discussions and debates as to the nature of dyslexia, its causes and therefore a definition have continued. The British Psychological Society (1999) states that

“Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty. This focuses on literacy learning at the word level and implies that the problem is severe and persistent despite appropriate learning opportunities. It provides the basis for a staged process of assessment through teaching.” (Taken from Morgan and Klein 2000, p32).

The BPS definition is very broad and enables those in need of support to hopefully receive it. It neither examines the causes of dyslexia nor does it suggest a specific cognitive weakness or discrepancy compared with other abilities. This is useful from the point of view of the practitioner attempting to remediate or compensate for difficulties in literacy skills, as resources can be channelled on a basis of need, regardless of exact aetiology. However, from the point of view of research, such a broad definition can have limitations, especially when trying to determine the causes of reading difficulties amongst a group of dyslexics.

Other researchers have developed definitions based on underlying deficits or profiles of cognitive strengths and weaknesses. The most commonly held view of dyslexia, supported by an extensive research literature, is that of a phonological processing
deficit, whereby individuals have a difficulty processing the sounds of speech into
their corresponding orthographic representations (Frith 1999, Snowling, 1987, Bruck
1992, Gottardo, Siegal and Stanovich 1997, Stanovich 1982, Swan and Goswami
1997, Torgesen, Rashotte and Greenstein, 1988, Perfetti 1985). Weak phonology is
seen as the central, but not exclusive, defining feature of a dyslexic profile. Others,
such as Hanley (1997), however, have examined visual processing deficits amongst
dyslexic groups. He identified some dyslexic learners who had no phonological
deficits, but experienced difficulties with literacy based tasks that were more visual in
nature. It is therefore important, as Hanley concludes, that theories of dyslexia can
account for these anomalies or profiles of individuals that do not fit the typical
phonological deficit model. Rack (1997), in a study of 28 dyslexic adults, found that
14 indicated typical weaknesses with phonological processing and memory and six
experienced predominantly visual processing deficits. Rack therefore concludes that
an understanding of dyslexics belonging to sub-groups may be appropriate and that
any definition of dyslexia needs to be broad to incorporate the variations between
individuals. Snowling (2001), however, rejects the idea of sub-types and states that
variation in difficulties is a result of the severity of phonological deficit, counter-
balanced by the compensatory strategies and experiences that the individual has.

Everatt (1997) focuses on the spelling difficulties associated with adult dyslexics as a
central diagnostic tool for assessment. He also cites speeded non-word reading and
naming under conflict situations as diagnostic indicators. The notion of speed of
processing has been taken up by other researchers (Yuill and Oakhill 1996, Tallal et
al 1997, Stanovich 1980, and Perfetti and Lesgold 1977) who contend that it is a
major weakness amongst impaired readers. Wolf and Bowers (1999) have put
forward a double deficit hypothesis of dyslexia whereby phonological deficits and
naming-speed deficits are two distinctive underlying difficulties. They argue that
rather than speed of processing weaknesses being a consequence of phonological
difficulties, attention should also be given to processing speeds and fluency, not just
in the domain of phonological processing, but in general terms that might also impact
upon visual processing of orthographic information and also motor-based processing
skills.

Wolf and Bowers also make reference to Stein’s theory of visual-processing deficits
amongst dyslexics, notably the magno-cellular theory. This theory states that
dyslexics have an inability to sense the most rapid changes in the world around
them. He believes that this is a result of damage to young nerve-cells inside the
brain during foetal development.

"Stein suggests that the defect lies in a set of very large nerve cells known as
magno-cells. These cells form a pathway from the retina to the area where
information from the left and right eyes first combine....and onwards to the
visual cortex." (Clayton 1999, p3

It is the speed at which these cells pass the information to the visual cortex that is
essential. When reading our eyes move across the lines of text in saccades or
jumps. Stein’s theory maintains that the eyes of a dyslexic are not holding the image
of the printed word steady enough for them to process the correct information. This
may also cause the print to dance or blur, a sensation reported by a significant
numbers of dyslexics.
The most obvious weakness in Stein's theory is that it does not account for the phonological difficulties that most dyslexics encounter. Stein believes that a similar pathway exists within the auditory processing pathway, and that this accounts for the phonological difficulties. He also argues that a similar phenomenon is taking place with the cells involved in sending messages to the cerebellum, which deals with motor-coordination and automaticity. This would explain why some dyslexics have difficulties with co-ordination and are clumsy or accident-prone. Stein believes that the damage to these magno-cells is a result of a genetic disposition which is why there is a high incidence in certain families.

The role of the cerebellum has interested other researchers, particularly Nicholson and Fawcett (1999). Their work centres on the construct that dyslexia is a difficulty with the automatic processing of information. Difficulties with the processing of phonological and visual information, rapid processing, motor skills and memory are identified and related to a problem with automatic processing. They then link this idea to the working of the cerebellum in the brain.

"The most severe deficits for children with dyslexia were in terms of phonological skills, naming speed, motor skill and balance. This is precisely the pattern that would be predicted in the light of current understanding of the role of the cerebellum in skill acquisition and execution. Clearly, therefore, mild cerebellar impairment was a prime candidate for the underlying cause of dyslexia." (p12).

A further area of research regarding the causation of dyslexia is related to the role of memory. Most researchers contend that weaknesses in working memory play a
significant role in the cognitive profile of a dyslexic learner. Many dyslexics have
difficulties with auditory rehearsal; some also demonstrate weaknesses with visual
McLoughlin and Reid (2001) and Gathercole (2004) have cited weaknesses with
working memory as a determining factor, particularly in relation to reading
acquisition. Howard and Best (1997) describe the use of a visual lexicon to
retrieve regular and frequent words from memory and a phonological lexicon to
decode irregular and infrequent words. Palmer (2000, p29) believes that

"one of the most reliable....characteristics of developmental dyslexia is
inefficiency in working memory" and that "dyslexic learners make less efficient
use of phonological codes and hence have more limited working memory
capacity".

Palmer continues that as working memory is concerned with the "storage,
interpretation and integration of new information with previously stored information"
then any weaknesses are likely to impact upon the development of literacy skills.
Another facet of the use of memory is the ability to retrieve information from the long
term memory at speed, as implicated by Denckla and Rudel (1976 – quoted in
Pumprey and Reason 1991). Although memory appears to be an integral part of
literacy learning and that weaknesses are apparent amongst dyslexic learners, the
exact nature or role that memory plays in this process is ill-defined.

With so much conflicting research and emphasis placed on particular aspects of
cognition with regard to dyslexia, definitions are often broad and imprecise. The
most recent definition given by the British Dyslexia Association attempts to
incorporate a number of key concepts attributed to dyslexia without favouring one particular theoretical approach.

“Dyslexia is a specific learning difficulty which mainly affects the development of literacy and language related skills. It is likely to be present at birth and to be lifelong in its effects. It is characterised by difficulties with phonological processing, rapid naming, working memory, processing speed, and the automatic development of skills that may not match up to an individual’s other cognitive abilities. It tends to be resistant to conventional teaching methods, but its effects can be mitigated by appropriately specific intervention, including the application of information technology and supportive counselling.”
(www.bdadyslexia.org.uk, accessed 26/05/2008)

The consensus view of dyslexia is muddled and complex. It is extremely difficult to isolate all the different variables that are involved with reading and how reading failure occurs amongst some individuals and not others. In an attempt to obtain a degree of clarity, dyslexia within this body of work will be viewed as difficulties with literacy skills as a result of weak phonological processing, deficits in verbal working memory and speeds of information processing. Throughout the research literature, and based on practical experience of working with adult dyslexic learners, these issues appear to be the most central in defining a profile of dyslexia. These three factors also significantly hinder the reading process, at the single word level and amongst higher order processes related to comprehension. Other factors, such as spelling and speeds of writing, are also significant, but are not directly relevant to this study.
It may be that different individuals' process information in slightly different ways, giving no hope to identifying a single set of cognitive processes involved in reading. A great deal of the research into reading has examined internal cognitive processes related to phonological processing, visual processing, use of memory or speeds of processing. It is also worth mentioning at this juncture that these internal processes are affected by the external environment an individual inhabits, including their experiences, both in the present and the past.

"The point about brains is that they are open, not closed, systems, in continued interaction with their environments. And for humans, that environment is both the immediate present constituted by the society in which we are embedded, and the past, expressed in our individual and social histories." (S. Rose 1999 p14/15).

It may also be the case that different theorists have identified part of the answer and research is still ongoing into the relationship between the different processes involved in reading. Weaknesses or failure in one aspect of the reading process may produce a label of dyslexia or reading disabled, but it cannot be assumed that all those with such a label have the same problem and therefore need the same intervention and support. For example, some readers may have significant weaknesses with their single word reading and this may impact upon their ability to comprehend text. Others may also experience decoding difficulties, but may still be able to use strategies to extract appropriate meaning. Another learner may experience difficulties concentrating on the text and lose focus, or may have weaknesses with working memory which may result in an inability to recall the start
of a sentence, paragraph or page. The needs of a young child struggling to grasp the early stages of the reading process are not the same as an adult college student who has in the past failed to develop good reading skills. The age and experience that a reader brings to the task is an important determining factor on reading success. It is therefore difficult to view dyslexics as a single coherent group, and looking at sets of individuals or a series of sub-groups under the umbrella term of dyslexia might be more productive. The ability to address these issues and answer some of these questions is important, as it can lead to enabling those who experience difficulty with reading to receive the right intervention and hopefully the opportunity to overcome or accommodate the barriers they face in accessing information within society.

Theories of Reading
Reading is not a natural inherent phenomenon, but one that has roots embedded in historical, economic, social and cultural norms. These have changed throughout time and access to the printed word has increased rapidly in recent years. The learning and teaching of reading is a complex and multi-faceted task; academic interest in the area is relatively recent. Edmund Burke Huey noted in 1908 that any theory of reading would have to cover "very many of the most intricate workings of the human mind" (Huey, cited in Perfetti 1985, p3). However, it was not until the 1960s that significant interest and research into reading developed with early theorists including Chomsky, Miller and Neisser. Most research focussed on an understanding of how skilled readers dealt with meaning and several models of reading were developed. Much of this work was focussed on the concept of serial processing (Lovett 1981), whereby different component parts of the reading process,
phonology, word recognition, semantic knowledge are processed one after another in a series of steps. In the 1970s, modelling reading developed with early forms of the dual route model. Early exponents included Forster and Chambers (1973), Marshall and Newcombe (1973) and Baron and Strawson (1976) (cited in Coltheart 2005). These dual route theories distinguish between the processing of words via a lexical route and a non-lexical route.

Research has continued into the 21st century in an attempt to understand the intricacies of reading acquisition and skilled reading, and a plethora of models and theories have been suggested based on both psycholinguistics and cognitive processing. Numerous authors have attempted to assign a number of inter-related processes involved in reading (Perfetti, Maron and Foltz, 1996; Gough, Hoover and Petersen, 1996; Cornoldi, De Beni and Pazzaglia, 1996; Snowling, 2002). Factors often cited include eye movements, receiving visual and auditory information, word recognition, assigning meaning to words held within the internal lexicon, understanding grapho-phoneme correspondences, developing phonological skills, use of the working memory, inference making, use of context, understanding syntax, speed of reading and general verbal abilities. A distinction should also be drawn between internal cognitive processes and external factors based on the environmental and cultural influences that an individual brings to the task of reading, including their own personal life history, experiences and knowledge. It should also be noted that minds are open systems. Cognitive processes do not evolve or develop in isolation to environmental and individual circumstances, they co-exist and interact with each other along an on-going and developmental pathway. The poor reader of yesterday can become the competent reader of tomorrow and the role of appropriate teaching methods is of significance. It is clear that reading is a complex
process to understand because of the interplay of such a wide variety of internal and external variables.

Smith (1978) argued that reading is primarily a top-down process, with the understanding of meaning as the central core. He saw no relevance in teaching reading skills out of context of meaning and stated that comprehension was the basis of learning. He may well be correct with regard to comprehension and learning, but more recent research (Snowling 1980, 2000, amongst others) has shown the need to teach early readers how to break the code of reading. Oral language learning may be inherent in early development, but it does not necessarily translate that literacy skills follow the same pattern. In contrast to the top-down approach, whereby higher level reading processes are seen as the driving force for learning lower level skills such as decoding, bottom-up theories advocate the reverse in that higher order reading skills cannot be developed until lower level skills have been grasped. These theorists see the development of reading as a process of stages, the acquisition of one being the pre-requisite for the next.

“In Bottom up processing, information only goes from the lower levels to the higher levels and not the reverse. Thus, detection of lines and angles leads to identification of letters, which in turn leads to identification of words”. (Perfetti, p21).

Top-down theories see the development of reading as using a pre-existing structure to learn the codes of reading. The bottom-up approach contends that lexical and linguistic knowledge have to be explicitly taught as a means of grasping the initial concepts of reading; only then can higher order reading skills such as
comprehension begin to be developed. Both theoretical positions have been criticised as being too rigid (Stanovich, 1980), as both see development of reading skills moving in a single direction. This has lead to the development of a number of theories broadly classified as interactive models of reading, which view reading development and its sub-processes moving in both directions from the development of lower order skills to higher, and vice versa.

Rumelhart (1977) and later Rumelhart and McLelland (1982) are generally cited as being the first to introduce the concept of an interactive model to reading. They proposed various levels within their model, which were distinct but constantly interacting. They also incorporated a compensatory element in their work and stated that a weakness in one level could be compensated for by another intact or stronger level in the cognitive process of reading (Ellis, 1993). This approach defines separate levels within memory at the grapheme, phoneme and word stages of reading acquisition and that this information is passed between levels in both directions when decoding words and during lexical access (Perfetti, 1985). The model declares that both visual processing of whole words and phonological coding are important in the development of reading skills. Perfetti and Lesgold (1977) put forward a verbal efficiency model stating that slower processing speeds of word level information are weaker and less efficient within the short-term memory amongst unskilled readers. They see weaknesses in short-term memory as causing a bottleneck, hindering and delaying higher-level processing due to the speed of processing issues.

Stanovich (1980) rejects both bottom-up and top-down models. He is in favour of an integrated approach, stressing the compensatory nature of the model as a means of
explaining how individuals with reading difficulties in one domain can overcome weaknesses, by being more reliant on another level in the reading process.

"An interactive model, when coupled with the assumption that various component sub-skills of reading can operate in a compensatory manner, leads to a re-conceptualisation of the nature of individual differences in reading"...." Higher-level processes can actually compensate for deficiencies in lower level processes. Thus a reader with poor word recognition skills may actually be prone to a greater reliance on contextual factors because these provide additional sources of information". (Stanovich, 1980, p35-36).

There are several other interactive models of reading including connectionist models based on computer modelling (Seidenberg 2002), the dual route cascade model (Coltheart et al 1993: cited in Coltheart 2005), cognitive processing models (for example Spear-Swirling and Sternberg 1998) and a variety of parallel processing models (Rumelhart 1977, Rumelhart and McClelland 1982). All these models, although different in detail, support the view that the various levels within the reading process interact with each other rather than follow a series of stages. They do differ, however, in relation to the direct or indirect routes that exist between phonological decoding and semantic recall of words.

The dual route cascade model (Coltheart et al, 1993) argues that the pronunciation of words occurs via two routes, a lexical procedure and a non-lexical procedure. The lexical procedure involves the accessing of words already known to the reader via an internal lexicon, which activates known phonemes to enable the correct pronunciation. Non-words or unfamiliar words are activated via the non-lexical route using grapheme-phoneme correspondence rules. The model describes how a series
of processing cycles occur until the word is correctly decoded. Initially, the first cycle activates the lexical route, then if the word is not recognised the non-lexical route is utilised to decode. These two routes can be activated simultaneously; the cycle of processing continues with both inhibitory and excitatory connections until the word is successfully decoded.

Many researchers (Nation and Snowling, 1999, Stothart and Hulme, 1996, Ehri, 2002, Perfetti, 1985, Cornoldi, 1996, Stanovich, 1982) contend that, despite the multitude of factors affecting reading acquisition and development, the process can be divided into two key spheres: decoding and comprehension. It is pertinent therefore to initially look at the processes involved with decoding before moving on to comprehension.

Ellis (1993) makes the point that to decode printed words we need to “create an internal acoustic code” (p14) and develop a strategy of phonic mediation. He proclaims that a “visual analysis system” also needs to be developed to identify letters and “create an internal letter code”. (p15). As to the order of the processing of visual and auditory stimuli in reading, the exact nature of the system is not known. There may be a sequence in the brain to facilitate word processing that starts with the visual stimulus and then deals with the auditory information. Robertson (2000) contends that a significant amount of neurological literature might support this. Other cognitive processing models put forward the view that this information is processed in parallel and Stanovich (1982) asserts that both auditory and visual processing can operate simultaneously.
When letters and words are presented to children, and they recognise the symbols both visually and phonetically, how do they manage to learn how to read? Many researchers believe that a major part of the answer to this question lies with how beginner readers learn to read individual words. Ehri (2002) supports the view that words are the basic units that are visually processed rather than individual letters. She goes on to report five different ways that we do this: decoding using grapheme-phoneme correspondence rules, chunking common spelling patterns, retrieving words from memory, using analogy based on a phonic understanding of words and by predicting words from context. Children grasp these skills by developing a "connection forming process" that link written words to their corresponding sounds, which in turn evoke a meaning drawn from memory. The key to learning words and accessing them from memory is, according to Ehri, based on

"Pronunciations of words" which "are the anchors for words in memory. Readers learn sight words by forming connections between letters seen in spellings of words and sounds detected in their pronunciations already present in memory. The connections are formed out of readers' knowledge of letter-sound relations, that is grapheme-phoneme relations" (Ehri 2002, p11)

The memory forms and stores these grapheme-phoneme connections and once this alphabetic sound-based system is known, beginner readers can start the process of building up a bank or lexicon of words within their memory. Ehri sees four phases involved in this process; the pre-alphabetic (early sight word learning), partial alphabetic (learning the sounds of letters), full alphabetic (making connections between written letters and their corresponding sounds including phonemic segmentation skills) and consolidated alphabetic (whereby gradually readers are
able to readily access a lexicon of words internally with their associated meanings). It is this last phase that Ehri and others see as the foundation for fluent and accurate reading skills. The phonological codes learnt during this development are continually used to decode new words which are then added to the internal lexicon. The larger the number of words that can be accurately decoded automatically from memory, the more fluent an individual’s reading becomes.

Goswami and Bryant (1990) propose two separate components of phonological awareness in early literacy development; analysing syllables into onset-rime and phonemic units. However, further research by Muter and Snowling (1998) place emphasis on the key phonological developments as phoneme segmentation and knowledge of letter names. Stuart (2002) supports the view that early reading acquisition is aided by good knowledge of letter-sound relationships and that this leads to the development of a store of lexical items. Likewise, Snowling (2002) maintains that:

“Learning to read in an alphabetic system requires the child to establish a set of mappings between the letter strings (graphemes) of printed words and the speech sounds (phonemes) of spoken words. These mappings between orthography and phonology code the knowledge required to allow novel words to be pronounced and provide a foundation for the acquisition for more advanced, fluent reading skills” (p62).

As readers gain in knowledge and experience, they become more fluent and efficient in their decoding skills. They no longer require the use of memory capacity in decoding and can concentrate their energies in comprehending texts. A number of
researchers, including Snowling (2002) and Stanovich (1982), assert that weaknesses in phonological coding leads to less efficient decoding and forms the basis of reading difficulties amongst dyslexic learners. Weak decoding skills may also impact upon the slow speed of reading found in dyslexic learners, especially adults, and result in the use of other less efficient methods, or alternative methods, to adequately comprehend text. Slow reading is not an efficient form of reading as the short-term memory can become overloaded with decoding text rather than eliciting meaning (Smith 1978). Yuill and Oakhill (1996), Tallal et al. (1997) and Stanovich (1980) contend that accurate decoding is not enough to comprehend text efficiently, but rather rapid and automatic decoding is the key to successful reading.

There does appear to be a link between decoding words and comprehension of text, which is not a surprising assumption to make. However, decoding is just one of many factors involved in comprehension. Other variables involved include the use of memory and speeds of processing to decode efficiently and accurately and the ability to concentrate on the meaning of the text and to elicit meaning. This is particularly true as readers increase in age and experience. Muter and Snowling (1998) also found that child readers start to use syntactic clues to interpret texts more clearly and cite earlier work by Tumner (1989) who asserts that as readers develop they use context to extract word-level meaning from text. Cain, Oakhill and Bryant (2004) conclude that lower-level skills such as decoding always play a role in comprehension, but as readers get older and more experienced this effect becomes less important and other independent factors take hold. These include inference making, integration of the text into existing knowledge, monitoring of comprehension and knowledge of text structures. They maintain that children need to develop comprehension monitoring skills to further their reading abilities.
There is also evidence to suggest that weak decoders are not necessarily poor comprehenders, but rather that they may be less efficient or are using alternative strategies to extract meaning (Jackson and Doelinger, 2002, Ransby and Swanson, 2003). It may also be the case that, based on an interaction model, different readers are employing different strategies, or accessing different skills within the phases of reading acquisition, particularly those who experience difficulties with the perceived normal route to successful reading. For example, a weak decoder may not fluently and automatically read each word but can extract sufficient meaning from the text by using contextual clues based on other words within the sentence or paragraph.

Understanding reading comprehension processes
Once decoding has been mastered, readers can then turn their attention to comprehending texts and reading for meaning. There is a wealth of literature on understanding reading comprehension with theories and assertions about how individuals break down text and assign meaning to it. The simple model of reading, asserted by Gough and Turner (1986) states that reading is a combination of decoding skills and listening comprehension. This model is a good starting point to examine the reading process, but fails to enable the researcher to fully understand potential reading failure amongst individual learners. Reading is a complex process and failure can occur at a number of stages. If decoding is intact but comprehension is weak, then the simple view of reading would lead one to conclude that an individual lacks comprehension skills or general abilities. No further analysis of speed of reading, the role of memory or text knowledge would be pursued. Conversely, if decoding was poor but comprehension intact, the simple model of reading would fail to explain the reason for this. What is therefore needed is a
greater understanding of the process of comprehension and an analysis of whether the process can be broken down into a series of sub-skills or influencing factors.

Some researchers have therefore attempted to specify whether reading comprehension is a single process or a set of sub-processes. Davis (1968, cited in Johnston, 1983) identified eight separate sub-processes. This work was later re-examined by Spearitt (1972), who condensed Davis’s work into four categories: recalling words from meaning, drawing inferences, recognising the author's purpose and understanding the structure of the passage (Johnston 1983). This approach looks at the skills of the reader in terms of decoding and inference making, as well as their ability and knowledge of texts, and therefore incorporates an experiential element into the process. Cornoldi, De Beni and Pazzaglia (1996) cite a wide range of factors influencing comprehension ranging from attention, verbal knowledge, lexical access, use of long term memory, syntactic processes, use of inference, text integration, meta-cognition and listening skills. An assessment of differing variables is helpful as it can analyse specific strengths and weaknesses held by the reader; it can also contextualise these with reference to the specific type of text being read. Lexical access and use of long term memory are internal cognitive processes with reliance on memory skills. The use of memory is integral to the reading process, not only in decoding and retrieving known words, but in passage recall. Verbal knowledge, use of inference and listening skills are often associated with general verbal comprehension abilities, but might also be influenced by the reader's level of experience. The use of meta-cognition may reflect the reader's educational experiences or familiarity with the reading process rather than general comprehension.
In the initial stages of the comprehension process, a reader decodes a word and obtains a semantic meaning attached to the word from his or her internal lexicon. Perfetti (1985) states that

“word recognition processes are essentially translations of visual objects into linguistic symbols” (p5)

and describes these initial stages as local processes. These are essentially the ability to construct meaning units from the text in a short period of time, leading to what Perfetti describes as a series of ‘propositions’. As each proposition is understood, it forms a chain of meaning linking one proposition to another. The correct interpretation of each proposition is related to the context within the text and the syntax. Perfetti argues that contextual mechanisms based on syntax might help to predict words within text when reading. Perfetti, however, offers a more detailed approach to the simple view of reading proposed by Gough and Tunmer, which may explain a theoretical approach to reading skills, but does place it in the context of the reader and the strengths and weaknesses they bring with them to the task.

Theorists such as Lunzer and Gardner (1979) who have analysed the earlier work of Davis and Spearitt, found that the sub-skills hypothesis does not hold up to scrutiny. Lunzer and Gardner see comprehension as a single, whole process. They add that a sequence of events takes place when comprehending and these include: decoding, making sense, questioning, judging and revising notions. However, their analysis does not categorise these events into separate categories or skills and is based on a reader's ability to recall facts. They argue that:
“Individual differences in reading comprehension should not be thought of in terms of a multiplicity of specialised aptitudes. To all intents and purposes such differences reflect only one general aptitude: this being the pupil's ability and willingness to reflect on whatever it is he is reading” (p64).

Lunzer and Gardner therefore seem to be saying that comprehension reflects global ability levels, which may be the case in general terms, but this viewpoint fails to explain how those with a specific reading difficulty cope with the reading process and how they can be effectively supported to overcome such difficulties. The debate about whether quantifiable sub-skills exist with regard to reading comprehension will continue, however it is more pertinent to analyse the various processes and influences in order to understand comprehension and the difficulties faced by those with weak reading skills. The idea of reading comprehension solely representing global comprehension skills is therefore rejected here. It neither explains how those with high general abilities can experience difficulties with reading comprehension, nor does it help to understand the specific weaknesses experienced by failing readers.

An alternative method of analysing comprehension skills is to look at the main areas of weakness. Oakhill and Yuill (1996), for example, state that the three main areas of difficulty arise from weaknesses in inference making, understanding text structure and comprehension monitoring. Stothard and Hulme (1996) concur that weaknesses in decoding, global comprehension difficulties and weak meta-cognition are the main culprits of reading comprehension failure. Cornoldi, De Beni and Pazzaglia (1996) highlighted three factors that warranted further scrutiny when understanding reading failure; working memory, meta-cognition and listening comprehension. They
analysed a number of individual children's reading skills and found meta-cognition to be highly related to reading comprehension. They also found the existence of working memory weaknesses amongst the poor comprehenders, especially in relation to the storing of a sequence of events. Their research also showed a relationship between reading comprehension and listening comprehension, but in general ability measures. The study also indicated that reading difficulties across the cases were not the same and individual differences in reading comprehension difficulties were apparent.

Kintsch (1998) sees reading comprehension as a problem solving exercise. An important factor within this process is the actual structure of the text itself; the more complex it is, the harder to decode and comprehend. Kintsch's Construction-Integration theory (C.I model) views comprehension as a constraint/satisfaction process, whereby information that is understood is satisfied and accepted, and information that is not understood is suppressed or constrained. The reader interacts with the text based on his/her past knowledge and experience in order to form a series of propositions or ideas gained from the text. This view is similar to that of Perfetti (1985) and Perfetti and Lesgold (1977) but the propositions held in working memory are at the sentence level in Kintsch's model and at the clause level in Perfetti and Lesgold's. These idea units or propositions, according to Kintsch, are integrated into preconceived ideas drawn from long-term memory to form an interrelated network of ideas. Kintsch attempts to advance Bartlett's schema theory into a two-way/interactive process. He sees Bartlett's theory as a top-down process admitting newly processed material into an internal schema, whereas the C. I. model asserts that certain information is suppressed and discarded as irrelevant and also that relevant information can alter and influence pre-existing schemas.
The propositions that are drawn or constructed from the text produce a propositional network, with varying links between propositions based on the strength of associations. This network of propositions is then integrated into a more global network of understanding. In this manner, as the reader digests information from the text, a sequence of representations is built up. Semantic knowledge from one sentence is obtained and stored in working memory in order to digest the next sentence or proposition. Working memory is usually at full capacity at the end of each sentence and has to be cleared to process the next one. Usefully constructed knowledge is transferred to long-term memory, whilst key propositions are held in working memory to aid processing of the next sentence; irrelevant material is disregarded. The strongest proposition from the previous cycle of information is transferred to the next processing cycle producing an episodic text memory. This episodic memory is influenced by the text itself and the interpretation of the text by the reader which is influenced by their prior knowledge, belief system and personal experience.

Good readers therefore tend to use their understanding of syntax, word knowledge (vocabulary) and general knowledge to aid them to access and interpret new textual information. The inexperienced reader is at a disadvantage as they have fewer resources available to them to support the reading of new material. Inexperienced readers, especially inexperienced adult readers, often rely on context to support their weaker decoding skills. Stanovich (1980) argues that good readers tend to use context to aid their comprehension, whereas poor readers are over-reliant on context to decode, thus leaving them with less effective comprehension strategies. The use of context enables readers to make predictions about what they are about to read.
and again facilitates comprehension. The greater our ability to predict, the less mental energy we have to use in decoding and the more resources are available to comprehend. Smith (1978) sees prediction as the key to comprehension, as this process aids active reading and questioning the content of the text. Predictions are context based and relate to our pre-existing knowledge, which again suggests a link between comprehension skills and general knowledge or ability, but not exclusively so. However, the role of context amongst those with weaker reading skills can be seen at two different levels: it can aid non-automatic decoding during prose reading and it can aid understanding at the sentence level or above. Weaker decoders are therefore not necessarily weaker comprehenders, but may have to use more resources to comprehend effectively. Those with weak decoding skills, but a good level of general ability, word knowledge and/or reading experience, may be able to access more resources to comprehend successfully than those who lack such prior knowledge, educational experience or vocabulary. As stated earlier, (Lunzer and Gardner 1979, Cornoldi et al 1996, Stothard and Hulme 1996) the literature suggests a strong relationship between verbal ability and comprehension skills, and it may be that the more able or those with greater educational experience are better placed to support weak decoding than those without such attributes or knowledge.

Another factor involved in the process of semantic integration, forming propositions and making predictions, is the role of memory: particularly working memory and long-term memory.

*Short term memory is needed for temporary storage and integration of information, and long term memory is needed for more permanent storage and as a source of background knowledge (for example, in making
inferences). Both therefore play an important part in comprehension (Oakhill and Yuill 1996, p80).

Perfetti (1985) and others argue that decoding words and linking them to a semantic store relies on the use of memory. Yuill and Oakhill (1996) assert that there is a significant correlation between working memory and reading comprehension, and put forward the proposition that children are not able to reflect upon their understanding of texts if they cannot recall its content effectively. If, for example, the first part of a sentence is forgotten by the time the reader reaches the end of the sentence, then comprehension will be impaired. Thus, the longer or more complex a sentence is, the greater the chance of comprehension failure. Stothart and Hulme concur:

“To understand prose it is necessary to hold information in memory so that the semantic and syntactic relationships among successive words, phrases and sentences may be computed and a meaningful representation of the passage constructed.” (Stothart and Hulme, 1996 p95).

It is also important to understand the role of working memory in more detail to relate the consequences of weak memory skills to reading comprehension. Baddeley’s working memory model states that working memory is controlled by the central executive. The central executive is concerned with attentional control and coordinating information received. Linked to the central executive are three separate domains; the visuo-spatial sketchpad, the episodic buffer and the phonological loop which contains a phonological short-term store and a subvocal rehearsal unit.
Verbal information is stored within the phonological loop and its capacity for storage increases with child development, levelling off towards 15 years of age. The visuo-spatial sketchpad stores visual and spatial information whilst the episodic buffer is responsible for integrating information from different parts of the working memory and the long-term memory (Baddeley 1992, Gathercole and Alloway, 2006).

Curtis (1980) analysed the memory skills and prose reading of primary school children. She concluded that beginner readers use working memory more intensely due to their inability to decode automatically, leaving fewer resources available to comprehend. She goes on to maintain that weaknesses in working memory may affect less able readers at different levels. There may be a trade off between resources used to identify new or less familiar words with the storage and retention of new information. Weaknesses may also occur with the ability to integrate new information held in working memory into existing knowledge held in long term memory. Gathercole and Alloway (2006) found that weaknesses in working memory limit the amount of information that can be stored. They argue that verbal working memory skills are not simply or directly associated with general cognitive abilities and that visual memory skills are thought to operate separately within working memory to verbal memory skills. It is thought that it is verbal working memory, linked to weaknesses in phonological processing that can inhibit reading skills amongst dyslexic learners. This would suggest that weaknesses with verbal working memory may impact upon reading but not necessarily general comprehension skills.

The use of inference also plays a key role in an analysis of comprehension. Johnston (1983) distinguishes between three different types of inferences: logical
relationships, informal relationships and evaluation. Some inferences can be drawn directly from the text, but this relies upon the reader storing sufficient information in short term memory and being able to mentally structure the information whilst reading in order to make the logical connections between one piece of information and another. Other inferences are drawn from general knowledge or subject specific knowledge and rely on the reader having this knowledge in the first instance and being able to readily access it in the second. As has been stated earlier, it is thought that skilled readers use context to draw inferences from texts and the more complex a text the more likely inferences are to be required to comprehend adequately. Conversely Oakhill (1993- cited in Perfetti, Maron and Foltz 1996) reports that weak inferential skills can lead to a weak global understanding of text and that weak comprehenders often lack these inference-making skills. Poor comprehenders may also lack the general knowledge to make the inferences.

Good comprehenders seem to be able to structure the information that they read into a mental map or internal schema. Bartlett (1932, cited in Ellis 1993) first described the process of schematic ordering of information and it is still used by educationalists today. Any theory of reading must therefore take into account the readers’ prior knowledge that they bring with them to the task of text comprehension. Anderson et al (1978- cited in Perfetti 1985) state that

"a schema serves as scaffolding on which to construct the meaning of text"

and that new information comprehended whilst reading is filtered into the existing schema, which aids understanding. Clearly the extent or complexity of the pre-existing schema will impact upon new learning. Perfetti, Maron and Foltz (1996)
state that research indicates that more experienced readers are better at comprehension monitoring skills, especially at the macro text level. Dixon, LeFevre and Twilley (1988) conclude that a reader’s familiarity and knowledge of words is a potent factor in reading success, in both children and adult readers. Thus the extent of one’s knowledge and the ability to monitor and structure new information into existing schemas is a fundamental part of successful comprehension. Linked to this ability to structure new information is the capability to understand the structure of the material that is being read. Understanding the structure of reading material can also aid comprehension as it puts information into context and facilitates the assimilation of new information.

The weak reader, unfortunately, is caught in a ‘vicious circle’, or as Stanovich (1986) asserts a ‘Mathew effect’. This states that the more one reads the better one gets and conversely the less one reads the weaker one’s skills are likely to be. It is easy to see how people who have failed in the past at reading are less likely to read in the future. The development of their background or subject-specific knowledge will be reduced as a result, and therefore new learning will be harder to incorporate due to weak development of schematic representations. Their knowledge and development of written vocabulary will also be affected. This may, in turn, have an impact on the motivation to learn, as reading becomes progressively harder or less accessible, and a downward spiral of reading failure may possibly occur.

Reading comprehension can be restricted or impaired at a number of levels within the process of reading. The simple model of reading is not sufficient enough to explain all of the possible difficulties as problems can occur at a variety of points within the decoding and comprehension process. The idea that reading
comprehension is little more than general comprehension or a general ability measure does not seem an adequate answer. It is therefore imperative to try and understand where failure is occurring in the reading process when trying to offer remediation or compensatory strategies. Problems could arise at a single or a series of junctures. Determining the answers to these questions should aid in the ability to devise successful reading strategies.

Remediation and Compensatory Strategies

The key to successful reading is to understand and recall the content of texts so that knowledge can be assimilated and developed in a coherent manner. Most teaching methods in schools tend to focus on the initial stages of reading or lower order skills such as decoding. Numerous intervention programmes have taken place to improve the basic word level skills of beginner readers. Several researchers (Snowling, 2000, Gittleman and Feingold, 1983, Bradley and Bryant, 1983) maintain that longitudinal studies have shown that these early interventions have long lasting effects on reading skills. Although this may be the case, once pupils and students within mainstream education reach a certain age, it is assumed that if they have developed the lower order decoding skills sufficiently well, they will automatically transfer this knowledge into successful comprehension skills. Comprehension, as a skill in itself is seldom taught (Bell 1991). Often it may be tested, via a series of questions attached to a text, but this does not help the learner to discover how to effectively break down the meaning of sentences, paragraphs and chapters. An assumption is made that learners will develop skills such as inference making, understanding the structure of text, effective note taking and summarising skills, thus developing effective reading comprehension skills. This assumption may well be
true of a number of skilled readers, but for those who have struggled in the development of decoding skills or find learning a challenge, little or no attention is given to aid these learners to comprehend texts successfully and make reading relevant and rewarding. The whole purpose of reading, to gain new knowledge, may become a time-consuming and a demanding struggle.

Attention therefore needs to be drawn to the development of comprehension skills, both for school-aged pupils, once they have grasped decoding skills, and for adults in colleges and universities. There are a number of different strategies available to teach comprehension to both children and adults. It will be argued that some strategies are age specific and more suited to children than adults, whilst others tend to lend themselves more to the adult or experienced reader. The main focus of this research will be to examine strategies that are best suited to an adult student in a UK university setting.

One way of establishing appropriate strategies is to gather information from the students' themselves. Such an avenue of research has been provided by a number of studies that have attempted to give the ‘student voice’. Riddick, Farmer and Sterling (1997) outline a number of case studies where UK higher education students are interviewed in detail about their experiences of being dyslexic and how this has impacted upon their learning throughout the education system. A number of key themes are drawn from this evidence including the adult student with dyslexia's experience of reading at university level. A number of the participants noted weaknesses with their speed of reading and comprehension. One participant, Andy, noted that his reading:
“is very slow….you’ll be looking at a page of text and you may be jumping ahead, or skipping a line…then I realise I’m reading a line I’ve already read and that produces a sense of absolute rage and frustration. You have to read a page two or three times before you extract anything… it’s difficult, it’s a slog.” (p.37, Riddick, Farmer and Sterling, 1997)

Another student, Janet confirms the need to reread text, but also seems to indicate that if she is given sufficient time her comprehension is adequate:

“I always find comprehension hard and I really need to read it twice to actually grasp it – then I can answer the questions, no problem” (p.51)

The issue of comprehending texts taking a long time is reinforced by the testimony of Sean:

Some passages I can’t comprehend at all. When it comes to factual maths books and physics books it just doesn’t go in…. I try to skim it to get the briefest outline of whatever it is trying to say to me…” (p.107)

Further testimony from Jenny confirms this trend:

“… I’m still the same now, it’s trying to read quickly and taking in what I’m reading. I can read a page and not actually take in what I have read…. If I want to read and take anything in it takes a long time and I sort of stop and highlight something or underline it really” (pp.135-6)
These first hand accounts not only confirm the difficulties faced by adult students with dyslexia, but also allude to the sort of strategies some of them have adopted to compensate for their weaknesses, particularly the rereading of text and taking additional time.

A number of the participants in the Riddick, Farmer and Sterling study cite low self-esteem as a result of their experiences of dyslexia and the perceptions of others towards them, particularly those in authority within the education system. Riddick (1999) also confirms this point in a separate study where she matched 16 dyslexic university students with a group of controls. This study indicated significantly lower self esteem amongst the dyslexic students. This is an issue taken up by Mortimer (2003) who identifies how teasing and low-level bullying at school can still leave emotional scars and feelings of a lack of self-worth in teenagers. This lack of self-esteem often continues into adulthood and can have an impact upon the learning process both in higher education and elsewhere.

Mortimer and Crozier (2006) examined the difficulties faced by a group of dyslexic students from a number of UK universities and compared their experiences with a non-dyslexic control group. A questionnaire was used and they found the group of dyslexic students identified a number of study related skills as being weaker compared with the control group. These included reading speed, spelling, note taking, organising essays and expressing ideas in writing. With regard to general reading skills the number of students with dyslexia reporting difficulties declined as they progressed through the education system from primary to secondary to higher education. However, with regard to weaknesses with reading speed, the self reported difficulties were maintained throughout the different levels of the education system.
Gilroy and Miles (1996) use contributions from five adult dyslexics on their experiences of the education system. With regard to reading skills within higher education two of the contributors make a number of comments regarding the difficulties they faced and the strategies they adopted to alleviate these. One participant, C.R. Wishire, reports that "reducing the load to be learned and remembered" (p. 192) is vital. Learning how to research effectively and only read directly relevant material in an active rather than passive manner is also suggested. Another contributor, F. Zinovieff, confirms the difficulty of reading slowly and misreading. She sees slowing her reading as being a more efficient way to gain understanding. She cites the use of highlighter pens as an effective way of selecting and recalling key points.

A number of research papers have identified strategies to improve reading skills in pupils, particularly those with reading difficulties. Two basic approaches in teaching reading to beginner readers have predominated since the 1960s: whole word recognition strategies and phonics. Whole word methods, such as "look and say" encourage children to recognise words as visual units; phonics is based on alphabetic knowledge and letter-sound correspondences. Context and meaning-based strategies drive the whole word approach, with the notion that children are able to choose subject areas to learn to read and therefore be better motivated to learn (Ellis 1993). Phonics teaching is more abstract in that it teaches children the sounds of letters, chunks of letters in combinations, such as rime in order to teach children the patterns of sound-based correspondences. Children are therefore taught to understand the code of alphabetic structures and apply it to the learning of new words. Bond and Dykstra (1967) and Evans and Carr (1985) (cited in Ellis
1993) both carried out large-scale studies in the U.S. examining the efficacy of both teaching methods and found that the phonics approach seemed to have distinct advantages over a whole word strategy. Bryant and Bradley (1985) also found that phonological skills present in UK pre-schoolers were a good predictor of reading ability three years later. Clay (1985) found that developing a structured reading programme that involves whole word decoding, and relating this to a phonological approach produced success; work that has been replicated by others such as Hatcher, Hulme and Ellis (cited in Ellis 1993). Thus interventions using both phonics and a mixed approach using both phonics and whole word recognition have found to be successful.

An analysis of intervention studies that aim to support pupils with reading difficulties indicates that a programme that involves an element of structured phonics and letter-sound correspondence training appears to be the most beneficial. Rack (1985) and Snowling (1980) maintain that dyslexic pupils who have phonological weaknesses tend to have a greater reliance on orthographic routes to semantic recognition of words. Thomson (1988) suggests that the comprehension skills of dyslexics are not the key issue, but rather their ability to decode due to weak phonological skills; he therefore maintains that the explicit teaching of phonics will aid in the overall reading skills of this cohort of children. He found that:

"The improved attainments of children receiving intensive help based on an approach designed to overcome phonological weakness and provide grapheme-phoneme correspondence rules indicate that apparent cognitive deficits can be overcome" (Thompson 1988, p27)
Gittleman and Feingold (1983) report that an intensive phonics-based teaching programme aided the reading development of pupils aged 7 to 13 with reading disabilities, and that there were some long lasting effects to this programme. Torgeson, Wagner and Rashotte (1997) maintain that if children don't develop good alphabetic reading skills their orthographic decoding abilities will be incomplete, causing inaccurate reading. Inaccurate reading may obviously hinder fluent comprehension. They therefore argue that teaching reading using a phonic and letter-sound correspondence approach is the most appropriate method of remediation. Snowling (1996) states that the most effective teaching methods combine reading instruction with phonological awareness, and the wealth of research available makes this conclusion inescapable: an assertion supported by Stuart (2002) and Ehri (2002).

The claim that successful teaching of reading using a phonics-based approach to children is borne out by the main body of research, even though this is sometimes supplemented with a whole word strategy. However, can we automatically assume that improving phonology will improve automatic and fluent decoding that will, in turn, aid comprehension? Often intervention studies post-test the participants several months later and it is often found that the intervention has long lasting effects. However, do these effects remain years later when children become adult learners? If decoding is the key to effective comprehension then those who have weak decoding skills may benefit from a strategy of listening to texts rather than decoding them via reading. This would then by-pass the specific difficulty that a number of reading-impaired learners have. Research by Higgins and Zvi (1995) assessed the contribution that optical character recognition software and text to speech software might have in supporting adult learners with reading difficulties. They concluded that
this type of technology helped students reading comprehension where their reading was severely impaired, but interfered with understanding when students had above average reading scores. This would suggest that those adult students' who find printed material inaccessible, due to severe difficulties with decoding, may have to rely more on their listening comprehension skills by hearing the text read to them.

McCallum et al (2004) reviewed the literature regarding the differences between silent and oral reading comprehension and found mixed results. They cited several researchers from the 1970s: for example Swalm (1972) and Elgart (1978) found that early beginner readers comprehended better when reading orally; likewise Fletcher and Pumfrey (1988) obtained similar results with 7 to 8 year olds. This was based on the use of a standardised reading test, with two passages read for each mode of delivery and questions were asked and answered orally. Miller and Smith (1985) tested 94 school children on a silent and an oral reading passage, asking literal and inferential questions at the end of each passage. They concluded that low ability children readers had significantly higher oral reading scores, while middle ability readers performed better on silent reading. High ability readers did not seem to differ. However, Miller and Smith (1990), using a similar design to their previous study, found the opposite findings with regard to poor ability readers to be true; they performed better this time on silent reading. Fuchs and Maxwell (1988) found that boys with reading difficulties comprehended better when reading orally. Prior and Welling (2001) also found children with reading difficulties performed better when comprehending texts read orally. However, Holmes and Allison (1985) found no conclusive differences between silent and oral reading amongst a range of different ability groups. McCallum et al's own study using a graded reading test of sentences and short passages with both literal and inferential questions, supported the findings.
of Holmes and Allison that across a typical sample of school children, comprehension did not differ significantly between oral and silent reading (McCallum et al 2004). It is difficult to draw any firm conclusions from the evidence cited in McCallum et al's study, especially as the different studies cited obtained data under differing conditions (individual vs group administration) and varying samples of participants used. It might be possible, however, to suggest that children who are poor readers comprehend better orally, but this assertion does not hold up across a range of different ability readers. It may be that hearing the text when reading orally, aids those with decoding difficulties to process words more accurately and thus aids understanding and general comprehension.

Martino and Hoffman (2002) studied the higher and lower reading abilities of college freshmen. They concluded that phonological awareness is still an important factor in the reading abilities of college students. This evidence would suggest that for some learners, decoding weaknesses are impacting upon comprehension. However, they put forward an argument that teaching reading comprehension skills to college students should not just be based on phonological skills in isolation, but in the context of understanding syntactic and semantic structures of text and by enabling students to decode words more effectively. In contrast to this study, Guyer and Sabatino (1989) conducted research on college students (aged 17-24), classed as learning disabled, where they were taught a variation of the Orton-Gillingham programme, which is a synthetic phonics-based approach. The authors found that it proved successful and advocated the use of such an approach with adult students. This would seem to suggest that teaching phonic-based decoding skills improves the reading abilities of college students, but the results do not necessarily predict improvements in comprehension.
It may, therefore, be argued that contrary to the research by Guyer and Sabatino, a phonological approach is best suited to children, but not for adults who bring with them a wealth of prior experience to reading. Scarborough et al (1998) state that adolescent and adult learners may not rely on phonemic awareness to read successfully and that other processes may be more important in the reading processes of adults. They cite working memory deficiencies as the key determinant of reading failure in adults. Ransby and Swanson (2003) suggest that adults with a childhood diagnosis of dyslexia use both higher order and lower order processing skills to read effectively, again downplaying the role of phonological awareness in adult dyslexic readers. If, over successive years, the phonological route to semantic access is impeded, then surely the direct visual to semantic route will become reinforced and be the preferred option. It may therefore be better to start a teaching programme based on 'where the student is at' rather than going back to the rudimentary aspects of reading acquisition.

It may be the case that non-dyslexic students could also benefit from such an approach to support their reading skills. However, their options for support are greater as they are more able to develop their reading skills by using both phonological and orthographic routes to enhance decoding skills and word knowledge. The dyslexic cohort, however, is impeded in the phonological route and the rationale suggested here is that students should work to their strengths and not attempt to remediate their weaknesses. Strategies should be compensatory and attempt to support or 'bootstrap' existing skills. Such an approach would therefore lend itself to the teaching of decoding via a more visual to semantic route or a more global approach rather than a phonics-based intervention model. For example,
nursing students need to learn complex medical vocabulary; an approach focussing on the understanding or the roots of words, suffixes, prefixes, visually chunking sections of words to aid recall or a mnemonics-based strategy are more likely to aid recall than a phonological approach which is likely to challenge one of their core weaknesses.

Another area of the research literature, particularly concerning the reading skills of adult learners, is focussed around the theme of teaching meta-cognitive strategies, especially those related to schematic representations of text. Experienced readers have learnt how to structure new information that they obtain from reading into an internal mental framework or schema. If a reader is inexperienced or is facing difficulties decoding printed material, (s)he may not have the capacity available within their working memory to actively engage with the text and sort information into appropriate categories. One school of thought proposes that these skills should be explicitly taught as a means of aiding comprehension. Glover, Ronning and Bruning (1990) describe a series of skills related to meta-cognition that start with reviewing prior knowledge before reading commences. This process is thought to activate existing schema within the reader that will facilitate the easier assimilation of new knowledge when reading begins. Students are then taught how to locate the main idea within a passage of text via a process of modelling and questioning. The next stage in the process is teaching students how to review and summarise texts, based on the work of Winograd (1984), Le Fevre (1988), Palinscar (1987) and King et al (1984) as cited in Glover, Ronning and Bruning (1990). The strategies of finding topic sentences and listing key pieces of information are taught, alongside the ability to disregard less important material. Other strategies including self-questioning (supported by the research of King et al, 1984) and drawing inferences from texts.
are also suggested. To summarise, if readers are taught to actively engage in the text, plan their reading by reviewing their pre-existing knowledge and learn how to understand the structure of the texts they are reading, their comprehension is likely to improve.

Palinscar and Brown (1984) conducted research into the effectiveness of four comprehension monitoring and comprehension fostering techniques amongst poor comprehenders in 7th grade (U.S. education system). This involved developing skills of summarising, questioning, clarifying and predicting the text using a method of reciprocal teaching. They found six functions that facilitated good comprehension: understanding the purpose of reading, using relevant background knowledge, attention and concentration, critical evaluation of text content, monitoring comprehension via a process of review and drawing inferences, interpretations and conclusions. All of these strategies and skills can be broadly described under the heading of active and participatory reading. Palinscar and Brown’s study found significant and reliable gains in the comprehension skills of their participants and they cite the strategies used and the reciprocal nature of the teaching process as being the fundamental factors involved.

Dolan et al (1979) advocate a number of meta-cognitive strategies based on group discussion activities. These include developing an understanding of chunks of texts within sentences (equivalent to what Perfetti (1985) describes as forming propositions), teaching pupils about the structures of texts, predicting future text meaning which leads to improved inference making and shared reading tasks. One common approach to developing these skills, also advocated by Dolan et al, is often referred to as SQ3R (survey, question, read, recite, review), first developed by
Robinson in 1972 (Glover, Ronning and Bruning 1990). Other researchers have focussed on specific aspects of meta-cognitive strategies and have questioned the validity of general strategies such as SQ3R. Cook and Mayer (1988) found that teaching domain specific text structure of scientific text to students aided their understanding and comprehension. An understanding of the design of a reading passage is thought to aid the development of a schematic representation of the text and this in turn, it is suggested, assists with the development of inference-making skills.

There are some who view the complexity of the text as a defining feature of the ability of a reader to comprehend effectively. If sentences are complex and the material is laden with inferential connections rather than expository information, then the difficulties faced by weaker students will be exposed. More complex vocabulary needs a higher general ability and vocabulary knowledge for comprehension. Such words and phrases are also often much harder to decode, especially if they are unfamiliar. More memory take-up during decoding is thought to lead to less capacity to comprehend. Longer sentence structure may impact upon working memory capacity and the ability to comprehend a sentence as a single unit or a group of inter-related propositions. The more complex the text, the greater reliance the reader may need to place on contextual clues to further understanding, especially if there are deficiencies in decoding and/or working memory. However, such difficulties could be faced by all readers; the harder the task the greater the risk of not being able to comprehend.

Perhaps, a better way of examining this situation is to analyse the range of compensatory strategies a reader has to deal with the demands of such a complex
task. Strategies including slowing down, re-reading or actively questioning as one reads may prove advantageous. The use of highlighter pens to pinpoint key sections of text and effective note taking skills are all in common use by university students as a means of structuring and recalling information from texts. Thiede, Anderson and Therriault (2003) stress that meta-cognitive monitoring of comprehension can aid the learning process. Thide et al specifically looked at the generation of key words to generate a better comprehension of texts. They also found a delay in summarising texts aided comprehension as this allowed time to reflect upon what had been learnt. These findings were based on the participation of U.S. university undergraduates and assert that off-line strategies (meta-cognition of the text after it has been read) are effective in supporting comprehension.

In contrast, Bereiter and Bird (1985) support the idea of on-line strategies (i.e. meta-cognitive strategies used during the active reading process) as being effective. They specifically advocate the use of thinking aloud strategies. They assert that even though this might slow down the process of reading, it still actively engages the reader in thinking about the text in context and aids understanding. This approach actively engages the reader in the reading process and leads to the generation of questions and the monitoring of confusions within the comprehension process. This research also stresses the importance of using mental visual imagery to aid understanding and the activation of prior knowledge to contextualise new learning. The study, based on school children, concluded that the explicit teaching of thinking aloud strategies was important in the development of cognitive comprehension skills.

The use of visual imagery to recall information from text is another strategy that is advocated by some professionals, including Bell (1991) and Mortimore (2003). Bell
puts forward a strategy based on Gestalt theory, whereby the whole text is thought of as a series of visual images. Such a strategy might work for narrative texts, but it is harder to conceptualise this approach when reading more theoretical or academic material. Perhaps the most appropriate alternative strategy would be the development of mind-maps as a form of note taking whilst reading.

Adult readers need strategies to aid their comprehension. Many may have failed or struggled with early reading strategies during their childhood education and a return to decoding skills or phonological development is perhaps not the most beneficial strategy to apply. Comprehension, as an explicit skill, needs to be taught to adult students with reading difficulties. They have often managed to cope with aspects of reading or have relied on sight recognition and context to aid their decoding. They often find is that the time taken to break down the meaning of text is much longer than experienced by their non-dyslexic counterparts and they need strategies to extract meaning successfully and as efficiently as possible. Some researchers, such as Higgins and Zvi (1995) have looked to technological solutions to aid decoding and listening comprehension, whilst others (McCallum et al 2004) have examined the relative merits of oral reading as opposed to silent reading to assist in understanding. There is also a school of thought that maintains that the teaching of phonics has its place amongst strategies for adults, but by far the overwhelming number of research studies seem to indicate that explicit teaching of meta-cognitive and active reading comprehension strategies are most effective. Understanding the structure of text, reviewing prior knowledge, assimilating new knowledge, reviewing and summarising information, making predictions and inferences from the text can all aid comprehension. Slowing down the reading, for those who experience difficulties and
using active meta-cognitive strategies, including more visual representations of information, may therefore be the way forward.

Review of methodology

All research has an underlying epistemological framework, whether it be explicit or incidental. Within educational and psychological research, and across the social sciences, a number of competing theoretical approaches exist. Research is the exploration of the truth and the starting point for an investigation is usually focused on experience, of the researcher and others in the subject area; of reasoning of ideas including both deductive and inductive methods; and the research itself (Cohen and Manion, 1994). The scientific method has evolved from a positivist approach to research, whereby the finding of objective knowledge based on empirical collection of data is the central paradigm (Willig, 2001). Educational research, over the last twenty years or more, has questioned the validity of a purely empirical or quantitative approach to research. Hammersley (1993, p x) notes that:

“Doubts have been expressed about whether research can simply document the facts about educational policy and practice—whether they do not in some sense ‘construct’ the facts they present.” And that “the function of educational research... is now seen by some as needing to have a much more ‘critical’ orientation and to be much more closely involved with, if not integrated into, educational practice.”

Educational research, as well as other disciplines within the social sciences, has therefore turned to more qualitative and subjective approaches. The scientific method has been criticised as not representing a true picture of human behaviour as a controlled environment cannot replicate reality as behaviour has to be placed in its
environmental context. A more interpretive paradigm is therefore required that can more easily negotiate through the multitude of variables that interact to produce human behaviour. Such an approach lends itself to research methods that examine personal accounts, ethnographic studies, researcher observations in the field, personal constructs and case studies. Action research has developed, particularly within education, as a means of the practitioner attempting to research a real situation in a specific context with the aim of improving practise. A change in practise is seen as a means of putting forward a change in the underlying theoretical approach to an educational problem or situation; for example implementing a teaching strategy to support an aspect of reading could impact upon the theory of reading acquisition.

However, educational research has not turned its back on empiricism. Research methodology does not have to make a spurious choice between a quantitative versus a qualitative approach, but rather can look to 'marry' the two. The process of triangulation uses two or more methods of data collection in an attempt to map out more fully the complexity of human behaviour and can use both empirical data and subjective analysis to complement each other (Cohen and Manion, 1994). This body of research has focussed on the gathering of empirical data with regard to the reading skills of groups of students. However, the initial design and generation of ideas for the studies was based on practitioner experience working within the field of adult dyslexia support. Feedback from students on teaching methods and specific difficulties with learning were instrumental in guiding the programme of research within the thesis. The intervention study (chapter 4) used a case study approach and a mixture of qualitative interview techniques with the gathering of
empirical data on reading performance. Strategies for teaching have been guided by quantitative data, the student experience, participant feedback and performance.
Chapter 2

Part 1: The development of an adult reading test

Introduction

In order to provide effective intervention for adult students with reading difficulties an appropriate assessment of their reading skills and other educational abilities needed to be undertaken. In January 1999 the National Working Party on Dyslexia in Higher Education published its report on policy, provision and practice. Within this report the authors noted that:

"There are few standardised tests that are appropriate to this age and ability group that can be strongly recommended at the present time and there is an urgent need for research and test development in this area".

(p 98)

The assessment of dyslexia in adults in the UK is predominantly carried out by psychologists and specialist teachers. The general approach is to conduct a series of cognitive tests that assess verbal abilities, visual processing or non-verbal skills, use of working memory and speeds of processing. Despite the discrepancy model becoming out of favour, assessment procedures still tend to contrast cognitive abilities with literacy based attainments, with psychologists often performing statistical analysis to see if there is a mis-match between general abilities and literacy skills. Regardless of the efficacy of this approach, what is certain is that any assessment of a specific learning difficulty should contain reading measures. For a number of years there have been several single word reading tests, for example the BAS word reading test or the WRAT as well as a number of sentence completion tests and short prose comprehension tests (Woodcock, Edinburgh Reading Test). A
number of assessors have found that a prose reading test was required to gain a better understanding of the reading process within an individual and practitioners often used the Neale Analysis of Reading Ability as it had a UK standardisation and enabled scores to be obtained for reading accuracy, comprehension and rate. The problem, however, when assessing an adult population, was that the Neale is a child reading test with a standardisation up to the age of 12 years 10 months. This meant that teenagers and adults could not be effectively tested and their results compared with a comparable normative population. The subject matter of the passages within the test was not age appropriate and, apart from the extension passage, that was not part of the standardisation, the material was not sufficiently complex enough for a number of students entering further and higher education.

There was therefore an urgent need for a UK standardised prose reading test that could assess the reading skills of adults in relation to their accuracy, comprehension and rate of reading. It was important to have a standardised test to ensure that comparisons of reading ability could be made with a 'normal' population. It can be argued that prose reading measures of accuracy, rate and comprehension are vital as part of a battery of tests in the assessment of literacy skills amongst adult dyslexic students. The reasons for this are many. The three measures of rate, comprehension and accuracy tap into a number of the different core deficits, directly or indirectly, within a dyslexic profile. Speed of processing should partly be represented by rate of reading, use of working memory could impact upon comprehension levels and word decoding should be linked with reading accuracy. However, reading is an extremely complex process, with different readers displaying strengths and weaknesses within the different component parts of the process. It is therefore important to understand as much as possible about this process within an
individual, and the inter-relationship between rate of reading, reading accuracy and comprehension. For students studying at University or College, it is best understood in a prose test as this is the environment in which these skills are required whilst studying. The assessment of these different skills also enables the practitioner to begin to understand the learning profile of the student and implement effective study skills strategies.

The test was developed as an oral reading test as it was felt a measure of accuracy was important in the understanding of possible errors in the reading process. There are some concerns that silent reading and reading aloud are separate skills, and that those with reading difficulties will find the oral reading harder and therefore their scores are likely to be depressed when taking such a test. This was acknowledged by the test authors (Brooks, Everatt and Fidler, 2004) and research presented within this body of work explores this issue further.

Method
Initially, a measure of prose reading had to be devised, which evolved into the development of a formal prose reading test (The Adult Reading Test, 2004). Seven passages were written, increasing in difficulty of reading accuracy. The increases in accuracy were measured via the use of the Flesch-Kincaid grade level score which follows the US school year grade and the passages varied from 5.5 to 12 in readability score. The passages also increased in length through the test, initially starting with 152 words and ending with the final passage of 297. The passages were produced with the adult student in mind and questions in the comprehension test were divided into those attempting to tap factual, memory and inference aspects. The subject matter of the tests attempted to provide a variety of educational subjects
to ensure that students with an arts, science or technical bias were not either advantaged or disadvantaged. The tests were piloted with an opportunity sample, any ambiguities were noted and passages were refined and amended. The questions were given to a group of undergraduate students to answer without having access to the passages. This was done to ensure that the comprehension questions were measuring reading skills as opposed to general knowledge. Any questions that were answerable without seeing the passage were altered or removed.

The standardisation for the test was carried out in the South East of England at six institutions; three Further Education Colleges and three Higher Education Institutions. Participants were recruited by means of advertising and paid for their time, but a cross section of abilities, based on NVQ levels, was targeted to ensure a representative sample. The research programme followed the BPS recommended guidelines on research and participants were informed as to the nature of the study and their ability to withdraw at any point. (These procedures were followed for all of the studies detailed within the thesis.) Colleges were chosen to represent a cross section of students from differing cultural and class backgrounds at both the further and higher educational levels. The majority of the sample (230, 76%) indicated that their first language was English (though three of these indicated that they were bilingual English/French, English/Yoruba or English/Africaans speakers). The majority of students with English as an additional language had been using English for seven or more years; only 7% of the sample had been using English for less than seven years. A small number of individuals (less than 3% of the sample) indicated interruptions in primary or secondary education of more than one year, whereas 50 (15% of the total sample) indicated problems in literacy acquisition or difficulties related to special educational needs during their education. Within the total sample,
40 students were attending NVQ level 1 courses, 30 level 2, 72 level 3, 131 level 4 and 29 level 5; with an approximate equivalent number of FE and HE students. Of the total sample, 105 (35%) were male. The larger number of females in the sample was consistent with the larger number of females studying across the six institutions. The average age of the sample was just under 21 years of age (mean = 20.78 years, standard deviation = 5.9) with a range from 16 to 55 years of age across the whole sample.

The seven passages give percentile levels for accuracy, comprehension, speed of reading and speed of writing. Percentile scores were used so as to give ease of comparison with other tests and literacy measures. In addition to these measures, demographic information about each student tested was obtained; this involved the student answering a series of questions verbally. Students were also tested using the BAS II single word reading test (Elliot 1983) and comparative data was obtained. The BAS II test involves reading a series of words, increasing in complexity. Once ten errors are made the test is stopped, or alternatively the reader gets to the end of the test and the number of errors are counted.

Students were given scores for reading accuracy, comprehension and rate. If no errors of accuracy on a passage were made then 15 points were given per passage. A point was deducted for each error. If a student made 15 errors or more on a passage, the test was terminated and total scores were taken from the previously successfully completed passages. Each passage had 10 questions, a point awarded for each correct answer. The rate of reading was calculated in words per minute for each passage and as an average for all the passages successfully read. A speed of writing was also obtained by asking the student to write a summary of one of the
passages. Tables 1 and 2 below give the descriptive statistics for the sample student population.

Results

Table 2.1. Descriptive statistics for reading accuracy, reading rate and reading comprehension produced by combining scores across the seven passages.

<table>
<thead>
<tr>
<th>measure</th>
<th>minimum</th>
<th>maximum</th>
<th>mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 304</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>accuracy</td>
<td>3</td>
<td>105</td>
<td>78.4</td>
<td>25.7</td>
</tr>
<tr>
<td>rate</td>
<td>65</td>
<td>243</td>
<td>154</td>
<td>33</td>
</tr>
<tr>
<td>comp</td>
<td>6</td>
<td>67</td>
<td>37.1</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Table 2.2. Descriptive statistics for the number of words written per minute; minimum and maximum scores, together with mean and standard deviations.

<table>
<thead>
<tr>
<th>measure</th>
<th>minimum</th>
<th>maximum</th>
<th>mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=296</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>writing speed</td>
<td>4</td>
<td>40</td>
<td>22.9</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Alpha coefficients were calculated for the prose reading measures. The 221 participants that completed all 7 passages produced alpha coefficients for accuracy of 0.85, for rate of 0.97 and for comprehension of 0.81. Test-retest correlations were produced for a sample of 32 HE students. The two tests sessions occurred approximately one month apart. Coefficients were 0.88, 0.76 and 0.79 for accuracy, rate and comprehension respectively.

In order to test the validity of the test as a measure of reading accuracy, the sample of FE/HE students was also tested on the British Ability Scales (BAS) II Reading Test (Elliot, 1983). Of the sample, 302 students completed the BAS test. Pearson Correlation Coefficients were calculated between the BAS Test and the prose
reading measures. These produced r-values of 0.76 for accuracy, 0.46 for rate and 0.53 for comprehension. Despite the ceiling effects found in the BAS, there was a good level of agreement between the accuracy score of the prose reading test (ART) and reading accuracy as measured by the BAS.

A separate sample of 100 children from 2 city-based schools was given the prose reading test together with the Neale Analysis of Reading Ability - Revised (Neale, 1997). The sample comprised 50 males and 50 females aged between 13 and 15 years of age – approximately equal numbers of 13, 14 and 15 year olds were tested. Within the sample, eight had English as an additional language, though only three had been using English for less than seven years prior to testing. Additionally, six cases reported Special Educational Needs, 22 reported they had received extra support (mainly for literacy) and 13 reported literacy difficulties. Half the participants were given the Neale first followed immediately by the ART. The remainder performed the tests in the reverse order. Correlations between the equivalent measures of the tests were large and highly significant: accuracy r=0.90; rate r=0.71; comprehension r=0.74.

The standardisation process also enabled a comparison of the performance of those with self-reported literacy difficulties with those without on measures of reading accuracy, comprehension and speed, as well as writing speeds. Statistical comparisons were performed and summary data provided in Table 3. Independent samples t-tests indicated that for reading accuracy, reading rate and writing speed, those with self-reported reading problems performed worse than the remainder of the cohort (t(227)=2.79, p=.006 for reading accuracy; t(227)=3.02, p=.003 for reading
rate; $t_{(222)}=2.22$, $p=.027$ for writing speed). For reading comprehension, the groups did not differ ($t_{(227)}=0.96$, $p=.34$).

Table 2.3 Average scores, with standard deviations in brackets, for students with self-reported literacy deficits on reading accuracy, rate and comprehension, as well as writing speed in comparison to those without known long-term literacy problems.

<table>
<thead>
<tr>
<th></th>
<th>Reading problems</th>
<th>No known long-term reading problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>68.38 (24.34)</td>
<td>83.26 (23.23)</td>
</tr>
<tr>
<td>Rate</td>
<td>139.32 (31.67)</td>
<td>161.59 (32.30)</td>
</tr>
<tr>
<td>Comprehension</td>
<td>35.53 (13.83)</td>
<td>38.54 (12.30)</td>
</tr>
<tr>
<td>Writing speed</td>
<td>20.60 (6.53)</td>
<td>23.73 (6.12)</td>
</tr>
</tbody>
</table>

Discussion

The test standardisation process proved successful and lead to the production of an appropriate tool that was fit for purpose. The validity and reliability measures were robust when compared with known and reliable tests. The test was now able to be used to assess the reading abilities of adults with age appropriate norms. It was also useful to use the test as part of a wider battery of tests, to assess general educational abilities amongst groups of adults.

The initial comparison between those within the standardisation who self-reported literacy difficulties with the rest of the sample produced some interesting results. Significant differences were noted with regard to reading accuracy and reading rate between the two groups, but not for comprehension. This would indicate that accuracy and to a greater extent reading rate are the most pertinent features of weaknesses amongst impaired readers. The significant differences in both reading
and writing speeds could also suggest that a speed of processing issue is a defining characteristic of those with literacy difficulties. The findings are also consistent with the view that adults with reading difficulties do not necessarily have comprehension weaknesses, despite experiencing difficulties accessing information in a printed form. This would lead to an assertion that the simple model of reading (reading = decoding + comprehension) does not adequately enable us to understand the reading process amongst those with reading difficulties. Rather, it is suggested that a more complex approach is required that tries to delve beneath the surface of the reading process and attempts to understand where individual differences and weaknesses occur.

Part 2: Developing an adult dyslexic profile of abilities and weaknesses

There are ever increasing numbers of students within the UK education system being assessed with dyslexia or a specific learning difficulty. Significant numbers of these students are continuing their education into both further and higher educational institutions. Figures given by the Higher Educational Statistical Agency on all first year UK higher education students reveal that the number of known dyslexics within this group rose from 2,359 in 1994/5 to 10,430 in 2000/1, to 18,700 in 2003/4 and to 24,820 in 2006/7. (www.hesa.ac.uk/index.php, accessed 28/05/2008). These figures are likely to be an under representation of the true number of dyslexic students entering higher education, only including those who have disclosed and not including the large numbers of students assessed whilst they are studying. At the University of Surrey alone, in the last three years more than 100 assessments have taken place.
each year for existing students, indicating that the trend is for increasing numbers of
students within the system who potentially may require support with reading and
research, as well as other study skills.

There is also legislation within the UK that requires educational establishments to
have due regard to the needs of disabled learners, not only to provide reasonable
adjustments for individuals to access the curriculum, but also an anticipatory duty to
make the learning environment more accessible in general. Universities therefore
need to understand the strengths and weaknesses of a significant cohort of their
student population. Few studies have included an examination of the prose reading
skills of adult students within the UK, which, given the importance of such a skill
within the education sector, is surprising. Research therefore needs to be conducted
to understand the learning profiles of dyslexic students, including their abilities with
reading and research-based tasks. This study attempts to develop a profile of a
‘typical’ dyslexic student in regard to literacy and cognitive skills, including prose
reading, as identified by the Adult Reading Test (2004). It is also anticipated that
developing such a profile might lead to the production of cognitive indicators that
underpin the weaknesses observed in dyslexics when reading text.

Method
Participants
An analysis of higher education students was conducted. For all of these students,
records of a formal assessment of dyslexia were obtained and they were recorded
as receiving dyslexia-related support from the institution where they were studying.
The dyslexic cohort comprised of 74 students, with the mean age of the group being
25.3 years (sd =8.25), and 28% being male and 72% female. The analysis was
carried out to assess the typical dyslexic profile on the prose reading measures, together with their performance on tasks normally included in dyslexia assessment procedures.

**Measures**

The Adult Reading Test was administered as a measure of prose reading accuracy, comprehension and speed and to obtain a writing speed measure. The development of this test and the test procedures are described in the previous section of this thesis, Part 1 of Chapter 2.

The British Abilities Scale II word reading test (Elliot, 1983) was used to measure single word decoding. The test consists of a series of words, increasing in complexity, that the participant has to read aloud. The number of errors is recorded and the test is terminated when the participant makes ten errors or when (s)he reaches the end of the list of words.

The Helen Arkell Spelling Test (Brooks and Mclean, 1998) was used to assess spelling; participants listen to a series of words that are also put into the context of a sentence and asked to spell them. The test is not timed and participants have to obtain a base level of five correct spellings before moving to the next group of words. Words increase in complexity through the test and each group of words contains both regular and irregular words. The test is stopped once the participant makes ten errors and a score is obtained.

A Spoonerisms task from the Phonological Assessment Battery (Frederickson, Frith and Reason, 1997) was used as a test of phonology. The full spoonerisms measure
was used which involved the transposition of the initial sounds of two words ('fed' and 'man' = 'med fan'). Participants were verbally presented with pairs of words and asked to swap the first sound of each of the two words around (for example King John becomes Jing Kohn). No time constraints were imposed and participants are presented with twenty pairs of words, with the number of responses being used as the measure for this task.

Cognitive measures were taken from the Wechsler Adult Intelligence Scale (WAIS III; Wechsler 1997) and included subtests for verbal abilities (Similarities and Vocabulary), non-verbal measures (Block Design and Matrix Reasoning), Coding (a measure of processing speed) and Digit Span (a measure of auditory working memory).

The Similarities test involved the participant being asked to verbally give a suitable explanation for two words being linked in meaning (for example tennis and hockey are both sports), which increase in complexity during the test. As with all the WAIS measures, the raw scores on the task were converted to WAIS standard scores based on a mean of 10 and standard deviation of 3.

The Vocabulary subtest was used to assess word knowledge. It requires subjects to define words by providing synonyms, major uses, primary features or general classifications. Each word was presented verbally by the tester, though a printed version remaining available to the subject at all times. Responses were scored either zero, one or two based on the marking criteria reported in the test manual, with the maximum raw score being 70, which was converted to standard scores. The test was discontinued following five consecutive scores of zero.
The Block Design required participant to arrange coloured blocks in order to reproduce model patterns displayed on a card. There were nine patterns in total. The complexity of the pattern determined a time limit imposed for completion. Completion of the task within the given time limit earned the subject extra points in addition to those awarded for accuracy. Raw scores were converted to standard scores. The test was discontinued following three consecutive failures.

The Matrix Reasoning sub-test involved non-verbal problem solving and spatial reasoning skills. Participants were given a series of patterns that formed a sequence but with one part missing. The task was to complete the missing section with one of a number of choices given. The test was not timed, with the number completed correctly being used as a raw score which was converted to standard scores.

The Digit Symbol Coding test presents participants with a series of symbols that are matched with numbers and the participant has to code the symbols to match their corresponding number under timed constraints. Again the number correctly coded was converted to standard scores.

The Digit Span Test involved the verbal presentation of sequences of digits, with participants being required to repeat each arbitrary sequence of discrete numbers. For the forward task, participants were required to repeat the series in the order presented, whereas for the backwards task they were required to repeat the digits in the reverse order. For digits forwards, the number of digits presented per sequence ranged from three to nine digits. For digits backwards, sequence length ranged from two to eight. Sequences increased by one digit after completion of two trials at each
sequence length, unless the test was discontinued following failure on both trials. The raw score (out of a maximum of 28) was the sum of total number of sequences forwards and reverse. This combined score was then converted to WAIS standard scores.

A further measure of speed of processing was used from the Phonological Assessment Battery (Frederickson et al, 1997). This was the Digit Naming Speed Test which presents participants with a string of 50 digits, written in blocks of five on a sheet of paper. The participants were required to name the sequence of 50 digits as quickly as possible. The stimuli were the digits one through nine (bar seven) and the order of presentation of the items was pseudo-random, avoiding sequences of the same object or runs of digits. Although errors were noted, the time taken to complete the task was used as the performance measure.

Results

Descriptive statistics for the dyslexic cohort of 74 are outlined below, with the mean age of the group 25.3 years (sd =8.25) with 28% male and 72% female.
Table 2.4: Mean scores (standard or scaled) for a number of ability measures and literacy skills amongst a group of adult dyslexic students

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean score</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAS word reading</td>
<td>98.8</td>
<td>14.0</td>
</tr>
<tr>
<td>ART accuracy</td>
<td>98.4</td>
<td>10.2</td>
</tr>
<tr>
<td>ART comprehension</td>
<td>101.2</td>
<td>13.3</td>
</tr>
<tr>
<td>ART speed</td>
<td>85.8</td>
<td>10.3</td>
</tr>
<tr>
<td>HAST spelling</td>
<td>87.7</td>
<td>13.8</td>
</tr>
<tr>
<td>Writing speed</td>
<td>88.8</td>
<td>11.7</td>
</tr>
<tr>
<td>PhAB Spoonerisms</td>
<td>103.8</td>
<td>13.3</td>
</tr>
<tr>
<td>PhAB Naming speed digits</td>
<td>85.4</td>
<td>14.1</td>
</tr>
<tr>
<td>WAIS Similarities</td>
<td>11.7</td>
<td>2.7</td>
</tr>
<tr>
<td>WAIS Vocabulary</td>
<td>12.0</td>
<td>2.6</td>
</tr>
<tr>
<td>WAIS Block design</td>
<td>10.5</td>
<td>2.7</td>
</tr>
<tr>
<td>WAIS Matrix reasoning</td>
<td>12.1</td>
<td>3.1</td>
</tr>
<tr>
<td>WAIS Coding</td>
<td>7.4</td>
<td>2.3</td>
</tr>
<tr>
<td>WAIS Digit span</td>
<td>8.2</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Figure 2.1 represents this typical profile against normative data for each of the test measures used (average population levels are indicated by a score of 100, with a population standard deviation of 15).
The results from this study found that within the literacy measures speed of reading, spelling and speed of writing were the main areas of weakness amongst the dyslexics. Consistent with the initial data on the prose reading performance, the dyslexics were slower readers. However, their reading comprehension was relatively good and typical of tertiary education students in general. This cohort of students' performance on single word reading and prose reading accuracy was overall within the average range. Performance on the phonological processing task was also within the average range, comparing well with the normative data (see Table 2.4 above). Overall, it seems that adult dyslexic students show particular weaknesses in the time it takes to read a passage of text, rather than gaining meaning from what is being read. With regard to the cognitive measures, specific deficits were noted in
terms of speed of processing measures and auditory working memory. General verbal and non-verbal skills amongst this group were within the average range.

Regression analysis was conducted on both reading accuracy and comprehension. The most important factors found to influence reading accuracy were verbal ability (similarities and vocabulary measures from the WAIS) \( (F(6,67)= 4.19, p<0.001) \), phonological recoding measures (digit span and spoonerisms) \( (F(10,63)= 4.20, p<0.001) \) and single word literacy (BAS reading and spelling) \( (F(12,61)=10.52, p<0.001) \). Reading comprehension was influenced predominantly by verbal ability \( (F(6,67)=4.78, p<0.001) \) and text speed (reading and writing speeds) \( (F(14,59)=4.38, p<0.002) \).

**Discussion**

From the data presented in this study, an adult student dyslexic profile consists of average to high average general abilities (verbal and non-verbal measures) but weaknesses with speeds of information processing and auditory working memory. With regard to literacy skills, spelling and writing speeds are weak, at the bottom end of the average range, with mean standard scores of 87.7 and 88.8 respectively. Single word reading and prose reading accuracy were not significantly impaired and did not provide evidence of a significant weakness amongst this group of university students. This is not to say that some individual students may have significant impairments with single word reading or other groups of adult dyslexics, but at the university level this did not seem to be the case. What was significant regarding the prose reading skills of this group was their speed of reading, with a mean standard score of 85.8. It may be possible to explain the slower reading and writing speeds
as a reflection of weaker speeds of processing within the group. Further analysis of
the issue of reading speed needs to be explored to determine if this is the case.

The regression analysis revealed that reading accuracy was most strongly
associated with verbal abilities, phonological skills and single word decoding. This is
not surprising as the ability to decode accurately is inevitably going to rely on word
knowledge and familiarity and ability to decode using phonological skills. Within this
group, phonological skills (when given the Spoonerisms test) did not appear to be
weak, which is surprising. It may be that a spoonerisms task is not the best measure
of phonological processing skills amongst adults. However, Hatcher and Snowling
(www.york.ac.uk/res/crl/YAA accessed 07/06/08) maintain that a spoonerism task is
an effective measure of screening for dyslexia within a higher education student
population. It may be possible that the spoonerism task did not discriminate against
the dyslexic group in this study as it was not timed. Conversely, the York
Assessment Battery, developed by Hatcher and Snowling, gives a timed test and it is
suggested that it is the timed element that offers the differentiation between adult
dyslexics and their non-dyslexic peers.

The regression analysis for the comprehension measure produced a close link with
verbal abilities (similarities and vocabulary) and text speed (reading and writing
speeds). This would suggest that comprehension is a combination of an ability
measure and reading fluency. Issues related to single word decoding, memory,
speeds of processing, all of which are typically weak amongst a group of dyslexics
and verified by the profile obtained from this group of 74, were not highly associated
with comprehension within this regression analysis. It would appear that this data
might suggest that the speed a dyslexic adult student reads at can influence their
level of comprehension, with the slower one reads the increased opportunity to comprehend effectively. It may be that the process of slowing down reading enables more time to overcome difficulties with decoding, recall of information, storage of semantic meaning in working memory and thus aid overall comprehension levels.

Part 3: Speed of processing and reading comprehension strategies amongst adult students with developmental dyslexia

Introduction

Data gathered from the previous study suggest that the main defining feature of adult dyslexic students when reading prose may be their much slower rates of reading. In contrast, comprehension levels can be reasonable and, if comprehension difficulties do exist, they may be confined to specific types of comprehension skills. Given the noticeable effects of speed of reading, and the current use of extra time as the main provision for adult dyslexics in education, it was speculated as to why those with known reading difficulties read more slowly. It could be that those with reading difficulties have slower processing skills, particularly when decoding print, which leads to slower reading. Alternatively, it is possible that reading more slowly is a deliberate strategy amongst adult impaired readers as a means of aiding their understanding.

For example, it has been argued that dyslexics suffer from a speed of processing deficit (eg, Wolf and Bowers, 2001). Therefore, deficits in speed of processing, or fluency in word processing, may lead to weak reading skills that impact on rate of reading. A number of researchers (Perfetti 1985, Kuhn and Stahl 2003) have found that improvements in reading fluency aid understanding of text amongst children. Breznitz (1997) cites weaknesses with short term memory processing as a key...
weakness in the reading skills of dyslexic children and advocates that this can be overcome by improving speeds of reading. Breznitz also argues that dyslexic readers should focus more on visual orthographic representation of text and use of context rather than phonological decoding. If dyslexic children speed up their reading, it is argued, they will have more resources to comprehend the text and less strain will be put upon the working memory system. Reading acceleration is seen as increasing resources within short-term memory to access contextual information from the text and enhance processing. This view is based on a connectionist model of reading, whereby phonological, orthographic and semantic processing takes place continuously. It is thought that if there is a weakness in one area of processing, such as the phonological route, the other two processing routes will take over, especially so if reading rate is maintained and working memory resources are not overstretched. Karni et al (2004) contend that if dyslexic readers are made to read faster than their usual rate, they can increase their decoding accuracy and comprehension.

Carver (1992), however, reports that speed of reading has a direct impact on both accuracy and comprehension, and states that tests that use timed constraints may produce results that underestimate potential comprehension. It may therefore be the case that slowing down reading may free up resources available as the individual reader has more time to process accurately and thus aid their comprehension. They may also have more time to apply contextual clues and meta-cognitive strategies to enable successful comprehension, especially with more complex texts that are harder for dyslexics to decode automatically at speed. Stanovich’s (1980) interactive model of reading suggests that good reading skills in one area can compensate for
weaknesses in another: poor single word reading, for example, might be
compensated for by greater use of contextual clues during prose reading, thus aiding
comprehension. However, the use of contextual clues is time-consuming and,
therefore, would be predicted to slow reading down. Therefore, slow rates of reading
may be an uncontrollable result of an underlying cognitive deficit or a strategic
answer to weaknesses in one aspect of the reading process.

Method
To provide information on which to assess these alternatives, data were obtained on
the cognitive and literacy skills of a total of 97 adult dyslexics in further and higher
education. The students were assessed on speed of reading, reading
comprehension, reading accuracy for texts and single words, spelling, phonological
skills, naming speeds, coding, digit span forwards and reverse, verbal IQ and non-
verbal IQ. A battery of tests were used consisting of the Adult Reading Test (2004)
(see above for test description) to obtain measures of prose reading accuracy,
comprehension and rate, the Wide Range Assessment Test (Wilkinson 1993) for
single word reading and spelling (1993), the Spoonerisms and Digit Naming Speeds
tests from the Phonological Assessment Battery (1995) and sub-tests from the
Weschler Adult Intelligence Scale (coding, digits, vocabulary, similarities, block
design and matrix reasoning — see chapter 2, part 2 for test descriptions). The
WRAT test is a U.S normed test that includes a spelling test and a single word
reading test. The spelling test presents a series of words, increasing in complexity,
that are presented orally and placed in the context of a sentence. The participant
writes down each target word and is required to obtain a baseline of five correct
consecutive words. The participant is required to spell up to 40 words, or the test is
stopped if 10 consecutive errors are made. The reading test follows a similar format, with a series of words presented on a card that the participant reads aloud. The participant is required to obtain a baseline of the first five consecutive words to continue the test and then has to read a series of words, increasing in complexity until (s)he reaches the end of the list of 42 words. The test is stopped if ten consecutive errors are made.

Data was obtained from formal dyslexia assessments, with the participants consent, and test scores aggregated. This cohort of 97 dyslexic students were then sub-divided based on speed of reading and reading comprehension scores given in their psychological assessments, producing four sub-groups:

- slow readers and weak comprehenders (9% of sample)
- slow readers and good comprehenders (53% of sample)
- fast readers and weak comprehenders (14% of sample)
- fast readers and good comprehenders (24% of the sample)

Slow readers were categorised if their performance on the reading speed measure produced a standard score of 85 or below (i.e. 1 standard deviation or more below the mean). Those above 85 were categorised as good (average or above). Likewise with regard to the comprehension group categorisation, those with a standard score of 85 or below on the comprehension measure were categorised as weak; those above as good. The four groups were compared with the other measures producing the following results:

**Results**

Initially descriptive data is presented on each of the measures for the 97 dyslexic participants (see table 2.5). However, of greater interest is how the data compares
within groups once the initial cohort is broken down into the four sub-groups, based on reading speed and comprehension.

Table 2.5: Descriptive data for measures obtained from a group of 97 dyslexic students (F.E and H.E)

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean Score</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART comprehension</td>
<td>94.5</td>
<td>14.1</td>
</tr>
<tr>
<td>ART accuracy</td>
<td>100.2</td>
<td>10.9</td>
</tr>
<tr>
<td>ART rate</td>
<td>83.4</td>
<td>13.0</td>
</tr>
<tr>
<td>Spelling (HAST)</td>
<td>96.7</td>
<td>9.6</td>
</tr>
<tr>
<td>Spoonerisms (PhAB)</td>
<td>103.4</td>
<td>14.4</td>
</tr>
<tr>
<td>Naming speed (PhAB)</td>
<td>88.5</td>
<td>15.6</td>
</tr>
<tr>
<td>Similarities (WAIS)</td>
<td>10.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Vocabulary (WAIS)</td>
<td>11.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Block Design (WAIS)</td>
<td>11.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Matrix Reasoning (WAIS)</td>
<td>12.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Digit Span (forwards)</td>
<td>9.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Digit Span (Reversed)</td>
<td>5.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Coding</td>
<td>8.2</td>
<td>2.4</td>
</tr>
</tbody>
</table>

By far the largest sub-group within the overall cohort was the group that read more slowly but maintained a reasonable/good level of comprehension (the slow/good group). A finding consistent with the data from the first study in that rate of reading may be weak, whereas comprehension is preserved. This would seem to be a feature of the majority of adult students with dyslexia, and would be consistent with the view that a significant proportion of dyslexics read more slowly to maintain their understanding of text. Further analyses were conducted by means of a series of analyses of variance which contrasted the different groups' performance on the measures of accuracy, spelling, phonological skills (Spoonerisms), naming speeds, coding, digit span forwards and reverse, similarities, vocabulary, block design and matrix reasoning. These data and anova results can be found in table 2.6, which also included the data for the different groups on the measures of reading rate and
comprehension. Post-hoc (Sheffe) comparisons were also performed, the results of which can also be found in table 2.6.

Table 2.6: One factor ANOVA on a series of measures between groups based on reading comprehension and speed

<table>
<thead>
<tr>
<th>Test</th>
<th>Slow/ weak Mean (SD)</th>
<th>Slow/ good Mean (SD)</th>
<th>Fast/ weak Mean (SD)</th>
<th>Fast/ good Mean (SD)</th>
<th>ANOVA F-value (p-value)</th>
<th>Post hocs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading accuracy (ART)</td>
<td>98.7 (8.3)</td>
<td>101.5 (9.8)</td>
<td>103.0 (17.1)</td>
<td>96.1 (8.7)</td>
<td>1.760 (0.16)</td>
<td></td>
</tr>
<tr>
<td>Reading Speed (ART)</td>
<td>71.7 (11.4)</td>
<td>76.4 (5.6)</td>
<td>91.0 (5.6)</td>
<td>99.0 (11.7)</td>
<td>52.391 (&lt;0.001)</td>
<td>1,2&lt;3&lt;4</td>
</tr>
<tr>
<td>Comprehension (ART)</td>
<td>75.8 (9.4)</td>
<td>100.5 (8.6)</td>
<td>74.8 (10.8)</td>
<td>100.7 (9.2)</td>
<td>44.768 (&lt;0.001)</td>
<td>1,3&lt;2,4</td>
</tr>
<tr>
<td>Spelling (HAST)</td>
<td>93.3 (3.2)</td>
<td>96.9 (10.9)</td>
<td>98.7 (4.2)</td>
<td>96.7 (9.6)</td>
<td>0.867 (0.46)</td>
<td></td>
</tr>
<tr>
<td>Spoonerisms (PHAB)</td>
<td>95.1 (20.2)</td>
<td>102.4 (14.0)</td>
<td>105.7 (14.1)</td>
<td>107.6 (12.2)</td>
<td>1.890 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Naming speeds (PHAB)</td>
<td>69.7 (19.3)</td>
<td>89.7 (14.4)</td>
<td>90.9 (14.9)</td>
<td>91.7 (12.8)</td>
<td>5.608 (0.001)</td>
<td>1&lt;2,3,4</td>
</tr>
<tr>
<td>Coding (WAIS)</td>
<td>7.7 (2.6)</td>
<td>7.9 (2.5)</td>
<td>8.7 (2.4)</td>
<td>8.7 (2.2)</td>
<td>0.844 (0.473)</td>
<td></td>
</tr>
<tr>
<td>Digits forwards (WAIS)</td>
<td>9.8 (3.6)</td>
<td>9.4 (1.8)</td>
<td>9.4 (2.0)</td>
<td>9.5 (2.3)</td>
<td>0.098 (0.961)</td>
<td></td>
</tr>
<tr>
<td>Digits reversed (WAIS)</td>
<td>4.3 (1.9)</td>
<td>5.7 (1.5)</td>
<td>4.6 (2.3)</td>
<td>6.0 (2.1)</td>
<td>3.121 (0.03)</td>
<td>none</td>
</tr>
<tr>
<td>Similarities (WAIS)</td>
<td>9.8 (3.6)</td>
<td>10.4 (3.1)</td>
<td>9.4 (3.3)</td>
<td>12.7 (3.3)</td>
<td>4.148 (0.008)</td>
<td>2,3&lt;4</td>
</tr>
<tr>
<td>Vocabulary (WAIS)</td>
<td>11.1 (2.7)</td>
<td>11.5 (2.2)</td>
<td>10.5 (3.2)</td>
<td>13.2 (2.3)</td>
<td>4.173 (0.008)</td>
<td>3&lt;4</td>
</tr>
<tr>
<td>Block design (WAIS)</td>
<td>10.1 (3.2)</td>
<td>10.9 (2.9)</td>
<td>9.0 (3.5)</td>
<td>13.6 (2.6)</td>
<td>8.379 (&lt;0.001)</td>
<td>1,2,3&lt;4</td>
</tr>
<tr>
<td>Matrix reasoning (WAIS)</td>
<td>12.4 (2.8)</td>
<td>12.4 (2.5)</td>
<td>10.4 (3.8)</td>
<td>13.8 (2.0)</td>
<td>4.966 (0.003)</td>
<td>3&lt;4</td>
</tr>
</tbody>
</table>

Results for the reading speed and comprehension measures were consistent with grouping; although there was a just significant difference (p=.04) between groups 3 and 4 on the reading speed measure.
No statistically significant differences were noted between the four groups for reading accuracy, spelling, phonological skills, digit span forward and coding. However, a statistically significant difference was noted between the slow weak group and the other groups on naming speeds, a speed of processing measure. Additionally, significant differences were found for vocabulary, similarities, matrix reasoning and block design. These effects seem to stem from a tendency for the fast/good group to perform better than the other groups (see table 2.6).

Discussion
The data from the test measures indicated that there were no significant differences between the four sub-groups on reading accuracy, suggesting that the slow/good group are not significantly weaker on decoding skills and that their slow reading rate was unlikely to be due to a greater deficit in this area. The slow/good group were also not significantly worse than the other three sub-groups on phonological tasks and spelling, which also suggests that they do not have a more severe form of dyslexia. There were also no discernible differences between the four groups on working memory measures, suggesting that the slow/good group were not suffering from fewer resources available to process text, which has been related to less fluent reading. Finally, when the four groups were compared in terms of speed of processing, the slow/weak group were significantly slower than the other three groups, but the slow/good group were as quick as the other two fast reading groups. This latter finding would suggest that the slow/good group (53% of the overall cohort) were not reading slowly due to their slowness in processing, but more likely, as a deliberate strategy, either consciously or unconsciously, to aid their recall and understanding.
The data also indicates that the fast/weak group’s performance was significantly worse on measures of both verbal and performance IQ measures compared to the fast/good group. This was also confirmed by the post-hoc comparisons, where the vocabulary measure and similarities produced significant differences between the fast/weak group and the fast/good group. On the non-verbal measures, the post hoc comparisons highlighted significant differences between the slow/good and fast/weak groups compared with the fast/good group on block design; also significant differences were detected between the fast/weak and fast/good groups on matrix reasoning. This may indicate two factors: the fast/good group are generally a more able cohort of dyslexic learners; the fast/weak group are less able generally, and may not have learnt sufficient strategies to cope with their reading difficulties. A significant difference was also noted with regard to speed of processing between the slow/weak group and the others. This might indicate that this group is slow because of a weak speed of processing.

It is the slow/good group that is of greatest interest at present. Given that they do not appear to be slow readers due to specific deficits (compared to other dyslexics) in speed of processing, an alternative interpretation is that they are slowing down their speed of reading as a strategy, either deliberately or sub-consciously, to aid their understanding of the text. If this is a strategic process, their reasonably good levels of comprehension (the main purpose of reading at this level) suggests that it is an appropriate strategy to use. This evidence is contrary to the suggestion of accelerating reading put forward by Breznitz (1997) and Karni et al (2004) and further research will investigate how dyslexic learners might adopt specific strategies.
to aid their understanding of complex text more easily by slowing down their rate of reading.

Interestingly, there was no relationship found between the working memory measures and comprehension which would seem to suggest that working memory may not be a defining variable when assessing reading comprehension skills. This analysis does not rule out working memory as a factor in reading comprehension, but it did not appear to be the best predictor amongst the measures used. In this study working memory was assessed via performance on digits forwards and reversed and neither produced significant scores when compared to the comprehension measure in the post-hoc comparison. An alternative suggestion, that needs further clarification is whether the measures of digits forwards and reversed are the most sensitive to verbal working memory; therefore any relationship between working memory and comprehension is masked by these specific tests as they do not rely on the recall of complex verbal information.

Chapter Discussion

The development of the Adult Reading Test proved to be a reliable tool for the assessment of adult reading skills. The use of adult-related material and the design of a prose test enabled the assessment of accuracy, comprehension and rate of reading amongst reading impaired adults. It has, therefore, been possible to begin to look at the relationship between these three factors within the reading process and see if any relationships between them exist, either within individuals or amongst groups. It has also been possible to compare results obtained on the test with other literacy and cognitive measures. This is particularly important given the growing number of dyslexic students entering the UK adult education system.
Results of the standardisation process revealed that the defining feature between those who self reported literacy difficulties and the rest of the population was their speed of reading, whilst comprehension scores revealed no discernible differences. Further analysis of the general literacy and cognitive profile of a dyslexic learner confirmed that speed of reading, along with spelling and speed of writing were the defining literacy-based weaknesses amongst a group of dyslexic university students. Weaknesses were also evident with regard to speeds of processing and auditory working memory, but not general abilities or reading comprehension scores.

A closer investigation of the issue of reading speed amongst dyslexic learners was therefore necessary. An obvious connection could be made between the reading impaired students' slow speed of reading and their slow speeds of processing. However, when a further group of 100 dyslexic students' reading skills were analysed, it could be seen that the majority of them slowed down their reading despite having average processing speeds. This led to the proposition that slowing down one's reading is a strategy to aid understanding when rapid and automatic decoding is impaired. Rather than seeing this strategy as detrimental, it is proposed that the quality of reading comprehension is the key to success rather than the efficiency of processing. It may be that slowing down reduces the potential for what Perfetti (1985) describes as a bottleneck within the working memory. Slowing down one's speed of processing deliberately may avoid undue pressure being placed upon the working memory and therefore enable the dyslexic reader to maintain sufficient levels of reading accuracy and have resources available to comprehend effectively. Dyslexic learners may need longer to process information when engaging in research-based activities, but if they do so and combine this with effective
comprehension strategies, they are likely to achieve to levels comparable with their non-dyslexic counterparts.

It appears, therefore, that the main areas of weakness for dyslexic readers are their ability to comprehend information at speed. Slowing down seems to offer advantages in the quality of comprehension and recall of information, but comes at the cost of additional study time. Strategies will need to be employed that will make best use of this additional burden of time to make comprehending text as efficient as possible; an issue that will be returned to later. Further analysis of the type of specific difficulties experienced by dyslexic learners and the type of information they find demanding, specifically factual information or drawing inferences and the possible reasons for these distinctions, also needs further scrutiny.
Chapter 3: Studies of specific areas of weakness in text reading.

General Introduction

Having developed an appropriate tool for assessment and examined its use on a number of participants, several different questions began to arise. The first was whether reading aloud produced different results, especially in relation to reading comprehension, as compared with silent reading. The Adult Reading Test was devised as an oral test in order to obtain an accuracy score, which cannot be obtained in a silent prose reading task. However, it can be argued that reading aloud places an additional load on resources within working memory, as words have to be decoded accurately rather than merely registered semantically. A supposition can also be made in that those who already experience difficulties automatically processing words would be doubly disadvantaged by reading aloud, as the already existing load on working memory from silent reading is likely to be high. Consequently, compounding this process with the stress of accurate decoding could be disadvantageous and skew the performance attained on a test. An assessment of the performance of dyslexic students on reading aloud and silently was therefore required. It was also felt that this might also impact upon the most appropriate strategies for an individual to use when attempting to comprehend text.

A further issue that had been of concern from the beginning of the study was whether dyslexic learners have specific weaknesses in the recall of specific information. Simmonds and Singleton (2000) contend that dyslexic adults find inference questions more difficult. An analysis of their study suggests that their evidence is somewhat tentative. Data was gathered from an extended reading passage which included 10 multi-choice questions, ranked as either inference or factual questions. The passage and questions were given to two small groups of
students, one a dyslexic cohort of ten and the other a control group of ten. The sample size is small and, given that some questions could be re-classified (see question 1 and 6) and that question 3 has a rather vague answer, any conclusions would best be treated with caution.

The questions used to measure comprehension in the ART comprised three different types: those that required (i) memory for more general factual information in the text; (ii) memory for specific details stated in the text; (iii) an inference to be made about the text. Although not designed to specifically contrast these question types, there was a trend for those with a history of literacy problems to perform more poorly on the questions that required memory for details stated in the text, compared to the other types of questions. Additionally, when the dyslexic students (sample size of 74) were compared with a matched group of non-dyslexic students (control sample size of 127) on these comprehension questions, the potential area of weakness was also apparent (See Figure 3.1). A two factor analysis of variance was carried out on these data (with one between group factor and one repeated comprehension question type factor) which revealed a significant interaction between groups and comprehension question (F= 4.45 df =2,199 p=0.012). This interaction was due to a specific deficit among the dyslexics on those questions requiring memory for specific details: t(199)=2.72, p=.007 for memory questions; t(199)=1.03, p=.30 for factual questions; t(199)=0.22, p=.82 for inference questions. Overall, memory for specific details in the text (for example the name of a character or the date of an incident) was worse amongst the dyslexics. This was despite the dyslexics being comparable with controls in their ability to recall general details from the text (for example they may be able to recall an incident in the text but not the time when it happened) and their
ability to make an inference from general knowledge (for example that the type of incident suggests that it happened at sea). One potential problem with interpretation of these results is that the number of comprehension questions varied across passages in the ART. Therefore, the effects may be more of an artefact rather than a true difference. The current study aimed to assess this potential area of specific weakness amongst adult dyslexic students.

**Figure 3.1:** Comparison of adult dyslexic and non-dyslexic (control) students on three types of comprehension questions

Finally, it was also the intension to continue an exploration with the role reading speed plays on the performance of dyslexic learners in comprehending texts. A common accommodation for dyslexic students within education is the granting of additional time to complete tasks, most notably during formal examinations. It was felt that the efficacy of this adjustment should be examined in more detail to ensure
that it was an appropriate accommodation. Again, confirmation of slowing down one’s reading to aid comprehension also has consequences for remediation strategies.

It was therefore decided to investigate these issues further. Study 1 looked at performance of dyslexics and non-dyslexics on reading silently and aloud and their ability to answer both factual and inference questions under these two conditions. Study 2 examined reading comprehension amongst dyslexic and non-dyslexics under timed and unconstrained timed conditions. Finally, Study 3 explored the impact of constraining time on reading comprehension amongst dyslexic adult students.

**Study 1: A comparison between the performance of silent and aloud prose reading comprehension and question type of dyslexic students and non-dyslexic students on complex passages**

**Introduction**

The issue of reading aloud compared to silent reading was explored in this study. Reading aloud may have an impact on the use of working memory and the resources available to comprehend successfully (see Simmonds and Singleton, 2000). A counter-argument is that introducing an auditory component into the reading process may enable auditory memory to support the recall of information; thus aiding comprehension, particularly amongst dyslexic learners who often learn more successfully using a multi-sensory approach or who may show weaker processing between visual and verbal material (see Clark & Uhry, 1995; Hornby & Miles, 1980; Reid & Wearmouth, 2002).
McCallum et al (2004) found no significant difference in comprehension between silent and aloud reading amongst a group of 74 students. They also reviewed the literature, finding research to support better oral reading comprehension scores for younger readers (Swalm 1972, Elgart 1978, Fletcher and Pumprey 1988 – cited in McCallum et al 2004). In contrast, they also found research reporting improved comprehension amongst children when reading silently. It was further noted that beginner readers, or those with reading difficulties, tended to benefit more from aloud reading (Miller and Smith 1985, cited in McCallum et al 2004). McCallum et al conclude that previous research citing benefits of silent or aloud reading may reflect more the method of testing as opposed to the reader's skills. The research cited in these papers looked at 'normal' readers as opposed to a dyslexic or reading disabled population. However, the point about sensitivity of tests used in relation to silent verses aloud reading is important; especially as children and adults, when assessed for dyslexia, are often given either an aloud or silent prose reading test to assess their reading skills, but seldom both.

A second theme of this research was the investigation of potential differences in the ability of dyslexics and non-dyslexics to answer factual and inference questions based on text just read. Simmonds and Singleton (2000) found that dyslexic students have a particular difficulty with inference-making. An understanding of this issue could be useful in enabling dyslexic learners to focus on certain aspects of prose, especially text that they are more likely to have difficulty recalling or interpreting. It might be that inference-making skills need to be explicitly taught to dyslexic students. Bowyer-Crane and Snowling (2005) looked at the inference-making abilities of poor comprehenders and concluded that this group had difficulties applying pre-existing knowledge to a text during reading. This group, however, were
different from a typical dyslexic group as their decoding skills were good, but their comprehension weak. Cain, Oakhill and Bryant (2004) examined children's reading comprehension abilities. They identify different types of inference making, including inferences at the local text level and on a more global scale. They also assert that the ability to generate these types of inferences is linked to the age of the reader and their experience of comprehending texts. It could be argued, based on a working memory deficit, that dyslexic students should have more problems recalling facts from text, due to their weaker verbal working memory skills. The alternative position is that dyslexic students will present more problems when making inferences from text, due to the higher cognitive load such questions put on a system that may be 'strained' in literacy tasks. It can be seen, therefore, that both points of view assert weaknesses in verbal working memory, but conclude that this will impact upon the comprehension process in slightly different ways.

Alternatively, differences in reading comprehension skills may be the consequence of differing styles of learning related to cognitive profiles and/or part of academic/reading experiences between individuals, whether dyslexic or non-dyslexic. No differences, however, in the specific pattern, or style of reading comprehension may be found between dyslexic and non-dyslexic adult students. This project was designed to provide initial data contrasting these alternative viewpoints.

**Method**

Two reading passages and sets of comprehension questions were developed for testing purposes: one a science passage the other with a humanities focus (politics)
(see appendix 1 for details). The passages were complex in nature and novel in subject matter to avoid the influence of pre-existing knowledge. They were developed to test more advanced readers at the higher education level, containing a passage of text and a series of comprehension questions. The passages were piloted on a small sample of volunteers and revised accordingly. Both passages were judged to be equal in reading difficulty and associated questions were compared during piloting. Each passage had fourteen questions that were read aloud to each participant, after (s)he had read the passage. The first two questions were introductory in nature in order to ease the participant into the comprehension process. The remaining twelve questions were equally divided into factual questions, questions requiring inference from the text and questions requiring inference from general knowledge.

A background information sheet was completed which included participant age, gender, year of course, subject and whether (s)he had any literacy or educational difficulties. For all students, the first passage was read silently and the second aloud. Students were asked to read normally, but were informed that they would be timed. They were also informed that they would have to answer a series of questions afterwards, based on each passage. Any errors in accuracy when reading aloud were noted. Once the student had read the first passage, they were given the comprehension questions and their response noted. The same procedure occurred for the silent passage. This was followed by the Woodcock Test (1977) and the Adult Reading Test for both groups. Comprehension questions on the Science and Politics passages and the Adult Reading Test (see earlier for test description) were given orally to the participants, whilst the Woodcock Test consisted of participants
reading a series of sentences or short paragraphs and verbally giving a response to the missing word (cloze procedure). Students were given a sample question to ensure they understood the procedure, before the test was administered. The test was not timed. It was administered as per the manual instructions, with a base line of six correct answers obtained before each participant was able to continue through to the end of the test. The Woodcock Test was chosen to ensure robust comprehension measures as well as to compare a cloze sentence comprehension test with that of prose reading exercises.

Each participant was asked to read the first passage silently and the second passage aloud; their scores were then compared. The order of passages given was reversed for alternate participants, enabling an equal number of participants to read each of the two passages both aloud and silently. Four comprehension scores were obtained from each participant, as well as an accuracy and speed of reading score from the Adult Reading Test. Speeds of reading were also obtained from the politics and science passages, and accuracy scores from the passages read aloud.

Order effects with regard to the different reading passages were considered but not in relation to silent versus aloud reading. For all participants, silent reading preceded oral reading. Therefore, this may be considered to be a potential weakness with the research design: i.e., differences between silent and aloud reading may have been masked by order effects. However, the primary analysis of interest was the potential effect of the silent versus aloud manipulation on the difference between dyslexics and non-dyslexics and any order effects were unlikely to be specific to one group over the other.
Two groups of students were recruited from a single higher educational institution by means of advertising across the campus for the non-dyslexic (control) group and by means of contacting known dyslexics at the establishment. All participants provided informed consent and were allowed to leave the study at any point if feeling undue stress. They were tested individually and given an information sheet regarding the study and the purpose of the research was explained to them. Second-year undergraduates were targeted so that the groups were similar in recent educational background. The groups were also evenly balanced in terms of the numbers of male and female participants, as well as a broad cross-section of subject areas studied. Students were paid for their participation.

Forty-seven students were tested on a battery of tests, 22 in the control group and 25 in the dyslexic group. The dyslexic group was eventually reduced to 22 as three of the students were either borderline dyslexic or assessed as not dyslexic and, therefore, screened out of the research project. The 22 controls were recruited by advertisements, producing an opportunity sample drawn from the same university and the same academic year. One of these students was screened out of the sample as a result of educational difficulties resulting from second language issues, but otherwise none of the controls reported any literacy difficulties. The final samples, therefore, consisted of 22 dyslexics (mean age 25.6) and 21 non-dyslexics (mean age 22.6). The control group consisted of 18 females and 3 males and the dyslexic group 5 males and 17 females. There was a degree of comparability between the two groups in terms of the subjects studied, with a significant number of students being drawn from Primary Education, Dance and Drama departments.
Results

The results of the tests are detailed in table 3.1 below, indicating that there were no statistically significant differences between the two groups, or between comprehension scores when reading aloud and reading silently.

Table 3.1: Descriptive statistics for reading speed and comprehension on four separate measures (Woodcock, ART, Politics (silent and aloud), Science (silent and aloud))

<table>
<thead>
<tr>
<th>Test</th>
<th>Group Type</th>
<th>Number of participants</th>
<th>Raw mean score</th>
<th>Stand. Dev</th>
<th>Indep. T test</th>
<th>Signif. 2-tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART speed (words/minute)</td>
<td>Control</td>
<td>21</td>
<td>166.7</td>
<td>26.87</td>
<td>6.52</td>
<td>&gt;0.001</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>22</td>
<td>113.5</td>
<td>26.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science passage silent speed (w/m)</td>
<td>Control</td>
<td>13</td>
<td>195.3</td>
<td>50.28</td>
<td>2.54</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>10</td>
<td>147.5</td>
<td>34.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science passage aloud speed (w/m)</td>
<td>Control</td>
<td>8</td>
<td>142.9</td>
<td>18.99</td>
<td>2.84</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>12</td>
<td>123.4</td>
<td>11.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Politics passage silent speed (w/m)</td>
<td>Control</td>
<td>8</td>
<td>153.12</td>
<td>41.87</td>
<td>0.82</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>12</td>
<td>140.75</td>
<td>26.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Politics passage aloud speed (w/m)</td>
<td>Control</td>
<td>13</td>
<td>153.00</td>
<td>44.44</td>
<td>3.16</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>10</td>
<td>102.20</td>
<td>28.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART comprehension</td>
<td>Control</td>
<td>21</td>
<td>32.43</td>
<td>7.23</td>
<td>2.05</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>22</td>
<td>27.41</td>
<td>8.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodcock comprehension</td>
<td>Control</td>
<td>21</td>
<td>58.0</td>
<td>7.21</td>
<td>0.72</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>22</td>
<td>56.6</td>
<td>5.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science silent comprehension</td>
<td>Control</td>
<td>13</td>
<td>6.3</td>
<td>2.02</td>
<td>1.19</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>10</td>
<td>5.4</td>
<td>1.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science aloud comprehension</td>
<td>Control</td>
<td>8</td>
<td>5.5</td>
<td>2.56</td>
<td>-0.31</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>12</td>
<td>5.6</td>
<td>2.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Politics silent comprehension</td>
<td>Control</td>
<td>8</td>
<td>4.3</td>
<td>2.25</td>
<td>0.085</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>12</td>
<td>4.2</td>
<td>2.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Politics aloud comprehension</td>
<td>Control</td>
<td>13</td>
<td>4.3</td>
<td>1.65</td>
<td>1.24</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>Dyslexic</td>
<td>10</td>
<td>3.3</td>
<td>2.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The analysis of the Science and Politics passage comprehension tasks was performed by a repeated measures analysis of variance, using mode of reading (silent versus aloud) and question type (specific facts, inference based on text and
inference based on general knowledge) as within subject factors and group (dyslexic versus control) as a between subject factor. This analysis indicated no evidence for an effect of mode of reading, and no interaction with this factor. Although there was not a main effect of group, this factor did show a marginally significant interaction with question type (F=3.91, df=1,41, p=.05), a factor which was significant as a main effect (F=74, df=1,41, p<.001). The potential interaction effect was analysed further by assessing any differences between dyslexics and controls across the three question types (scores were combined for silent and aloud reading). These independent samples t-tests indicated that only the comparison involving the questions that require recall of specific details in the text was significant (t=2.14, df=41, p=.04).

Table 3.2: Mean raw comprehension scores between dyslexic group and controls on question type and reading aloud/silently

<table>
<thead>
<tr>
<th>Question type</th>
<th>Silent factual</th>
<th>Silent inference from text</th>
<th>Silent inference from general knowledge</th>
<th>Aloud factual</th>
<th>Aloud inference from text</th>
<th>Aloud inference from general knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Mean 1.3810</td>
<td>2.0476</td>
<td>2.0952</td>
<td>.9524</td>
<td>1.5238</td>
<td>2.2857</td>
</tr>
<tr>
<td>Group</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>1.11697</td>
<td>1.24403</td>
<td>.99523</td>
<td>.80475</td>
<td>1.03049</td>
<td>1.10195</td>
</tr>
<tr>
<td>dyslexic</td>
<td>Mean .7273</td>
<td>1.6364</td>
<td>2.3636</td>
<td>.7273</td>
<td>1.5909</td>
<td>2.3636</td>
</tr>
<tr>
<td>Group</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>.82703</td>
<td>1.09307</td>
<td>1.17698</td>
<td>.76730</td>
<td>1.22121</td>
<td>1.32900</td>
</tr>
</tbody>
</table>
Table 3.3: Mean total raw comprehension scores (aloud and silent reading combined) between dyslexic group and controls

<table>
<thead>
<tr>
<th>Question type</th>
<th>group</th>
<th>Number of participants</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>factual</td>
<td>control</td>
<td>21</td>
<td>2.3333</td>
<td>1.31656</td>
</tr>
<tr>
<td></td>
<td>dyslexic</td>
<td>22</td>
<td>1.4545</td>
<td>1.37069</td>
</tr>
<tr>
<td>Inference from text</td>
<td>control</td>
<td>21</td>
<td>3.5714</td>
<td>1.69031</td>
</tr>
<tr>
<td></td>
<td>dyslexic</td>
<td>22</td>
<td>3.2273</td>
<td>1.57153</td>
</tr>
<tr>
<td>Inference from general knowledge</td>
<td>control</td>
<td>21</td>
<td>4.3810</td>
<td>1.46548</td>
</tr>
<tr>
<td></td>
<td>dyslexic</td>
<td>22</td>
<td>4.7273</td>
<td>1.95623</td>
</tr>
</tbody>
</table>

Figure 3.2: Mean total raw comprehension scores (aloud and silent reading combined) between dyslexic group and controls
Table 3.4: Comparison between question type (factual, inference from text and inference from general knowledge) between groups (dyslexic and controls)

<table>
<thead>
<tr>
<th>Question type</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total factual</td>
<td>2.142</td>
<td>41</td>
<td>0.038</td>
</tr>
<tr>
<td>Total inference from text</td>
<td>0.692</td>
<td>41</td>
<td>0.493</td>
</tr>
<tr>
<td>Total inference from general knowledge</td>
<td>-0.655</td>
<td>41</td>
<td>0.516</td>
</tr>
</tbody>
</table>

Independent samples t-tests were conducted on the Woodcock and ART data.
Groups did not differ significantly on the Woodcock reading comprehension (t= 0.72, df=41, p=0.47). However, a marginally significant difference was noted on the ART comprehension percentile scores (t=2.05, df =41, p=0.046), with the non-dyslexics outperforming the dyslexics, and a significant difference was found on the speed of reading measure of the ART (t= 6.52,df= 41, p<0.001). Overall, these results are consistent with the speed of reading deficits found in the previous data reported in this thesis, and suggest the potential for a marginal effect on reading comprehension.

The data also confirmed that speed of reading defined the two groups with significantly slower speeds obtained from the dyslexic group on the ART test, the Science passage (aloud and silent) and the Politics passage (aloud). There was no significant difference in speed between the two groups on the Politics (silent) passage; reasons for this are unknown.
Discussion

Results revealed that there were no discernible differences on the overall measure of reading comprehension between dyslexics and non-dyslexics. This finding would support previous results within this body of research and those of others (Jackson and Doellinger 2002, Kim and Goetz 1994, Bruck 1990). There was also no overall difference in either group noted in comprehension when reading aloud or silently. This would support the research conducted by McCallum et al (2004) and their research of the literature. It also indicates that silent reading tests have no specific merit with regard to gaining comprehension measures to that of aloud reading tests, and vice versa. It is unclear, however, what differences may exist between silent reading and aloud reading within each individual reader, dyslexic or non-dyslexic. This has implications for the assessment of reading skills, particularly when assessing for specific leaning difficulties, but also for general comprehension assessment processes as well.

An analysis of performance between the two groups on the types of questions successfully answered, did indicate a significant difference, with the dyslexic students finding the factual questions harder than their non-dyslexic counterparts, especially when reading silently. The reasons for this are unknown and contradict the research findings of Simmonds and Singleton (2000), who found that dyslexic students were more prone to weaknesses with inferential questions. Further research is therefore required to expand the body of evidence available on this issue.
Differences were noted between the control groups performances on the two comprehension measures with the controls performing better on both the Woodcock and the ART, compared with the dyslexics. This evidence would either contradict the previous evidence that dyslexics do not show significant discrepancies with their non-dyslexic counterparts in regard to reading comprehension, or there was a group effect.

The study suggests that it is the recall of factual information that is a particular weakness for adult dyslexic students. This was more marked when reading was done silently, but there were no overall significant differences between comprehension skills between the two groups when reading either silently or aloud.

Study 2: An assessment of reading with and without time constraints between a group of dyslexic students and a group of controls

Introduction

The purpose of this study was two-fold, to investigate the impact of constraining time when reading on a group of dyslexic students compared with a group of controls, and to see if any differences occurred with regard to ability to answer factual or inference questions between the two groups under the differing conditions.

Method

Two groups of students were recruited for this study. All participants were university students and had English as their first language. One group of 24 were dyslexic (10 male and 14 female, aged between 18 and 37 years with a mean age of 24.1 years, SD= 5.8 years) and were recruited via the university's dyslexia support department.
Under this recruitment process all dyslexic participants had been diagnosed with dyslexia, and during interview for the present study, all indicated literacy difficulties. The remaining 28 participants were non-dyslexic students (10 male and 18 female, aged between 19 years and 41 years with a mean age of 21.7 years, SD =1.1 years). During interview, all non-dyslexics indicated that they had no special educational needs, had never received extra literacy support and did not consider themselves to have literacy difficulties.

A reading comprehension measure was developed for the present study that used two passages of text, each of which was followed by 10 comprehension questions (see Appendix 2). Five of these questions were factual, requiring the participant to recall exact pieces of information from the passage. The remaining five questions were inferential and required the participants to go beyond explicit statements in the passage, and link ideas from the text to infer the answer. The two passages were used to allow time constrained and unconstrained reading to be assessed. The passage used in each condition was alternated across participants. Both were of similar word length and had a similar reading level of above 14 years of age. One passage was 389 words in length and described the revolutionary writings of a political leader. The second was 395 words and described UK education acts. The passages use low frequency words and complex syntactic structures that reflect university level texts.

Participants were tested individually and were asked to read one of the passages thoroughly. Participants were informed that they would have to answer questions about the passage after they had read it. The 'unconstrained time' condition was given first so participants were also told that the task would be timed, but were
allowed as much time as they required. Pilot studies confirmed that the passages did not take longer than five minutes to read. Participants were handed the text face down and once they turned the paper over a stop watch was started. The stop watch was stopped once the participant had signalled that (s)he had read the text thoroughly by turning the paper face down again, and the questions followed immediately afterwards. Participants were given the same information when presented with the second passage apart from having time to read it constrained, having half of the time to read the passage compared with the time taken to read the previous one. Again the stop watch was started as soon as the passage was turned face up. During the questioning process in both conditions the number of correct answers for both factual and inferential questions was recorded, as well as the time taken/time given.

Results
Comprehension levels were equivalent across dyslexic and control students when no time constraints on reading were imposed. However, consistent with the previous findings of lower rates of reading amongst dyslexic students, comprehension levels were lower for the dyslexics, compared to their peers, when time for reading was limited.
Table 3.5: Mean comprehension scores (with standard deviations) for dyslexics and non-dyslexics in the different conditions.

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Time Condition</th>
<th>Dyslexic (n=24)</th>
<th>Non-Dyslexic (n=38)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Score</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Factual</td>
<td>Unconstrained</td>
<td>1.46</td>
<td>1.35</td>
</tr>
<tr>
<td></td>
<td>Constrained</td>
<td>1.38</td>
<td>0.97</td>
</tr>
<tr>
<td>Inferential</td>
<td>Unconstrained</td>
<td>2.00</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>Constrained</td>
<td>1.17</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Figure 3.3: Comparison of adult dyslexic and non-dyslexic (control) students under conditions where time for reading was constrained and unconstrained

A three-way analysis of variance was used to assess the effects of these factors, with question type and time condition categorised as repeated measures factors.

Results showed that the dyslexic group under-performed significantly compared with the control group on overall comprehension ($F=12.51$, df=1,60, p=0.001);
performance in the unconstrained condition overall was better than in the constrained condition (F=11.08, df=1,60, p=0.001); the interaction between these factors, however, was non-significant (F<1)). In addition, there was no main effect of question type (F<1), though the interaction between question type and group (dyslexic versus non-dyslexic) did approach conventional significance levels (F=3.12, df=1, 60, p=0.08) suggesting a trend for the dyslexics to be worse on the factual questions compared to non-dyslexics, but the groups were similar on inference questions. This trend was more apparent in the non-constrained condition (see figures 3.4 and 3.5), although the three-way interaction also only approached conventional significance levels (F=2.69, df=1,60, p=0.10).

Further analysis of question type, however, under constrained and unconstrained timed conditions reveals an interesting, but not statistically significant, pattern. When time is constrained, there is a significant difference between the performances on the comprehension measure between the two groups. Conversely, when the time is unconstrained there is a narrowing of comprehension performance between the two groups, particularly in relation to factual questions, with the dyslexic group improving performance, but the control group not doing so, as outlined in Figures 3.4 and 3.5 below.
Figure 3.4: Comparison of mean comprehension scores for dyslexic and control groups under timed constraints.

Estimated Marginal Means of MEASURE_1

at time = 1

estimated marginal means

quest

Figure 3.5: Comparison of mean comprehension scores for dyslexic and control groups without timed constraints

Estimated Marginal Means of MEASURE_1

at time = 2

estimated marginal means

quest
Discussion

The results of this study show that constraining time for dyslexic learners inhibits their ability to comprehend effectively. The study also indicated that, when given more time, the dyslexic group were able to make gains in their comprehension to nearly match the non-dyslexic control group. This would confirm one of the primary assertions of this thesis; giving dyslexic learners more time to extract meaning from text is beneficial and also supports the research by Lesaux, Pearson and Siegel (2006).

With regard to the type of question dyslexic students had more difficulty with the data suggests, even though the results are not statistically significant, that again questions associated with memory for specific detail appear to be harder. This seemed particularly apparent in the non-timed constrained condition, with no differentiation on inference questions between the two groups. The data adds additional weight to the findings of earlier studies within this thesis and suggests that recall of specific detail within text is a defining feature of a dyslexic adult reading profile, rather than a difficulty with inference making and overall understanding of texts.
Study 3: Assessing the impact of constraining time on the reading comprehension skills of dyslexic adult students

This study was designed to assess the effects of reducing the ability to slow reading down on dyslexics' text comprehension. This was investigated by manipulating time constraints on reading. Dyslexic and non-dyslexic adult students read a passage of text at their own speed or under a timed constrained condition. Time limits in the constrained condition were based on the average rate of reading found amongst a cross-section of adult non-dyslexic students during pilot work prior to the study. The data, therefore, should be informative of the effects of constraining reading comprehension time for the dyslexics to the average level of the non-dyslexic.

In the study, two groups of dyslexics and two groups of non-dyslexics were matched prior to testing. One group of dyslexics and one group of non-dyslexics underwent a reading comprehension task in the time constrained condition. The other two groups were given unlimited time to complete the reading comprehension task. Groups were matched based on reading comprehension levels as determined by the Adult Reading Test (ART) and on a non-verbal ability measure (Raven's Advanced Progressive Matrices). Groups were also matched in terms of the average age of the participants and the number of males and females in the groups. These pre-test matching procedures ensured that the same reading comprehension measure could be used under both test conditions while avoiding practice effects, but controlled pre-experimental group differences that might affect the results.

Method
Participants
Dyslexic participants were recruited via the support services of the University in which they were studying for degree level or post-graduate level qualifications. All
those recruited had a record of assessment for dyslexia and were receiving support and exam accommodations based on the recommendations in the assessment report. The 30 dyslexics chosen for the study had been assessed using the ART and scores on the comprehension scale, therefore, were available for these individuals. Participants were tested using the Raven matrices as part of the procedures in this study.

Non-dyslexic participants were an opportunity sample taken from the same University in which the dyslexic participants were students. All non-dyslexics reported no history of educational/literacy learning problems. In total, 58 non-dyslexic participants were recruited for initial testing. These were interviewed and tested using the ART and Raven's matrices. Scores on these two tasks were compared with those produced by the dyslexic participants. From the 58 non-dyslexics, 30 were chosen who most closely corresponded to the dyslexics in terms of background comprehension and non-verbal ability levels. These 30 participants, therefore, underwent testing on two separate occasions, once for pre-testing and once, within two working weeks of pre-testing, for the actual testing. (The dyslexic participants were tested on a single occasion, which involved taking the Raven's and the reading comprehension task.)

The groups of dyslexics and non-dyslexics were then split into two groups each, ensuring that all groups were on average similar on the pre-study comprehension levels, based on ART norms, and on non-verbal ability, based on scores on Raven's matrices. These pre-test comparisons are presented in Table 3.6. Two-way analyses of variance were performed on these data and indicated no significant differences between the groups on either variable.
Table 3.6: Comparison of dyslexic and non-dyslexic groups on pre-test variables

<table>
<thead>
<tr>
<th></th>
<th>Dyslexic</th>
<th></th>
<th>Non-dyslexic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constrain</td>
<td>Non-constrain</td>
<td>Constrain</td>
</tr>
<tr>
<td>Gender ratio</td>
<td>10:5</td>
<td>10:5</td>
<td>10:5</td>
</tr>
<tr>
<td>(male:female)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td>21.27</td>
<td>21.60</td>
<td>21.20</td>
</tr>
<tr>
<td></td>
<td>(4.68)</td>
<td>(4.09)</td>
<td>(3.30)</td>
</tr>
<tr>
<td>Ravens (Score)</td>
<td>10.07</td>
<td>9.93</td>
<td>10.40</td>
</tr>
<tr>
<td></td>
<td>(2.19)</td>
<td>(2.22)</td>
<td>(1.77)</td>
</tr>
<tr>
<td>ART comp (normed 100:15)</td>
<td>98.87</td>
<td>104.87</td>
<td>102.73</td>
</tr>
<tr>
<td></td>
<td>(18.15)</td>
<td>(13.98)</td>
<td>(13.34)</td>
</tr>
</tbody>
</table>

**Measures**
The study used three measures, two as matching variables and one as a test variable. The ART comprehension scores for the dyslexic participants were available from assessment records and these individuals were not tested again. Data for the non-dyslexics was not available, however, and these participants were tested on the ART using the procedures for testing as described in previous work in this thesis. This task ensured that the groups were matched on reading comprehension levels prior to formal testing in the study.

Both groups were also tested on a short form of the Raven's advanced matrices (Arthur & Day, 1994). This comprised 12 items in which sequences of patterns were presented with a blank where the final pattern in the sequence should be added. The participant's task was to decide which of the options presented completed the sequence. They were given up to a maximum of 20 minutes to complete as many items as they wanted (most participants had completed the task within this time limit). This task was chosen to ensure that the groups were matched on non-verbal reasoning ability prior to formal testing.
A final task was the reading comprehension test. This comprised a single passage followed by 14 four-choice comprehension questions (see appendix 3). The passage was presented on one side of a sheet of paper, with the questions on the reverse. The participants in the non-constrained condition were allowed to read the passage for as long as they wished prior to turning the page and answering the multiple-choice questions. The participants in the time constrained condition were told they would be able to read the passage for 90 seconds; they were then required to turn over the sheet and answer the multiple-choice questions. Neither group were allowed to read the passage again once the page had been turned to the comprehension questions.

Results and Discussion

Table 3.7: Means, standard deviations (in brackets) for the reading comprehension task across groups and conditions

<table>
<thead>
<tr>
<th></th>
<th>Dyslexic</th>
<th>Non-dyslexic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constrained condition</td>
<td>8.33 (2.13)</td>
<td>10.47 (1.89)</td>
</tr>
<tr>
<td>Non-constrained condition</td>
<td>11.33 (1.95)</td>
<td>11.40 (1.84)</td>
</tr>
</tbody>
</table>

A two-way analysis of variance indicated a significant interaction between group (dyslexic versus non-dyslexic) and condition (time constrained or non-constrained) \(F(1, 56)=4.91, p=.045\). This interaction indicated that comprehension levels were equivalent across dyslexic and control students when no time constraints on reading were imposed \(t(28)=0.10, p=.924\); however, comprehension levels were lower for the dyslexics compared to their peers when time for reading was limited \(t(28)=2.91, p=.007\). This effect is presented in figure 3.6.
Figure 3.6: Comparison of adult dyslexic and non-dyslexic (control) students under conditions where time for reading was constrained and unconstrained

These findings indicate that reducing the time available for reading leads to a large reduction in comprehension levels amongst the dyslexic participants. When dyslexics were allowed to read at their own speed, their comprehension levels were equivalent to that produced by the non-dyslexics – in accord with the majority of data presented elsewhere in this thesis. The most consistent interpretation of these findings, and that of the other studies in this thesis, is that the dyslexics use the strategy of slowing down to support comprehension and when this strategy is not possible, comprehension levels suffer.
Chapter Conclusion

The first study in this chapter examined the differences between reading aloud and silently between two groups of students: one assessed as dyslexic the other reporting no literacy difficulties. No differences between the two groups when reading aloud or silently were noted, confirming the work of McCallum (2004) and indicating that adult dyslexic learners, as a group, are not disadvantaged compared to their non-dyslexic counterparts when given aloud prose reading tests. The efficacy of performing aloud reading tasks as part of a battery of tests when assessing for dyslexia, with the advantage of having an accuracy score and an analysis of individual reader errors is therefore confirmed. However, individuals did show differences in their comprehension levels between aloud reading and silent reading, not in any direction but rather based on individual preference or skill. Consequently, when conducting a dyslexia assessment, the most thorough approach would be to use both a silent reading test and an aloud reading test. The inclusion of additional tests in a large battery has to be considered carefully, as often the testing for dyslexia can last more than two hours, which can be quite stressful for the individual being tested. Ideally, further test development is required to produce a prose reading test that enables both aloud and silent reading on suitably complex passages which have been standardised for both aloud and silent reading.

The issue of question type in Study 1 revealed that dyslexic learners appear to have greater difficulty with factual questions requiring specific detail from the text as opposed to inferential responses. Study 2 also examined this issue and a similar result was observed, although not statistically significant; dyslexic learners found factual questions harder. This was particularly true when the dyslexic group were constrained by time available to read. Study 3 also confirmed that constraining time
to read has a detrimental affect on the comprehension of dyslexic learners compared with their non-dyslexic counterparts. This confirms indications from previous studies in the thesis, and such a finding could have implications for appropriate intervention strategies when teaching reading skills to dyslexic students. Strategies that focus on encouraging dyslexic students to note or highlight key factual information within texts may prove advantageous. This would also have the benefit of placing memory skills in the context of the subject being studied; thus avoiding the more onerous approach of trying to teach memory skills as a separate subject or strategy.

Overall comprehension levels between the groups of dyslexics and non-dyslexics were not significantly different on the first study when reading complex passages of text. During Study two, which looked at the effects of constraining time upon reading, comprehension levels between dyslexics and non-dyslexics were similar under no time constraints conditions, but the dyslexics performed worse when put under pressure of time. Such an effect was also confirmed by Study three with a significant relationship observed between the dyslexic groups comprehension skills and the amount of time given to read.

Lesaux, Pearson and Siegel (2006) assessed the effects that giving additional time to read had on a group of reading disabled readers, compared to 'normal' readers. They found that when time was constrained it had a significant effect on performance amongst the reading impaired group, but this was not the case in the non-time constrained conditions. They also found the key factors associated with poorer performance under timed conditions for the weaker readers were related to vocabulary knowledge and short-term memory. The findings that giving impaired or dyslexic adult readers additional time to process text aids comprehension are
consistent with the findings in this series of studies. It would also suggest that the examination accommodation of additional time for dyslexic learners is a suitable one.

The research, thus far, indicates that allowing dyslexic students additional time to read and to encourage them to slow down may enable them to adopt strategies to improve their comprehension. The research has also indicated that dyslexic students appear to find the recall of factual information more demanding than grasping more inferential aspects within a text. It would therefore seem appropriate that when considering teaching dyslexic learners how to extract information from texts, the issues of recall of factual information and processing speeds are given a sharp focus within the strategies adopted.
Chapter 4: Analysing different reading strategies to support comprehension of text in adult students with reading difficulties

Introduction

The key to reading is comprehension. Students with reading difficulties, particularly dyslexic students, often report difficulties with breaking down the meaning of text, especially academic texts at speed; despite the fact that often their overall comprehension abilities are generally not impaired. Researching for information and reading academic material is one of the cornerstones to successful completion of a higher education course. Adult learners bring with them strategies that they have adopted to aid their ability to study, some successful, others not. Students who experience difficulty with reading are more likely to require some sort of intervention programme to make their reading more productive.

Much of the research into reading difficulties and successful interventions have been conducted on children and has focussed on improving word level skills (for example see Bryant and Bradley, 1983; Hatcher, Hulme and Ellis, 1994; Hornsby and Miles, 1980; Thompson, 1998; Torgeson, Wagner and Rasholte, 1994). A great deal of success has been found with the teaching of phonics in the early years and this key strategy now forms a major part of the government’s literacy programmes within the UK. However, these strategies may not be as relevant to adult learners, and research has indicated a variety of both low order and high order skills associated with successful reading comprehension amongst adult dyslexics (Ransby and Swanson 2003, Bruck 1990). Adults with a history of reading difficulties who have failed to develop their skills using methods adopted during their formative years, need other more meaningful strategies. Students often bring with them a series of skills they have either learnt or developed, consciously or sub-consciously, to the
learning environment. It is essential that literacy and reading strategies for the adult learner are made contextually relevant and acknowledge, or take into consideration, the learning history of the individual. Often support teachers working within further and higher education will focus on supporting students by teaching study skills strategies that are relevant to the individual student's course.

Research has also shown that adopting an approach that looks at the cognitive profile of learners can assist in the learning process, by suggesting specific strategies that map alongside individual strengths and weaknesses. Brooks and Weeks (1999) studied teaching strategies used on children between the ages of 6-8 and found that those with strengths in visual areas learnt spelling best using strategies that focussed on visual processing strengths, whilst those with relative strengths in phonological processing learnt how to spell more easily when these skills were emphasised. Lyon (1985) and Givon and Reid, (1999) have also suggested teaching and learning interventions that focus on the strengths and weaknesses of individuals may be of benefit.

Again these studies focus on children, with much of the adult studies examining individual strategies rather than cognitive profiles. Research by Higgins and Zvi (1995) assessed the contribution that optical character recognition software and text to speech software might have in supporting adult learners with reading difficulties. If a computer reads information to a student then the burden of decoding is lessened and possibly more resources can be used within working memory to comprehend rather than decode. They found that students who had weak decoding skills were aided by the software, but those with average or better skills were hindered. Martino and Hoffman (2002) concluded that phonological awareness is still an important
factor in the reading abilities of college students, suggesting that, for some learners, decoding weaknesses are impacting upon comprehension. Snowling et al (2001) noted residual phonological deficits within adult dyslexic students, and a test of phonology is often a key determining test within an adult dyslexia assessment battery. Given these deficits, a phonological approach to aid decoding and reading fluency could be beneficial. Such a strategy, however, needs to be placed in the context of the learners needs and their past perceptions and experience of such strategies; consideration also needs to be given to whether improvements in decoding are the most effective way to develop adult comprehension.

A further area of the research literature concerning adult learners is focused around the theme of teaching meta-cognitive strategies, especially those related to schematic representations of text. The theory of developing an internal schema (Bartlett 1932 -cited in Ellis 1993), whereby new information can be internalised more easily when one is already thinking about the subject concerned prior to reading, is well known. This can be described as an off-line strategy, thinking through one's ideas prior to reading in full rather than during the process of reading. Preparing for reading by reviewing the text, thinking about the subject area and pre-existing knowledge may lead to easier integration of new information into an internal mental framework. Glover, Ronning and Bruning (1990) describe a series of skills related to meta-cognition that start with reviewing prior knowledge before reading commences. If readers are taught to actively engage in the text, plan their reading by reviewing their pre-existing knowledge and learn how to understand the structure of the texts they are reading, their comprehension is likely to improve.
Strategies including slowing down, re-reading or actively questioning as one reads may therefore prove advantageous. The use of highlighter pens to pinpoint key sections of text and effective note taking skills are all in common use by university students as a means of structuring and recalling information from texts. Such activities also encourage reinforcement of what has been learnt and the development of summary writing skills. Thiede, Anderson and Therriault (2003) stress that meta-cognitive monitoring of comprehension aids the learning process. Theide et al specifically looked at the generation of key words to generate a better comprehension of texts amongst U.S. undergraduate students, asserting that off-line strategies (strategies that take place prior to or after reading) are effective in supporting comprehension. There is also some research amongst adult readers (Karni et al, 2004) that the improvement of decoding and reading fluency aids comprehension. In contrast, Palinscar and Brown (1984), Bereiter and Bird (1985) and Thiede, Anderson and Therriault (2003) all argue that the development of meta-cognitive strategies to monitor text as the reader reads it (on-line strategies) will produce improvements in comprehension. Bell (1991) has specifically developed a strategy of recalling texts via the use of visual imagery. This is perhaps best developed when using fictional narratives, but can be adapted to incorporate mind mapping techniques, often associated with planning and structuring written work, rather than conceptualising information during reading and research activities. The activity of mind mapping is therefore used as a means of monitoring and rereading text whilst reading and structuring it into an interpretative form.

In the light of past research, this study focuses on some of the more commonly used reading strategies on a group of students who have been formally assessed as
dyslexic. Students were recruited, taught a series of strategies and their performance tested. The rationale was to see if any particular strategies worked better than others or if a preferred strategy could be related to a specific cognitive profile within individual students.

Method

A series of five different strategies were chosen to teach reading comprehension skills to two groups of university students. Students were recruited by advertising for volunteers within the two target groups: one following diploma nursing programmes and the other consisting of students studying at undergraduate level within the school of Human Sciences. These specific subject areas were chosen as both had relatively high incidences of dyslexic learners within them. Indeed, the cohort of nursing students contains a large number of mature adult returners to education, many of whom are in greater need of study skills development compared with younger students who have recent memories of the current education system and studying within it. Both of these groups consisted of students who had formally been assessed as dyslexic.

Prior to the commencement of the intervention study, reading comprehension passages were written as a means of testing students each week as to their performance using a specific strategy. Ten passages were developed (see Appendix 4), five related to the area of nursing and five were based on subjects related to human sciences: psychology, sociology, politics and anthropology. All passages had a Flesch-Kincade readability score of 12. Each passage had ten associated comprehension questions, equally divided between factual and inference
questions. The passages were then piloted on non-dyslexic adults to maintain consistency between passages and to revise questions that appeared too difficult or too easy to be able to discriminate between individuals. A total of 13 individuals took part in the pilot, attempting a mixture of five passages from both subject areas or all ten passages. Passages were edited and questions altered to achieve the required consistency. Pre-edited passages produced average raw comprehension scores from 5.0 to 7.0 out of a total score of 10. The hardest and easiest passages were then edited to improve consistency of comprehension levels.

Passages were rotated across individual participants and with different teaching strategies to even out any remaining inconsistencies across passages. This was achieved with all of the strategies, bar one, learning key words, which required the development of materials prior to reading. For this strategy, the passages chosen for each of the two student groups were those that were closest to the mean comprehension scores during the pilot study.

Order effects with regard to the different reading passages were considered but not in relation to silent versus aloud reading. For all participants, silent reading preceded oral reading. Therefore, this may be considered to be a potential weakness with the research design: i.e., differences between silent and aloud reading may have been masked by order effects. However, the primary analysis of interest was the potential effect of the silent versus aloud manipulation on the difference between dyslexics and non-dyslexics and any order effects were unlikely to be specific to one group over the other.
Materials from core texts within nursing and human sciences were also developed (Breakwell and Hammond, 2000 and Fallon and O'Neill, 1998). Liaison with the two academic departments identified key texts that the students were unlikely to have read at their stage of studies but were based on themes and material that was within their expected field of knowledge. Short passages from these texts were identified and each week students had to read the passage and write a summary of the passage, using the particular strategy that was under investigation.

Strategies used were based on some of the common techniques used by support tutors, as well as those identified within the research literature. These were split into five one hour individual teaching and testing sessions and followed the schedule below:

Week 1: Pre-testing and use of text to speech software
Week 2: Learning key words prior to reading
Week 3: Using mind maps to summarise texts
Week 4: Highlighting and summarising texts using standard notes
Week 5: Pre-reading activities (reading headings, key sentences and making brief notes)

Each teaching session followed a broadly consistent format of modelling the strategy, allowing the student to practice it and then two forms of testing were conducted to evaluate the effectiveness. The first form of analysis consisted of asking the student to read a piece of course-related text using the designated strategy and then to write a summary of the passage unaided. The second part of the intervention involved the student reading a comprehension passage, based
within their field of study and answering a series of ten comprehension questions verbally, again without being given access to the text. Feedback about the use of the strategies was elicited throughout each session and observations regarding each participants use of the strategies noted.

A total of twelve participants were recruited to the study, all assessed as dyslexic with ten of them enrolled on nursing diploma courses and two undergraduates from the School of Human Sciences. Consent was obtained to use information given in their dyslexia assessment reports as part of the analysis, particularly scores obtained from cognitive tests. Nine students (eight nurses and one undergraduate) completed the intervention programme, with three partially completing. Students were predominantly female with only two out of the twelve participants being male and only one out of the nine who completed. This gender imbalance was primarily a result of the high proportion of females within the nursing courses at the university. The age of the participants ranged from 19-51 with a mean age of 31. Four of the students were in their first year of study, four in their second and one in their third and final year (completed figures). All the students stated that English was their first language.

Week 1. Each student was introduced to the rationale of the study, consent to participate was formally obtained, and any specific participant questions were dealt with. Background information was obtained and pre-testing of reading ability and speed of processing were measured. The pre-testing reading abilities were obtained using the Adult Reading Test (Brooks, Everatt and Fidler, 2004) and scores for reading accuracy, comprehension and speed were noted. If the participant had recently been tested with the ART as part of their dyslexia assessment then their
attainment scores were obtained from their assessment report. Other scores from their dyslexia assessment report were also noted, specifically standard scores from the individual tests administered from the Wechsler Adult Intelligence Scale (Wechsler 1999). Speed of information processing was gauged via the use of the digit naming task taken from the Phonological Assessment Battery (Frederickson, Frith and Reason 1997) - See earlier studies for test descriptions.

Once data had been compiled on the individual participants, the first strategy taught was using text to speech software (Texthelp) to electronically read the material to the student. The strategy was chosen as often the software is recommended within the UK as a compensatory strategy for students with weak decoding skills. It is also thought that using a multi-sensory approach to reading, whereby the student can read and listen to the text simultaneously, might aid comprehension. Research by Higgins and Zvi (1995) identified this strategy as successful amongst students with significantly weak reading skills. It was placed first in the research programme as it is a strategy that is unlikely to affect performance in successive teaching sessions.

The relevant reading material (taken either from the ABC of Palliative Care (Fallon and O'Neill, 1998) or Research Methods for Psychologists, (Breakwell and Hammond, 2000) had been scanned into a computer prior to teaching the strategy and tested to ensure that all words were pronounced by the software correctly; any minor errors were amended by re-programming the software using the voice options menu. Students were given the option of what speed they wished the software to read the text via a process of speeding up and slowing down the voice until a preferred speed was obtained. Students were also given the option of reading the text from the screen or from a photocopy. Use of coloured overlays or changing the
background colour on the computer was also permitted, as well as enlarging the font size of the text if necessary.

Once the preferred options were chosen the student was asked to practice the strategy on a section of text taken from their subject-related textbook (The ABC of Palliative Care or Research Methods for Psychologists). They were then given a predetermined section of text, varying between 300-400 words, and asked to listen and read the text. They were instructed to complete this task in one go, without stopping the software and repeating/re-listening to sections of the text. They were then asked to write a summary of the text, recalling as much detail as possible. Summaries were marked according to a pre-determined marking criteria; assigning individual marks for the recall of individual points raised in the text. No time limits were set to either the reading of the texts or the writing of summaries, but time taken to carry out these tasks was noted. Students were then given one of the comprehension passages specifically written for the study (See Appendix 4) to read, again using the software in the manner described above. Their comprehension was then tested by asking the ten factual and inference questions and their scores recorded. Verbal feedback regarding the use of the strategy was obtained both during and at the end of the session.

**Week 2.** The second strategy involved pre-teaching students key words that appeared in the passages they were about to read (see appendix 5). The student was introduced to the concept of learning how to decode key words as a means of improving the ability and fluency of reading. This strategy might also be useful in reducing the number of words misread by dyslexic students, thus giving a clearer understanding of the text. It is also a pre-reading exercise as it helps the reader to
begin to think about the content of the material they are about to read and in some respects follows some of the work conducted by Thiede, Anderson and Therriault (2003).

The first list of words was given to the student (See appendix 5) and they were read to the student with their associated phonetic pronunciation and meaning. The student was then given time to reread and process this information and was allowed to refer to the list whilst (s)he read, if required. The student read a small section of text, from the given course-related material as a means of demonstrating the strategy. (S)he was then given a new list of words to learn and a further section of text from the same material which was read silently (or aloud if preferred) and then the student was asked to write a summary. The student had access to the list of words for the duration of the reading and the summary writing. There were no time limits placed upon the participants but the time taken to complete the tasks was recorded. Next the student was given a list of words that were contained in the pre-prepared comprehension passage. The prepared passage (either Palliative Care or Deviant Behaviour – See appendix 4) remained the same for each participant from the two groups and was not rotated. The participant read through the words, was given access to the list when reading, but the list was removed when the comprehension questions were asked.

**Week 3.** The third strategy, using mind-maps to interpret information, was one of two ‘on-line’ strategies used. Students were shown a piece of course-related text and the process of mind mapping was modelled by the teacher. A simple mind map was produced and then colour highlighters were used to structure and review the key information. The student was then asked to practice the technique on the following
section of text, reviewing with colours at the end. A longer piece of text was then used (approximately 350 words) from the same material with the student reading, mind mapping (on blank A4 paper) and then reviewing with highlighters at the end. The student was then asked to produce a written summary of the text, without being given access to the text or their map. A second passage was then introduced, the comprehension passage, and the student read, made a mind map and reviewed the map with colours. (S)he then answered a series of questions about the passage, without access to it or to the map.

**Week 4.** The second of the on-line strategies involved reading, highlighting key sections of text and making summary notes simultaneously. The process was demonstrated to the student by the teacher who adopted a strategy of breaking the text down into sections, either individual sentences or short paragraphs. The highlighting and summary notes, written alongside the photocopies of the text itself, formed part of the process of reviewing what had been read and interpreting it into the individuals own words, which necessitates monitoring of understanding. Once the strategy had been modelled and practiced by the student, a passage taken from the course-related text was presented for the student to read, highlighting key sections and making summary notes before being asked to summarise the whole passage unaided. The student was then presented with the comprehension passage which (s)he read using the same strategy, answering a series of ten questions afterwards, without access to the passage or their notes.

**Week 5.** The final strategy was broadly described as a pre-reading task, which included reading headings and key sentences (the first of each paragraph), reviewing what information had been picked up during this process and considering
it in relation to pre-existing knowledge. Glover, Ronning and Bruning (1990) and Thiede, Anderson and Therriault (2003), amongst others, have developed this strategy with adult students. In this study the students were shown how to read through the key headings within a text and then directed to just read the first sentence of each paragraph, highlighting them if they wished. (S)he was then given some general questions related to the text to get them to think about the subject area and to enable them to consider what they were about to read in more detail. The student was also encouraged to make notes about the text or pre-existing knowledge. After the passage and was read, the student was asked to write a summary unaided. The student was then given the title of the comprehension passage with the first sentence of each paragraph. Initial sentences were designed to ensure that the information did not enable the student to answer any of the comprehension questions prior to reading the whole passage. The student was encouraged to make any notes about the passage, pre-existing knowledge of the subject area or what (s)he thought they might be about to read. Finally, the student was given the passage to read and asked to answer (verbally) a series of comprehension questions without access to the text or notes.

At the end of the final teaching session each participant was asked to give some verbal feedback regarding the strategies used. A report was also written detailing the individual test scores for each participant with suggested strategies to use to aid their reading comprehension and recall of information. (See Appendix 6).
Results

The type of study and number of participants meant that results were collated on a case by case basis with some general data given across cases. This rationale for analysis is consistent with previous work in the field (for example Brooks and Weeks, 1999, Lyon, 1985, Goulandris and Snowling, 1991).

Descriptive statistics

Figure 4.1 and 4.2 indicate the scores obtained by each participant for comprehension when using each of the five different strategies: figure 4.1 for the comprehension questions task and 4.2 for the summary writing task. As illustrated, there is a trend to suggest that the most successful strategies were summary notes and mind mapping with mean scores of 72.2% and 69.4% respectively on the questions task and 46.2% and 41.3% on the summary task (see table 4.3). This compared with the pre-reading strategy that obtained mean scores of 53.9% on the questions task and 33.8% on the summary task. The strategies with the lowest mean scores were the use of text to speech software (mean scores of 44.4% and 25.1%) and teaching key words (41.6% and 24.3%).

The speed of reading measure indicated a reverse effect, with the more successful comprehension strategies generally taking more time. As indicated in Table 4.2 and figures 4.3 and 4.4, the summary notes and the mind mapping strategies were far more time-consuming than the others. Mean scores are illustrated in the tables and figures below.
**Figure 4.1:** Oral comprehension questions scores for pre-testing and each teaching strategy used

**Figure 4.2:** Comprehension scores (summary writing) for each teaching strategy used
Table 4.1. Mean percentage scores for comprehension (question task and summary task) using different strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Questions Task</th>
<th>Summary Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texthelp</td>
<td>44.4</td>
<td>25.1</td>
</tr>
<tr>
<td>Key words</td>
<td>41.7</td>
<td>24.3</td>
</tr>
<tr>
<td>Mind maps</td>
<td>69.4</td>
<td>41.3</td>
</tr>
<tr>
<td>Summary notes</td>
<td>72.2</td>
<td>46.2</td>
</tr>
<tr>
<td>Pre reading</td>
<td>53.9</td>
<td>33.8</td>
</tr>
</tbody>
</table>

Table 4.2. Mean scores for speed of reading - words per minute- (question task and summary task) using different strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Questions Task</th>
<th>Summary Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texthelp</td>
<td>139</td>
<td>139</td>
</tr>
<tr>
<td>Key words</td>
<td>119</td>
<td>105</td>
</tr>
<tr>
<td>Mind maps</td>
<td>39</td>
<td>30</td>
</tr>
<tr>
<td>Summary notes</td>
<td>35</td>
<td>28</td>
</tr>
<tr>
<td>Pre reading</td>
<td>54</td>
<td>54</td>
</tr>
</tbody>
</table>
Figure 4.3: Speed of reading scores for pre-testing and each teaching strategy used on oral question comprehension task

![Graph showing speed of reading scores for pre-testing and each teaching strategy used.](image)

Figure 4.4: Speed of reading scores for different teaching strategies used on the summary writing task for each participant

![Graph showing speed of reading scores for different strategies used on the summary writing task.](image)
Participant One

This second year nursing student had significant difficulties with reading as noted in her dyslexia assessment which recorded her prose reading accuracy at the 24th percentile, her comprehension at the 1st percentile and her speed of reading at the 7th. She felt that her ability to concentrate on reading was a particular difficulty for her and she reread material several times as a matter of routine. She stated that she reads a sentence, but by the time she has started reading the second she has lost her understanding or recall of the first, causing her to reread several times until she begins to break down the overall semantic structure of the text. She reported that she can sometimes reread more complex material 15 times or more. When reading during the five training sessions, the participant preferred to use a larger font and a green overlay as she reported visual distortions of printed material.

Figures 4.5 and 4.6: Reading comprehension scores and cognitive profile for Participant One.
An analysis of the different strategies used would suggest that with this individual mind mapping techniques proved to be the most successful, with some positive results also noted when using summary notes and pre-reading techniques. All of these strategies are more time-consuming than the other two less successful strategies. The participant noted that she found it difficult to recall information when using the text to speech software as this strategy inhibited her ability to reread and work at her own pace. Most significant of all was her increase in recall of information when using mind maps (see Figure 4.5). There was also a positive influence related to the use of colour coding with both the mind maps and the summary notes, which she colour coded quite meticulously. It is also worth noting, perhaps, that the highest score on the ability measures was picture completion (Figure 4.6), possibly indicating good visual processing skills and hence the good use of colour and mind maps to aid the recall of textual information. The participant reported rereading of information as an important strategy for her as well as the 'chunking' of information.
into manageable sections, both of which are possible when using the on-line strategies of mind mapping and writing summary notes.

Participant Two

Participant 2 obtained average scores on pre-testing with percentile rankings of 63 for accuracy, 50 for comprehension and 46 for speed. Her difficulties with reading were not as severe as Participant One, yet when given the strategies to support her reading her performance was similar but slightly stronger. She, like Participant One, found the most useful strategies were the meta-cognitive on-line strategies of mind mapping and summary writing. She also benefited from the pre-reading strategies and her performance on the two comprehension tasks (answering questions orally and summary writing) maintained itself at a good level, even if slightly less than the previous two on-line strategies. Observation and feedback revealed that this participant liked to obtain an overview of the text before reading in more detail. This may explain her relatively good performance on the pre-reading tasks. She also incorporated this strategy into the summary writing task, reading and highlighting the whole passage first before re-reading and making notes. She found the mind mapping exercise quite difficult as she was unused to making notes in this manner, but despite this it was the most successful strategy (see Figure 4.7). It was also noted that she had to pause for significant periods of time to recall the content of the passages when writing her summaries; the participant put her reading difficulties down to her relatively weak memory rather than an issue of understanding. This view could be borne out by her cognitive profile (Figure 4.8) which shows good verbal abilities as well as a high score in block design, a visual processing sub-test. In contrast, her speed of processing and working memory measures were significantly weaker.
Figures 4.7 and 4.8: Reading comprehension scores and cognitive profile for Participant Two.
Participant 3

Figures 4.9 and 4.10: Reading comprehension scores and cognitive profile for Participant Three.

![Reading comprehension scores for participant 3: pre-testing and scores using different strategies](image1)

![General ability measures, Participant 3](image2)
Participant Three’s cognitive profile was flat and not particularly typical of a dyslexic learner. Her overall performance on the comprehension measures was good, outperforming the other participants, yet her pre-testing comprehension score was at the 9th percentile (20%), the second lowest in the group. Interestingly, her accuracy score and speed of reading during the pre-testing were both in the average range (60th and 35th percentile respectively) and her performance was far superior when using strategies that forced her to slow down her rate of reading. This was particularly true of the summary writing strategy where she obtained her best comprehension scores and the second slowest speeds of reading. Her slowest speeds of reading were for the mind mapping tasks, but her performance when using the pre-reading strategies was quicker and superior in comprehension on the summary writing task. She did also attempt to slow down the use of Texthelp software and reread/listened to a large number of sentences in the hope that this would aid her understanding, which appeared to assist with the summary writing task but not in relation to the comprehension questions task.

The key strategy for this participant seemed to be the need to reread sentences to aid recall and/or understanding. Observation of the strategy used during the text to speech software exercises indicated that it was the longer more complex sentences that were more likely to be replayed. This theme of rereading was evident in each of the five strategies employed, with the summary notes strategy enabling this rereading to be most productive as the participant read and highlighted first, then reread the whole text making notes and reinforcing her previous understanding. A similar pattern emerged with the pre-reading strategy, with the headings and key sentences playing a similar role to rereading, again producing quite successful results.
Participant Four

The cognitive profile of Participant Four was all within the average range, apart from the two speeds of processing measures which were significantly weaker. This pattern was repeated with her pre-testing reading scores, with comprehension and accuracy within the average range and speed of reading much slower, ranked at the 11th percentile. Her speeds of reading across the passages were slow, the fastest being the speed she set the Texthelp software at 140 words per minute, slowing down to 28 words per minute when using the summary notes strategy. Her comprehension of the passages never dipped below 30% (see figure 4.11), and peaked at 70% for her performance on the questions tasks whilst using the strategies of summary notes and the pre-reading tasks. Her best performance on the summary writing task was when using the summary notes strategy, which was also the slowest. Compared with her performance on the pre-testing ART passages, gains in comprehension appear to have been made on the mind mapping, summary writing and pre-reading question exercises.
Figures 4.11 and 4.12: Reading comprehension scores and cognitive profile for Participant Four.

When reviewing the performance of Participant Four, it became evident that the strategies of listening to text and learning key words may have made reading more
efficient as the feedback given by the participant suggested that decoding was
easier. This did not produce improvements in comprehension, however, and these
two strategies remained the weakest despite having some perceived benefits. The
summary writing strategy seemed to enable the participant to break the text down
into manageable chunks as she read, highlighting and taking notes section by
section in a methodical manner as she slowly worked through the text. Feedback
from the mind mapping exercise indicated that this strategy forced the participant to
slow down and structure her thoughts regarding the text, and thus she felt aided her
understanding.

**Participant Five**
The pre-testing results for reading for Participant Five indicated a significantly slow
speed of reading (10th percentile) and relatively weak accuracy (20th percentile) and
comprehension (30th percentile). The slow speed of reading was reinforced by the
significantly weak speeds of processing measures (rapid naming and symbol coding
— see figure 4.14).
Figures 4.13 and 4.14: Reading comprehension scores and cognitive profile for participant 5.

This participant seemed to maintain reasonable levels of comprehension throughout the various teaching sessions, with scores ranging from 23% to 43% on the
summary tasks and 40% to 75% on the questions tasks, achieving neither significantly low or significantly high scores in a similar fashion to Participant Four. Both Participant Four and Five also had all of their ability measures, apart from speeds of information processing, close to the mean score (figures 4.12 and 4.14).

The most successful strategy proved to be writing summary notes and observation and feedback suggested that this was due to the ability this strategy has in giving the participant time to actively engage with the text, think about it and write summary notes. Mind mapping also resulted in some improvements in performance (See Figure 13) as did using text to speech software and the use of key words, particularly on the questions task.

**Participant Six**

Participant Six obtained ability measure scores in the low-average to average range for verbal and visual processing, but significantly weaker scores on the speeds of processing and working memory measures (see figure 4.16). Her pre-testing reading scores on the Adult Reading Test revealed an average level of reading accuracy (50\(^{th}\) percentile), low average speed (22\(^{nd}\) percentile and also low average comprehension (30\(^{th}\) percentile = 46%). Her reading comprehension performance when using the different strategies was varied. The use of text to speech software was quite good on the questions task, but less successful on the summary writing exercise (See Figure 4.15). Learning key words did not produce significant benefits to comprehension, but the participant felt that it helped, perhaps with decoding rather than understanding or recall of information.

The two on-line strategies, mind mapping and writing summary notes, proved to be more successful, particularly the latter. The participant made some interesting
comments about the process of using mind maps as she felt it forced her to think about the content of the text and structure it to suit her own understanding. She also found the use of colour highlighters aided her recall of information as she could mentally picture the colours and structure of her map when she came to write her summary of the text. It may be worth noting that this participant's highest scores on the ability measures were two of the visual processing measures, matrix reasoning and block design and her preferred method was mind mapping.

**Figures 4.15 and 4.16:** Reading comprehension scores and cognitive profile for Participant Six.
Participant Seven

Ability measures for Participant Seven were unavailable but her performance on the pre-testing reading task produced results indicating weaknesses in reading accuracy (15th percentile) and speed of reading (6th percentile) as opposed to an average level of comprehension (40th percentile = 52% raw score). The first teaching strategy, using text to speech software, showed some gains in comprehension on the questions task, but less so on the summary writing exercise. The participant stated that she found this method useful and liked being able to listen to the text, possibly as a result of weak decoding, as reflected by the low accuracy score on the Adult Reading Test. The strategy of pre-learning key words prior to reading did not aid comprehension, but again participant feedback suggested that it aided decoding. The best performances for the summary writing tasks were with the strategies of mind mapping and summary notes. These were also the most time consuming with the speed of reading down to 28 words per minute when using the summary notes.
strategy. Feedback on these strategies was that the mind mapping helped to structure the new information gleaned from reading and recall was also aided by use of colour. Again the highlighting aspect of the summary notes strategy proved beneficial, but this student generally had difficulty with the skill of note taking and summarising. The pre-reading strategy produced mixed results and was not found to be that helpful by the participant, as it did not seem to aid her recall of information that successfully, especially on the summary writing task.

Figure 4.17: Reading comprehension scores for Participant Seven.

![Reading comprehension scores for Participant 7: pre testing and for using different strategies](image)

Participant Eight

Participant Eight's cognitive profile suggested a relative strength in her visual processing skills, with above average scores for matrix reasoning, block design and picture completion (Figure 4.18). There was also a significant weakness in her speed of processing measures which seemed to transfer across to her relatively slow speed of reading, which was placed at the 23rd percentile during the pre-testing.
This slow speed of processing was seen consistently with regard to the participant’s reading speed and speed of writing when generating summaries; one nearly taking 15 minutes and producing a writing speed of 12.5 words per minute. The other scores on the Adult Reading Test indicated average levels of accuracy and comprehension. Performance on the tasks using the various strategies peaked with the comprehension question tasks using the strategies of mind maps and summary notes, with a better performance using summary notes on the summary writing task (See Figure 4.19). Interestingly the best results were obtained during the slowest production times. This was also true when using the text to speech software, with the participant slowing down to 57 words per minute and obtaining the joint second highest score for the summary writing task across the five strategies used.

Figures 4.18 and 4.19: Cognitive profile and reading comprehension scores for Participant Eight.
Verbal feedback from the participant and observation during the teaching sessions revealed that she found text to speech software quite useful as a means of aiding recall of information. The key words strategy seemed to help more with spelling when generating the summary rather than recall, and was the least successful strategy. The mind mapping strategy proved more successful, but the participant found the process of writing the map quite hard, possibly due to a lack of experience; however, results were quite productive. The summary notes strategy was used as a means of rereading, with an initial reading linked to the use of highlighting and a second reading used in conjunction with making the summary notes. Mixed results were produced with the pre-reading strategy and likewise participant feedback was mixed.
Participant Nine

Figures 4.21 and 4.22: Reading comprehension scores and cognitive profile for Participant Nine.

Participant Nine’s cognitive profile was slightly different to many of the other participants; his verbal abilities were relatively strong, with a weaker working memory.
score (digit span) and speeds of processing within the average range. He reported significant difficulties with concentration when reading, easily losing focus of the meaning of text, unless he was engaged with the content. His reading on the pre-testing measure indicated an accuracy score placed at the 53rd percentile, comprehension at the 20th and a speed of reading at the 42nd. Overall the performance on the comprehension tasks was not very successful, especially the summary writing tasks. The participant had great difficulty recalling information and reported that he finds that he requires background knowledge of a subject before he can assimilate new information. This would suggest that the pre-reading strategies would be more successful with this participant, but unfortunately this did not seem to be the case, particularly with the questions exercise. Despite this, the participant preferred the pre-reading strategy and felt that the development of this, perhaps with some highlighting of text and note taking, might be the most productive.

Discussion

During the study it became clear that most participants felt that being given a strategy to support their comprehension and recall of text was beneficial, regardless of whether the performance on the various exercises indicated this or not. As far as the participants were concerned, any strategy was better than no strategy at all; whether this is true or a placebo effect is difficult to ascertain from the data collated. However, the results did show that certain strategies produced significantly greater gains in understanding and/or recall than others, most notably the use of mind mapping techniques and the writing of summary notes. These two strategies can best be described as on-line meta-cognitive strategies as they enable the reader to think about the text during the actual process of reading. These results therefore confirm the work conducted by Palinscar and Brown (1984), Bereiter and Bird (1985)
and Thiede, Anderson and Therriault (2003) that meta-cognitive strategies are the most successful. Bereiter and Bird's research highlighted thinking aloud processes, which were not investigated during this research programme, but the two processes of mind mapping and writing summary notes did force the participants to actively think about the text in a written form. The processes are therefore similar, but further research as to the benefits of thinking aloud, (perhaps by using a dictaphone or digital recorder to record ideas) as opposed to writing notes would be worthy of further research. Feedback from the participants indicated that it was the process of engaging in the text and being forced to think about the content that was of crucial importance. Also, the approaches of rereading and reinforcing understanding that these two strategies engendered, was of significance. Rereading was a key strategy for most of the participants in their normal reading process and the process of reading, highlighting and mind mapping or making notes created an automatic reinforcement process.

The use of highlighter pens was noted by a number of participants to be beneficial, both as part of the summary writing strategy and when reviewing the mind maps. Colour, with a number of students, seemed to aid recall of information. There is a lot of anecdotal evidence regarding the visual processing strengths amongst some dyslexics (Morgan and Klein 2000, Mortimore 2003) and therefore it was thought that a comparison between visual processing skills, as indicated using the scores obtained by the participants on the relevant Weschler Adult Intelligence Scale sub-tests and comprehension performance using mind mapping techniques, might produce a positive link. Some of the participants' visual processing skills did correspond with their abilities to use mind maps to aid comprehension, but with others this was not the case; no overall pattern emerged. (See figure 4.24). A similar
attempt was undertaken to try and correspond certain literacy skills or learning strategies with underlying cognitive skills. Reading accuracy across the participants was contrasted with both the strategies of using Texthelp software and learning key words (Figures 4.23 and 4.25); again with some individuals a correspondence was noted, with others it did not. The sub-test Similarities was cross referenced with performance on the writing summary notes strategy (Figure 4.26) and again results were mixed. This data makes the use of cognitive profiles to map potentially successful reading strategies problematic.

A recurring issue related to this research is whether the weaknesses in reading comprehension skills amongst dyslexic adults is in fact a comprehension or understanding issue or one of difficulties with recall of information. One could argue that weaknesses in decoding will cause greater use of resources within the working memory and leave less availability for the comprehension of the meaning of the text itself. Students therefore have to reread to ensure decoding is accurate before they can comprehend. If this were the case then the strategies that focussed on decoding skills, the use of text to speech software and learning key words should have produced significant benefits with regard to comprehension. The results of this study show that this was not the case, with these two strategies producing the least gains in comprehension. It may be the case that older students have learnt to decode most commonly used words effectively or are able to rely on context when reading to actually decode reasonably well. It may be that the strategies of improving decoding skills only work on those students with significantly weak decoding skills, whereas a number of dyslexic university students have managed, over the years, to develop enough strategies to support their sight recognition of words or decoding skills. It was therefore interesting to analyse the results of the
participant's performance when using the decoding strategies, as verbal feedback suggested that some felt their decoding skills were aided by these strategies. Figure 4.23, which compares reading accuracy scores with performance using Texthelp software, gives mixed results. Participants Five and Seven, who both had low accuracy scores did benefit significantly on the comprehension questions task, but this was less true for Participant One. Also Participant Six performed quite well on the comprehension questions task, but her decoding was within the average range. What does seem clear is that for most higher education dyslexic students, strategies that try and support decoding skills do not produce significant gains in comprehension.

**Figure 4.23:** A comparison between reading accuracy on the Adult Reading Test and comprehension performance using Texthelp software (figures as raw score percentages)
Figure 4.24: A comparison between participant scores on block design and comprehension performance when using the mind mapping strategy.

Figure 4.25: A comparison between participant scores on ART reading accuracy and comprehension performance when using the key words strategy.
A significant finding of the study was the suggestion that dyslexic students need more time to process information; therefore slowing down their reading can benefit their comprehension. The two most time-intensive strategies, summary notes and mind mapping were, as stated earlier, the most successful. It may therefore be a case of the more time you take to read something the more you are able to recall, particularly for those people who process information slowly, such as dyslexic students. This finding would support the work of Lesaux, Pearson and Siegel, (2006) and Runyan (2001) that the reading comprehension of dyslexic students is improved when they are given more time, and to a significantly greater level compared to their non-dyslexic counterparts. This evidence would suggest that speed of processing is a significant issue with regard to the comprehension of textual information for some dyslexics. The greater length of time to process information may aid the strategies of rereading, reinforcing and integration of information into
existing mental schemas. The extended time to process may aid the working memory, recall and integration of information.

**Conclusion to intervention study**

The most successful strategies for the comprehension of texts within the study were those that permitted the participants to use more time. The analysis of the cases identified writing summary notes and mind mapping as the most successful strategies; both of which can be described as on-line meta-cognitive strategies. This would seem to indicate that actively engaging with the text, thinking about the meaning and reinterpreting it during the reading process proved to be beneficial to this small group of dyslexic university students. In contrast, the least successful strategies were those that did not require additional time to implement during the reading process and were those that focussed on intervening and supporting decoding of words, either via an auditory route (use of computer software) or the learning and pronunciation of key terms. This would lead us to believe that teaching decoding skills to adult students is not the most effective approach to improve the comprehension and understanding of texts. This research therefore supports the work of Glover, Ronning and Bruning (1990), Palinscar and Brown (1984), Bereiter and Bird (1985) and Thiede, Anderson and Therriault (2003) who advocate the teaching of meta-cognitive skills.

With regard to the use of cognitive profiles to determine successful intervention strategies for developing reading skills for adult students, the results were inconclusive. Some students did seem to show a close correspondence between their ability to use a particular strategy and their underlying cognitive ability or level of
word decoding. Other students, equally, did not show any correspondence whatsoever, and in some cases a high score on a particular strategy mapped to a low score on their cognitive profile, or vice versa. These results were disappointing but it does seem to indicate that a simple correlation between a sub-skill and an ability to learn in a particular way is not a straightforward or obvious association. Reading is a complex process and such an easy solution to remediating against reading difficulties is a hopeful proposition, but unlikely to always bear rewards. Other factors such as educational history and amount of reading experience can mask skills or give individuals other strategies that they are familiar with and comfortable in using. However, it is worth using such profiles as a starting point for an intervention strategy, but as is often the case, a significant amount of 'trial and error' is likely to be required.
Chapter 5
General discussion

Overview of results

The research reported in this thesis investigated text reading comprehension amongst adult dyslexic students. Three types of studies were conducted. The first aimed to profile the strengths and weaknesses of the dyslexics. The second concentrated on features that might influence text comprehension in adult dyslexics compared to matched controls. The third focused on intervention strategies that might improve reading comprehension in adult students with dyslexia. In order to assess text comprehension in this group, it was necessary first to develop a prose reading test that could be used to profile text reading skills in the adult education population targeted. The initial work reported, therefore, focused on the development of the Adult Reading Test (ART). The results of this work argue for the ART being a measure of prose reading that can identify variability in reading accuracy, rate and comprehension amongst an adult education (FE and HE) population, and which can distinguish between those with and without a history of literacy acquisition problems.

The ART was then used with a range of assessment measures typical of dyslexia assessment procedures. The results of this profiling work indicate that adult dyslexics' literacy weaknesses typically manifest in problems in reading rate and spelling, though there may also be weaknesses in reading accuracy. In addition, there was evidence for deficits in naming speeds as well as working memory. Interestingly, the dyslexics did not show deficits, on average, in reading comprehension. Other findings in this section argue for differential effects between reading rate and text comprehension to be a strategy, used by the majority of dyslexics, in which reading is slowed to allow comprehension. Specifically, findings
indicated that when a group of adult dyslexics is divided into subgroups, those with slow reading rates but good comprehension levels were as fast in measures of speed of processing as those dyslexics with better reading rates. This finding argues against an underlying deficit amongst those with slow reading rates but good comprehension and more for a strategic trade-off between rate and comprehension. The findings in this section also argue for comprehension levels amongst the dyslexic adults to be best predicted by literacy rate in addition to the more general skills of word knowledge and verbal reasoning.

The second set of studies investigated the influence on text comprehension of (i) type of comprehension question, (ii) silent reading versus reading aloud, and (iii) time constraints. These studies argued for dyslexic adults to show weaknesses in comprehension questions that required the recall of specific details within the text read. When inferences were to be made about the text read, the dyslexic adults were, in the main, as good as their non-dyslexic peers unless reading time was constrained, when the dyslexics' performance on all types of comprehension question was worse than that of the non-dyslexics. Overall, constraining time seemed to have the most specific impact on the dyslexics' performance, whereas changing between reading silently and aloud had little differential effect on the dyslexics compared to the non-dyslexics tested. This is again consistent with the conclusion of the first section that slow reading rates are due to a strategic trade-off between speed and comprehension. When this strategy cannot be implemented, comprehension levels of the dyslexic adults suffer. Overall, these findings again argue for the importance of time on dyslexic reading comprehension performance, though there is also a potential effect of poor verbal memory.
In the final section of the current work, the intervention methodology suggested that comprehension strategies that led to a slowing of reading to use meta-cognitive processes was the most productive method in terms of improving reading comprehension for the majority of the cases trained. Again the data argue for slower rates being related to improved comprehension, though there were clear individual differences in the success of the intervention across the dyslexics tested. These individual differences in intervention success were not clearly predicted by the assessment data used in the study, although they may suggest that some dyslexics would benefit from word-level focused strategies over the use of text-level meta-cognitive processes.

**Prose reading assessment tool**

Initially, the research focussed on the development of a test measure that would enable the appropriate assessment of adult reading skills within the UK. The production of the Adult Reading Test (ART) enabled the gathering of data to give standardised scores for reading accuracy, comprehension and speed across a cohort of post-16 students in both further and higher education, studying at various educational levels and from diverse backgrounds. Tests of reliability and validity proved successful and the test has now become part of a commonly used battery of tests within the UK sector, being approved by the 2005 Dyslexia Working Party DFES guidelines for assessment (www.bdadyslexia.org.uk/downloads/dsaguidelines.pdf. accessed 15/06/08). Further research conducted in this body of work argues for the ART to be valid and useful (i.e., in terms of the specific comparisons with the Woodcock comprehension test and with measures of reading accuracy). An important feature of the development of this test is the confirmation that dyslexic adult students perform less favourably
compared with their non-dyslexic peers in relation to their speed of reading (see also Jackson and Doellinger 2002, Hanley 1997, Kim and Goetz 1994).

Children with dyslexia tend to have a difficulty with phonological awareness (Snowling, 1997, 2002; Goswami and Bryant, 1990). They also appear to experience weaknesses with their verbal working memory and speeds of processing. These core deficits are manifest into adulthood, but the weaknesses with phonology can often be masked with more experienced readers. The pattern of difficulties associated with adult dyslexics seem to be varied and dependent upon not just the core deficits but the life and educational histories that individuals bring to the reading process, especially strategies that have been developed over time. Therefore, it is imperative to have a firm understanding of the pattern of difficulties associated with reading amongst an adult population, a task this study has attempted, in part, to do.

With regard to the testing of adult students for dyslexia, this research would support the view that speed of reading is an important characteristic and needs to play a part in the assessment process. It is suggested that a single word reading test alone is insufficient to assess adult reading levels and that measures of word decoding need to be complimented by measures of prose reading. Including a prose reading task during formal assessment has the advantage of assessing students on a skill that is vital in their successful progression in education (either further or higher levels). It can also be argued to be more appropriate as an assessment of needs at work. Such a task can begin to give insights into what strategies for intervention might be required, as well as eliciting information regarding weaknesses in reading comprehension, accuracy or speed, and the possible inter-relationship between these three sub-skills. However, in order to obtain an accuracy measure the reading
task has to be completed aloud. It can be argued that a reading aloud task will cause problems for the assessment, potentially interfering with the use of working memory, given the additional load required for accurate decoding. This additional load may have a detrimental effect on comprehension and speed. Certainly reading speeds are much slower when reading aloud compared to reading silently, as the studies in this research have indicated. There remains, however, a question as to whether comprehension is impaired. Research presented here did not indicate group differences in comprehension abilities between dyslexic participants and their non-dyslexic counterparts and is consistent with other research (see McCallum, 2004). This would support, therefore, the use of an aloud prose reading test for the purposes of assessment. However, it was also apparent during the studies that individuals, both dyslexic and non-dyslexic, did perform differently when given aloud and silent reading tasks. As Cain and Oakhill (2006) state there are many ways of assessing comprehension, each one with at least some pitfalls:

"Comprehension is underpinned by many different language and cognitive skills;...word reading, listening comprehension, vocabulary and cognitive ability and the processing load in the comprehension assessment. For that reason a 'pure' measure of comprehension appears unrealisable" (p 705).

When administering reading tests it is important, therefore, to be aware of the limitations of each one and to ensure that appropriate conclusions are drawn from test performance. In order for a robust assessment of an individual's reading skills to be undertaken, it may be necessary for both silent and aloud reading tasks need to be considered. This has implications for test administration and putting those being assessed under additional stress and burden, but it is possible to refine the
development of suitable tests for adult populations so that they combine both elements and give standardisations for aloud and silent reading speeds and comprehension in a format that is not too onerous to administer. Further research and test development is required in this area.

**Adult dyslexic profile**

The general profile of dyslexia among adult university students developed in this research indicated that the defining features are slow reading rate, poor spelling and slow speed of writing, together with inefficient underlying processing speeds and weaknesses in the use of working memory. Interestingly, weak phonological processing was not a discerning characteristic of the adult cohort tested; although this may be a result of the type of test used, and it may be more appropriate to argue that the specific spoonerism test used in profiling did not produce a significant difference between dyslexic and non-dyslexic groups. However, a spoonerisms task is a relatively complex phonological task, requiring the recognition of sounds within words, the retention of words and sounds, the manipulation of sounds particularly in terms of deleting and combining sounds, and the production of novel word-like forms. These task components would seem to cover a range of phonological skills that are often related to deficits in dyslexics (see Snowling, 2000). Also, this negative phonological effect can be contrasted with other research (Wilson and Lesaux, 2001; Gottardo, Siegel and Stanovich, 1997; Muter and Snowling, 1997; Martino and Hoffman 2002) which has argued that when phonological processing tasks are given to adult dyslexic learners they experience difficulties. One difference across studies is that dyslexic adults often perform poorly on phonological tasks when they are put under timed constraints. However, this begs the question of whether the effects are due to the underlying phonological core deficit, as put
forward by Snowling and others, or whether speed of processing is the primary difficulty. Additionally, adult dyslexics can be found to show phonological weaknesses under some untimed conditions, suggesting that some do show persistent weaknesses in this area. These differences in effects show a clear need for further work investigating the phonological processing skills of adult dyslexics.

Although the underlying weaknesses have not been sufficiently investigated in the work conducted as part of this thesis, the characteristic of slower processing during literacy-based tasks is certainly more apparent than phonological weaknesses in the adult population tested in the current work, as is the feature of poor reading rate in comparison to relatively better reading accuracy. It may be that phonological deficits leading to poor word decoding accuracy, of the sort found amongst children and some adult dyslexics, can be masked in the more experienced dyslexic readers, especially when they are given enough time to implement learned coping strategies. Whatever the reason, the findings gathered in this body of research would not highlight phonological skills or single word decoding as the most significant literacy-related weakness amongst adult dyslexics. Although decoding difficulties do persist into adulthood (for example, somewhat lower scores on word accuracy measures were apparent throughout the studies), these seem to manifest primarily in slow speed rather than poor accuracy. Hence, weak decoding caused by underlying phonological deficits may still be the main causal pathway to dyslexia; however, at least among the adult dyslexic students tested in this research, the primary area of significant deviance from normal is in terms of speed. This has clear implications for assessment procedures, but it may also be worth considering in terms of intervention. Although phonological deficits leading to weak decoding may be the causal pathway that leads to adult dyslexia, the current data questions the idea that
the best process of remediation for adults is a phonics-based approach, an approach that would certainly be highly appropriate for beginner readers. Curtis (1980) asserts that developing decoding skills as a strategy for reading improvements becomes a less useful strategy with age and instead focuses on developing comprehension skills. This body of research would support this view and argue for an emphasis on the development of higher order skills amongst adult dyslexic students.

Comparisons of reading accuracy were generally weaker for dyslexics than non-dyslexics, but less significantly than the measure of reading speed. It is possible that weaknesses with decoding are not as apparent as dyslexic adults are able to build up a sight vocabulary that aids their decoding of text. Errors may still persist but the use of context and other meta-cognitive strategies can support successful reading (Walczyk et al, 2001). In a sense, decoding words within text or comprehension of text may not be the main area of weakness for a dyslexic learner, but rather the time it takes to use other compensatory strategies to achieve successful reading, especially at a higher education level, as texts become more complex in nature. As noted by Jackson (2005)

"among university students with a high, but broad range of abilities, a pattern of relatively poor decoding skills, poor phonological awareness, and poor spelling does not signify strongly that a student is likely to be poor in text comprehension." p131

Jackson goes on to argue that the association between word recognition skills and comprehension is developmentally limited. It has been argued here, and by others (Stanovich, 1980; Bruck, 1990; Jackson and Doellinger, 2002), that adult learners
use a range of strategies to compensate for weaknesses in the reading process. Nation and Snowling (1998) also found compensatory reading strategies amongst child readers. This study has also put forward the argument that dyslexic adults are not necessarily weak comprehenders. Data across most of the studies reported in this thesis indicated that dyslexics do not necessarily have weaknesses with global comprehension. What the work has found is that weak comprehension is apparent when adult dyslexics are asked to read at speed or under timed constraints. In such a situation the ability to comprehend deteriorates. This finding would therefore support the generally accepted examination accommodation that dyslexic learners should be granted additional time; not just to check their spelling and proofread their responses, but also to read and effectively comprehend questions and passages of text. As indicated in the sub-grouping study (in Part 3 of Chapter 2), this accommodation may support the majority of dyslexics for whom slow reading is not purely a response to general slow processing speeds but, it can be argued, is a strategy designed to assist in the accuracy and/or the comprehension of text.

Dyslexic university students adopt strategies to support their reading, primarily those of slowing down and re-reading. More advanced readers also use an array of supportive strategies such as writing summary notes, highlighting text, pre-reading and rereading. These strategies take time, as the remediation study indicated, but they do lead to more successful outcomes. Therefore, providing extra time can be seen as a way of overcoming limitations imposed by the primary problems associated with dyslexia (i.e., poor decoding, due to phonological deficits, leading to inefficient reading skills).

The constrained time study (Chapter 3, Study 2) also indicated that when given time, dyslexic students make gains in their ability to comprehend. This was also apparent
with the success of strategies used in the intervention study (Chapter 4), whereby
the techniques adopted that slowed down the reading process produced the greatest
gains. It was the strategies which enabled the students to think about the reading
material, whilst reading aided comprehension the most. Use of colour, mind maps,
summary writing and actively engaging with the text can enable dyslexic learners to
break the text down into manageable sections of information that can be processed
and integrated into existing knowledge structures. To advocate the slowing down of
reading and the adoption of strategies that break up information into smaller chunks,
would suggest that dyslexic learners can comprehend adequately well as long as the
flow of information is not too fast paced.

The data reported in this thesis also did not suggest that weaknesses with working
memory were a defining feature of the level of reading difficulties experienced by the
dyslexic adults. Although many of the students that were tested across studies had
weaknesses with auditory working memory, as tested by a digit span test, these
weaknesses did not directly correlate to reading comprehension performance. For
example, the findings of the study in Part 3 of Chapter 2 did not indicate associations
between the weaker comprehenders and working memory measures. The
association was more likely to be between weaker comprehension and general
abilities; as for example, in the contrasts across the fast/weak group and the
fast/good group. Despite this, there was consistent evidence for the dyslexic
students to display weaknesses in the recall of factual information in order to answer
comprehension questions, potentially implying weaknesses in verbal working
memory that may also impede comprehension processes. On the other hand, when
working memory measures (digits forwards and reversed) were compared with
comprehension scores, no clear associations were evident. As stated earlier, the
reason could be that the type of measures used lacked sensitivity with verbal working memory; however, it indicates that the relationship between working memory findings and the reading skills of dyslexics needs further consideration. Further evidence in the present work that argues for such a reconsideration was the lack of relationship between working memory and speeds of processing. As Perfetti (1985) noted, a bottleneck in working memory may prevent the rapid and automatic processing of text; therefore slowing down the input of information may relieve pressure, and thus aid understanding. The lack of a clear association in the present data argues for further work to assess the validity of this proposition. Further research may indicate that it is possible to separate the roles of verbal working memory and speeds of processing within the act of comprehension, thereby arguing for the need of alternative models of these roles.

Although a clear association between reading levels and verbal working memory could not be identified amongst the dyslexics tested, there was some evidence of associations between good versus poor comprehension and general ability measures (Part 3 of Chapter 2). A number of researchers have identified general abilities, particularly verbal skills, as a key indicator of reading comprehension. Kominski and Kominski (2001) found general knowledge to be an important factor in reading comprehension across a range of ability groups within high school students. Ransby and Swanson (2003), when assessing the comprehension skills of adult dyslexics, suggest that “oral language (as measured by listening comprehension and lexical knowledge) influenced both reading comprehension, accuracy and fluency”. Oakhill and Yuill (1996) state that poor comprehenders may lack the general ability to make clear inferences from text. However, general or verbal ability should not be assumed to be the only pre-determining factor with reading comprehension skills, but
rather one of several. The regression analysis performed in Part 2 of Chapter 2 revealed that the two main influences on comprehension were verbal ability and reading fluency, with the main predictor being speed of reading. It may be that speed of processing and slowing down reading as a deliberate strategy have a stronger impact on comprehension than general verbal ability. However, again further research is necessary, specifically to determine these interrelationships. For example, low verbal ability may limit the effectiveness of the trade-off strategy. The data from Part 3 of Chapter 2 indicated that the poor comprehenders, particularly the subgroup comprising relatively fast readers, were relatively weak on general verbal and non-verbal tasks (Vocabulary, Similarities, Matrix Reasoning and Block Design tests from the WAIS). It may be that those with poor general skills may not benefit from the trade-off strategy or that this strategy may need to be explicitly taught. Indeed an interesting factor that can be derived from the present work is that the majority of dyslexics seem to have naturally identified the best strategy to overcome literacy weaknesses: i.e., slow reading down to support understanding. Research that discerns these, potentially more instinctive, strategies may be a key to informing intervention strategies, particularly for those dyslexics who have not identified these strategies for themselves. Further work on the strategies used by dyslexics themselves may be worthwhile.

Theoretically, it is difficult to determine the underlying reasons for reading impairments amongst dyslexic adults. Weaknesses are generally identified across the dyslexic cohort with regard to speeds of processing, use of working memory and phonological processing, but the interrelationship between these factors and whether they are separate entities or closely intertwined skills is not possible to determine. Wolf and Bowers (2002) argue that speed of processing and phonological skills are
separate skills, whereas Snowling et al (1997) pursues the argument that issues of processing and working memory are a consequence of the level of phonological weaknesses. Working memory has been cited in a number of studies as a key determining factor in text comprehension (Cain, Oakhill and Bryant 2004; Perfetti, 1985; Swanson, 1994). It is important to try and analyse the reading process by looking, not at a single indicator, but at a series of sub-skills, as this approach seems to lend itself to a greater understanding of the complex processes at work. The notion of reading comprehension as a single skill masks the variety of sub-skills that are required to read and comprehend effectively.

If we can begin to determine what a dyslexic profile is for an adult population, is it possible to determine whether there is a dyslexic profile for reading? It certainly appears true that most dyslexic adults read slowly and that there seems to be a relationship between levels of accuracy, comprehension and speed; the latter being sacrificed to improve the other two, especially comprehension, which is, after all, the key to successful reading. The data would also suggest that with a number of dyslexic readers, errors in accuracy persist, probably as a result of underlying phonological weaknesses. However, it is also apparent that the more experienced dyslexic reader can overcome or mask their phonological weaknesses by building up a good level of sight vocabulary and by using contextual clues to interpret text successfully, albeit at a slower rate.

**Individual differences and interventions**

Other aspects of a dyslexic reading profile are less clear, suggesting a large amount of variability, or individual differences. For example, although the data did not reveal a preponderance of dyslexic adults to prefer silent reading over and above aloud
reading (see Study 1, Chapter 3)), differences can be identified at the individual level. Although these could be natural variability in the data, they may explain the variation in the literature on silent versus aloud reading — i.e., there are some dyslexics who perform better under reading aloud conditions whereas others do not. There was also some evidence from the case studies reported in Chapter 4 to suggest that some dyslexic learners had particular weaknesses with concentration and the ability to focus on the text, while others had problems with decoding more complex vocabulary, summarising what had been read and recall of information. A reading profile, therefore, seems to be a complex interaction of specific difficulties counter-posed by the strategies and learning experiences that the reader brings to the task. In this sense, a general reading profile is difficult to determine, but an individual profile is more attainable, based on the gathering of both objective test results and subjective probing of questions to understand current strategies and difficulties encountered. Further research focusing on these adult dyslexic profiles would be worthwhile to inform these assessment procedures.

An aspect of the research, particularly in the remediation study (Chapter 4), was to examine the possibility of using individual cognitive profiles to determine the most suitable strategies for reading. For example, it was postulated that those students with good visual processing measures on the WAIS sub-tests would find mind mapping a useful skill when reading and summarising information. Although this was a successful strategy for a number of the participants, there did not seem to be a direct relationship between the cognitive assessment measures and the usefulness of the skill in comprehending texts. This was also true when other strategies and underlying skills were compared, such as reading accuracy and the use of text to speech software. Further research is required into this area of study, and if firm
associations could be made it would advance the ability of providing individually tailored interventions to support the reading skills of those with specific weaknesses.

The study reported in Chapter 4 did not identify specific strategies to aid individual learners, but rather general approaches that should be applied. The strategies of teaching dyslexic learners to be active readers, to think about the purpose of reading and to reinforce understanding during the reading process itself seemed to be the most beneficial for the majority of the cases studied. These approaches tended to involve enhancing the higher order skills of readers, specifically active, on-line, meta-cognitive strategies. The two most successful in this study were the use of mind maps and the use of summary notes. These two strategies enabled readers to slow down their processing of text, chunk information into manageable sections and use colour and fine-motor memory skills to reinforce learning. The teaching of decoding strategies did not generally appear to be that effective amongst the small group of learners that took part in the intervention study. It may be that less able readers might benefit from decoding skills, but the participants in this study were able to read at a functional level, although they needed strategies to recall and interpret the text effectively. It is proposed, therefore, that slowing down ones reading enables information to be processed more effectively, avoiding any potential bottleneck caused by slow speeds of processing or weaknesses with verbal working memory.

Another issue considered was whether or not dyslexic learners have particular weaknesses in processing factual information or inferences from texts. The evidence from the first study reported in Chapter 3, when dyslexic and non-dyslexic groups were given complex passages to read, seemed to indicate that the dyslexic group found recall of factual information harder, especially when reading silently.
Other evidence, the comparison between dyslexics and non-dyslexics performance on the ART questions and the data gathered on the constrained time study, would support this assertion. The majority of the evidence reported in this work suggests that, when time was unconstrained, memory for specific details with prose text was the main area of comprehension deficit for the adult dyslexics tested. When time was constrained, however, further comprehension deficits were evident, particularly in making inferences from the text. Further research is needed to confirm this claim, but if this is the case, then such evidence could contribute to the fine-tuning of teaching strategies when working with this cohort of students.

Limitations of the research
The research conducted as part of this thesis had problems suffered by most work on dyslexia. One of these is the definition of dyslexia and its potential to lead to different conditions being included within the diagnosis of dyslexia. The BPS (1999) definition "Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty..." has lead to a broad definition of dyslexia being used for assessment purposes. Therefore, when gathering data from groups of adult dyslexic students, or when using groups of dyslexics in research studies, the groups themselves are often diverse in the variety of difficulties that each individual faces. Dyslexic students, particularly adult dyslexics, display a variety of strengths and weaknesses with their learning, some of which can affect their literacy levels but which were not specifically addressed in this work. For example, weaknesses with attention and concentration were not explicitly measured during the research, but some students can display these difficulties, especially if the assessment procedures used to diagnose dyslexia included a consideration of issues associated with attention. More recent thinking regarding the variety of
specific learning difficulties is focussing on the overlap between dyslexia, dyspraxia, attention deficit and other learning difficulties (e.g., Snowling, 2008). Therefore, within a cohort of students with the label of dyslexia, many of these students may have different or overlapping labels, potentially leading to differing reading profiles. Everatt et al (2008) found that groups of children identified with dyslexia, dyspraxia and attention deficits all showed evidence of reading weaknesses but had differing underlying cognitive deficits. Similarly, Savage et al (2006) found that weaknesses with attention skills amongst a group of ADHD children were more likely to be associated with weaknesses within the visuo-spatial sketchpad rather than the phonological loop – i.e., underlying visual problems rather than phonological deficits. Such differences in underlying difficulties may have an impact upon the most appropriate remediation strategies. Within the intervention study in Chapter 4, one of the participants displayed difficulties more associated with attention and concentration and the strategies that seemed to be more preferable were different to many of the other participants. For this individual, the use of pre-reading strategies rather than on-line meta-cognitive strategies seemed more beneficial. It may be that more detailed specific learning difficulty assessments may provide better ways of informing intervention procedures, though, as argued above, more research is needed to make clearer links between assessment profiles (or different types of learning difficulties) and intervention strategies.

Other limitations of the research were also evident. No firm conclusions can be drawn from the role of verbal working memory in reading comprehension. As stated earlier, many other researchers have made a link between verbal memory and reading comprehension skills; a connection not apparent from the findings in this study. One possible reason for this may lie in the lack of sensitivity of the digit span
test to indicate specific weaknesses with verbal working memory. Further research using more sensitive tests would therefore be of interest. Additionally, the direct teaching of working memory skills was not included in the intervention study (Chapter 4) as strategies are not that successful when administered over the short-term available to this work and where gains have been shown, these rarely generalise across contexts (see Jeffries and Everatt, 2004). Conversely, memory skills were incorporated into general meta-cognitive strategies, such as mind mapping and writing summary notes, which did lead to gains in comprehension, but the role of memory could not be isolated within this strategy. Again, further work attempting to isolate different aspects of the interventions used would be worthwhile.

A further weakness with the intervention study reported in Chapter 4 was the number of participants. Originally it was hoped to recruit two groups of students from two subject areas, but only sufficient numbers came forward from the nursing department, making any comparisons between groups impossible. Greater numbers of participants would have made the evidence for teaching on-line meta-cognitive strategies more robust. However, it is hoped that the evidence presented will act as a useful catalyst for future research in this field.

**Overall conclusion and future work**

Future research should be aimed at continuing to assess the merits of using cognitive profiles as a means of gauging appropriate strategies for learners; although the current research has not been able to identify relationships between profile and intervention, further work on alternative predictor measures may better inform practice. Determining whether subgroups of dyslexics (potentially based on their reading profiles, as in the current work) show differential improvements across
interventions may also help to identify optimal educational practice. Specifically, research determining the role of working memory in the process of reading comprehension and the relationship it has with speeds of information processing would be worthwhile, particularly to inform theoretical developments in the field. Developments in the area of prose reading tests that have standardised measures for aloud and silent reading would also be beneficial. Further examinations on the type of information, inference or factual, adult dyslexics find particularly difficult to retain needs to be conducted, although the current body of research would indicate the retention of factual information is more problematic. Determining how these differences may inform intervention practice should also be an area of investigation. Exploring ways of improving teaching and learning strategies for adult dyslexic learners is of key concern and it may be that different deficits may affect the comprehension of different types of text and that optimal intervention methods may vary with those different text types (e.g., from narrative to academic). Overall, the current thesis contends that slowing down the pace of reading may be an aid to overcome any potential difficulties with the use of verbal working memory and enhances the ability to use on-line meta-cognitive strategies. Active, slower, but effective reading appears to be the key to successful understanding of texts amongst adult dyslexic students.
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List of appendices

Appendix 1: Reading passages for Study 1, Chapter 3: Complex reading passages

Appendix 2: Reading passages for Study 2, Chapter 3: Education and Politics passages

Appendix 3: Reading passage for Study 3, Chapter 3: Complex Politics passage

Appendix 4: Reading passages and questions for intervention study, Chapter 4

Appendix 5: Lists of key words taught in intervention study, key word strategy

Appendix 6: Template of report written for each student after intervention strategy
Appendix 1 (Science passage and politics passage)

Scientists at the Levin Institute of Molecular Research believe that they have made a major breakthrough in their ability to understand the structure of the nervous system. Professor Marianne Courvierre and her colleagues began their exploration into the crucial role the nervous system plays in animal development more than twenty years ago. Initial studies using a revolutionary scanning system that can identify changes in the structure of nerve endings was developed using laboratory rats. Groups of rats were placed from birth in different environments; one group were placed in a bleak environment that consisted of a dark coloured box, another in a standard laboratory cage and a third in a rich and visually stimulating environment. Otherwise all the rats were treated the same; they were fed the same food; they inhabited the same amount of physical space; the amount of light they received was equal and they heard the same sounds. At different points in their life span each rat was screened with the new scanning system; known as the Nwabula-Garcia Machine, after it's inventors. Professor Courvierre and her team noticed distinct differences in the nervous systems of the different groups of rats. There were particular increases in the development of the nerve endings and networks of nerves in the rich environment group compared to that of both the control group and the bleak environment group.

The measurements taken by the scanner are unique in their use of magnetic resonance technology. The machine is able to detect very slight changes in the nervous system at the molecular level and can also measure the reaction speed of the nervous system when the rats were subjected to specific stimuli or tasks. Each group of rats, which consisted of twenty in each environment, after they had been scanned several times over a six month period, were then placed in a maze and timed how long it took them to find their way to the centre, where they were rewarded with food. Again the rich environment group out-performed the other two, and significantly, when the rats were scanned after completing a number of tasks, there were changes in the molecular structure of nerve endings in all three groups, but more so in the rich environment group.

The research team, led by Professor Courvierre, commenced a longitudinal study on human participants ten years ago. Using the same scanning techniques the project is attempting to investigate the development of nerve endings in a diverse number of families from different income groups and environmental backgrounds. Initial results indicate that there are significant differences in families and the research team are trying to ascertain the variety of possible causes of these variations. For example high income participants tend to have a more developed nervous system than their lower socio-economic counterparts; but interestingly, city dwellers have significant deficiencies in aspects of their nerve endings than participants in rural locations. Professor Courvierre commented that “this is only the beginning of the study and we have a long journey ahead of us if we are to begin to understand the inter-relationship between environment, mind and body” (515)
1. What animals were used in the experiments?
Rats

2. Did any of the experiments mentioned use monkeys?
No

3. What body system were the scientists examining?
The nervous system

(F) 4. What is the name of the institute where the research is taking place?
Levin

(F) 5. How was the scanning system first developed?
Experiments using rats

(F) 6. What is the name of the scanning machine?
Nwabula-Garcia Machine

(I GK) 7. Why was it important to ensure all the rats were treated the same in their different environments?
If they were treated differently the scientists would not be able to tell if the different environments were the reason for differences in nervous system development or not.

(I T) 8. Which group of rats was the control group?
The rats in the normal cage

(I GK) 9. What do you think the rich environment consisted of?
Coloured walls / pictures / visual stimuli / tunnels / wheels / colourful objects and shapes or similar response

(I T) 10. Why do you think that the scientists believe that the environment effects the development of the nervous system?
The rats in the rich environment had more developed nervous systems than the other two groups

(I T) 11. Which group do you think had the least developed nervous system?
The rats in the bleak environment

(F) 12. How many rats were used in the initial experiments?
60

(I. GK) 13. Why were rats used in the initial experiment?
Rats are commonly used in experiments / It would be too dangerous to test a new technique on humans

(I. GK) 14. During the maze experiments why do you think the rats were given food?
To encourage them to complete the task / a reward for completing the task

(I T) 15. When do you think the study will be completed?
Not for some time / It will take several more years / along time or similar response

Answers (Name of participant)

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Words per minute = $\frac{515 \times 60}{188}$
Not since the political theory of post emancipationism has the academic world been so avidly discussing a new social discourse that claims to encompass a holistic approach to social construction. Global Domination Theory takes as its starting point the view that the world is controlled by a small elite of top financiers, oil magnates and military leaders. Politicians and nation states are seen as irrelevant and without significant influence on world events. With the advance of the world capitalist economy, four major blocks of capital are now seen as the main players in world affairs, other nations will need to align themselves with one of these blocks or face economic marginalisation.

Post emancipationism heralded an era of continuing wealth development in the advanced capitalist societies, leading to a decline in the need for social reform as wealth generation in these countries negated the need or demand for state intervention. The unrestrained development of the free market led to the withering away of the state and welfare provision, with social services being provided by the major multi-national corporations. Freedoms and services could be bought, and all those citizens that were part of the system were able to purchase their social and leisure needs. The theory, however, had a major flaw, it failed to understand or incorporate those who were outside of the economic system. It also failed to understand the inter-relationship between the prosperous from the socially outcast. Whole regions of the world were unexplained by the theory; those who critiqued post emancipationism felt that this was deliberate and accused the advocates of the theory of not caring for the poor and impoverished. Criticisms were made by a number of liberal organisations and particularly environmentalists.

Now a number of leading political analysts and academics have produced a collection of essays entitled 'Who Controls the World'. The theory sets a context of post oil production wars, the coming together of world economic interests and the continued battle against global terrorism and industrial working class power. Global Domination Theory sprang from an analysis of the Beijing Agreement between the oil-producing corporations, the World Bank, the Arms Industry and international communications companies. This agreement, the authors argue, set the world on a course for the merging of regional economic elites, uniting against their common foe, an anti-'western', anti-capitalist movement that is fractured into a multitude of different groups across the globe. The theory argues that the days of inter-capitalist competition are over, replaced by a more focussed effort to destroy and subjugate the enemies of the elite. The 'war on terror', that was central to the propaganda machine of years gone by, has been replaced by a 'war on the dispossessed'. The authors conclude that this shift in world politics may have united the capitalist world, but it may have also united the enemies of capital to such an extent, that it may well have sown the seeds of its eventual down fall.

(489)
1. What is the main subject of this passage?
Politics / economics / world power / capitalism or similar response

2. What sort of people are said to be in control of society?
The rich / elite / military / financiers / oil producers or similar response

3. What is the name of the first theory mentioned in the passage?
Post emancipationism

4. Why do you think this theory is called post emancipationism?
Because the authors thought that there was no further need to extend freedoms / people could buy their freedom / people had been emancipated or similar response

5. How many main blocks of capital are there thought to be?
4

6. What does GDT stand for?
Global Domination Theory

7. What is the name of the authors’ book?
Who Controls the World

8. What do you think trade unions thought about post emancipationism?
They were against it / opposed it or similar response

9. Why did environmentalists criticise post emancipationism?
The theory did not consider poorer nations / it did not consider protecting the environment / it was not interested in green issues

10. What societies benefited during the post emancipationism era?
Wealthy countries / societies that were not poor

11. What do you think might have been discussed at the Beijing agreement?
How to control the world / the sharing of resources between big business / big business agreeing to work together

12. Global Domination theory states that the world is controlled by whom?
Major businesses, financial leaders and the military

13. Who are the enemies of the elite?
Terrorists / anti-capitalists / environmentalists / workers

14. Where do you think the oil wars were fought?
The Middle East / oil producing countries or similar response

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Appendix 2
Passage 1
The revolutionary writings of Leonardo Panchas have only just come to light. For years he lead a guerrilla war against the military government who controlled the once idyllic island of Limonique. In 1985, after a wave of Industrial revolt in the fishing fleet and cannery industry, the government imposed draconian laws that outlawed all forms of protest. Many of the opposition forces took to the hills and mountain jungles of the interior of the island and began an armed insurgency movement against the police, the army and government officials. Supported by the peasants, the guerrillas launched a long term strategic war against the forces of oppression, which in 2005 lead to the overthrow of the Mourinlo regime.

Now in power, the coalition movement of guerrillas and peasants lead by Panchas have begun to reveal the ideological rationale behind their struggle. Many have assumed that the guerrillas followed a Marxist view of politics and history, especially as their movement blossomed during the trade union struggles of the 1980's. Now in power the new regime are following a more liberal, quasi-capitalist route to social reform. There has not been whole-scale nationalisation of key industries, apart from the fisheries and transport. Banks are still in the control of multi-national corporations, as indeed are the power companies and telecommunications. There have been promises of massive investment in education and health, but as of yet, little has been delivered.

Panchas's recently published series of short essays reveals his commitment to a programme of social reform and limited powers given to big business and a free market economy. This mix of ideological opinions stems from a merging of the industrial trade union movement that spawned the guerrilla movement and the peasant movement who strive for control of the land. Many of the peasant leaders have taken control of the large farming estates on the island, and as a means of appeasing the old colonial powers, Panchas has promised to leave certain sectors of the economy in the hands of the traditional elite. This has caused a degree of friction within the movement, with the old trade unionists calling for greater nationalisation of industry. Neither are the remnants of the old regime happy, for although they still control the banks and other sectors of the economy, they have lost a great deal within the agricultural sector.

389 words
Questions
1. In which industries did the industrial revolt occur? (F)
2. What was the name of the island? (F)
3. How long did the guerrilla war last? (I)
4. Whose regime was overthrown in 2005? (F)
5. Of what does the coalition government comprise? (F)
6. Do you think the guerrillas are for or against capitalism? (I)
7. Who or what controls the multinationals? (F)
8. Who or what has promised investment in health and education? (I)
9. What did the revolutionary writings reveal? (I)
10. When did the peasant leaders take control of the farming estates? (I)

Answers
1. Fisheries and cannery industry
2. Limonique
3. 20 years
4. Mourinio
5. guerrillas and peasants
6. neither - for some aspects and not others
7. Banks
8. The Panchas coalition government
9. Panchas’ commitment to social reform
10. After 2005 when the old regime was overthrown
The 1944 Education Act introduced free secondary education to all. The system operated via the 11 plus examination, a form of general intelligence testing, which determined whether children went to a more academic grammar school or a standard secondary school. Passing this test made a significant difference to the educational opportunities available to children. However, intelligence tests, with their class and cultural biases, meant that the class divisions of the pre-1944 education system were maintained via this selection process. The children from more middle class backgrounds, with greater resources, were more likely to receive support and training to pass the test from their parents, again reinforcing the class divide. This selection process at age 11 set the pattern of opportunity further up the education system, with proportionally more children from higher social classes attending university than those from working class backgrounds.

In the 1970s there was a growing increase in comprehensive education and a reduction in the number of local authorities using the 11+ system of selection. Some researchers have argued that the comprehensive system has made little difference to the class inequalities within the education system, but other scholars dispute this. Research based in Scotland, where the introduction of comprehensive schools was more widespread, seems to indicate a narrowing of the gap between the performance of middle class and working class children in examination performance.

However, another factor impacting upon equitable educational opportunities was the policy of streaming that took place in a number of comprehensive schools. Children were allocated to different ability levels and again this often replicated the class background of the children, with the more financially well off in the higher group. The preconceived expectations of the teachers towards different streams could lead to a differential curriculum and therefore educational opportunity was restricted to some pupils.

Another interesting piece of research conducted in the early 1980s examined the role a school had on children from the same class background. This study seemed to indicate that those children in the more selective or fee paying schools did better than those in a non-selective school. One can therefore conclude that class plays a determining factor in the type of school that children ended up going to, but also that the type of school reinforced those opportunities and made a difference to the type of education received and the ability to achieve academically.

395 words
Level 12
Education passage questions

1. What act was passed in 1944? (F)
2. What is the 11+ exam described as in the text? (F)
3. Why was the 11+ system not used for children at comprehensive schools? (I)
4. What did the research from Scotland indicate? (F)
5. What in the passage suggests that the comprehensive system was not compulsory for all local authorities in England? (I)
6. What process replaced the 11+ as a potential source of educational inequality? (I)
7. In which schools did children do better according to the 1980s research? (F)
8. What did research in the 1980's examine? (F)
9. Based on the passage, what do you think one of the aims of removing the 11+ system was? (I)
10. Were the grammar schools of the 40s the same as the fee-paying schools of the 80s according to the passage? Explain your answer. (I)

Answers

1. Education Act
2. type of intelligence test
3. test used for entry to secondary school
4. That comprehensive education did lead to a narrowing of the difference in performance between children from different social classes
5. more wide spread in Scotland
6. process of streaming
7. selective/fee-paying
8. the role a school had - or the effects of different schools - on children from the same class background
9. reduce inequalities in educational opportunity
10. No - grammar schools were free
Appendix 3
Not since the political theory of post emancipationism has the academic world been so avidly discussing a new social discourse that claims to encompass a holistic approach to social construction. Global Domination Theory takes as its starting point the view that the world is controlled by a small elite of top financiers, oil magnates and military leaders. Politicians and nation states are seen as irrelevant and without significant influence on world events. With the advance of the world capitalist economy, four major blocks of capital are now seen as the main players in world affairs, other nations will need to align themselves with one of these blocks or face economic marginalisation.

Post emancipationism heralded an era of continuing wealth development in the advanced capitalist societies, leading to a decline in the need for social reform as wealth generation in these countries negated the need or demand for state intervention. The unrestrained development of the free market led to the withering away of the state and welfare provision, with social services being provided by the major multi-national corporations. Freedoms and services could be bought, and all those citizens that were part of the system were able to purchase their social and leisure needs. The theory, however, had a major flaw, it failed to understand or incorporate those who were outside of the economic system. It also failed to understand the inter-relationship between the prosperous from the socially outcast. Whole regions of the world were unexplained by the theory; those who critiqued post emancipationism felt that this was deliberate and accused the advocates of the theory of not caring for the poor and impoverished. Criticisms were made by a number of liberal organisations and particularly environmentalists.

Now a number of leading political analysts and academics have produced a collection of essays entitled 'Who Controls the World'. The theory sets a context of post oil production wars, the coming together of world economic interests and the continued battle against global terrorism and industrial working class power. Global Domination Theory sprang from an analysis of the Beijing Agreement between the oil-producing corporations, the World Bank, the Arms Industry and international communications companies. This agreement, the authors argue, set the world on a course for the merging of regional economic elites, uniting against their common foe, an anti-western', anti-capitalist movement that is fractured into a multitude of different groups across the globe. The theory argues that the days of inter-capitalist competition are over, replaced by a more focussed effort to destroy and subjugate the enemies of the elite. The 'war on terror', that was central to the propaganda machine of years gone by, has been replaced by a 'war on the dispossessed'. The authors conclude that this shift in world politics may have united the capitalist world, but it may have also united the enemies of capital to such an extent, that it may well have sown the seeds of it's eventual downfall.
Appendix 4
List of comprehension passages for intervention study:

A) Human Science Passages

B) Nursing Passages

A Human Science Passages
1. Anthropology passage

Shifts in the South Pacific tectonic plates have, apart from causing massive devastation and huge loss of life, uncovered a plethora of new archaeological and anthropological evidence related to previously unknown civilisations. These new discoveries are on the island of Mechani where rural village ruins and artefacts have been uncovered. Evidence of this early civilisation includes stone spearheads, clay pots and religious or ritualistic icons. Carbon dating technology places the age of this civilisation as more than 3000 years earlier than previously known civilisations in this vicinity which had been dated at about 8000 BC.

Archaeologists from across the globe are descending on the island to witness the discoveries first hand. This is causing some difficulties for the local communities who are still coming to terms with the loss of life and devastation of recent events. NGOs working in the region are concerned that the finding of ancient ruins is taking the public's attention away from the plight of the local people who need support and financial aid. They are petitioning government ministers to delay the work of the archaeologists until emergency measures to ensure food and shelter are delivered to all of the survivors on the island are complete. They insist that this must be completed prior to the commencement of the monsoon season as transporting aid to the rural areas will be hindered by the risk of landslides. This will ensure that travel to the island is restricted to relief work and that funds are not diverted away from humanitarian aid. Archaeologists, on the other hand, have expressed concerns about looting of sites and the potential destruction of important findings. Indeed, despite the protests of aid workers, the new discovery is so controversial that it is unlikely that the archaeological work can be stopped.

The new evidence has set the anthropological community ablaze as it challenges the pre-conceived notion of a single African/Middle Eastern origin of human civilisation. A new discourse is emerging whereby two parallel cultures evolved simultaneously and without the capability of any form of intercommunication. Other scholars dismiss this theoretical position as scientifically impossible; contending that a dual-route to human civilisation, without any mutual contact, is inconceivable. If such a contention was plausible then the world would be inhabited by two types of humanoid species rather than one.

386 words
Read = 12
Questions

1. What caused the loss of life and devastation in the South Pacific? (F)
2. What is the response of the local people to the archaeological dig? (I)
3. What is the name of the Island? (F)
4. What process has placed the age of the newly discovered civilisation? (F)
5. How old do you think this lost civilisation is? (I)
6. What sort of food do you think this civilisation ate? (I)
7. What are the local communities coming to terms with? (F)
8. Why do some scholars say that the development of two separate civilisations is impossible? (F)
9. Why do you think the NGOs are trying to defend the single origin of human civilisation theory by attempting to stop further work? (I)
10. In what part of the world will archaeologists focus their search for the hypothesised second source of human civilisation? (I)

Answers

1. Tectonic plate movement/earthquake/sunami
2. They are not happy / upset
3. Mechani
4. carbon dating technology
5. 3000 years plus the age of the oldest civilisation 10 000 years, therefore 13000 years
6. Meet/animals - due to the fact that they found spearheads.
7. loss of life and devastation
8. Because that would have produced two human sub-species (two types of humanoid species)
9. they are not – trying to stop work to allow relief work
10. South Pacific
2. Education passage

The 1944 Education Act introduced free secondary education to all. The system operated via the 11 plus examination, a form of general intelligence testing, which determined whether children went to a more academic grammar school or a standard secondary school. Passing this test made a significant difference to the educational opportunities available to children. However, intelligence tests, with their class and cultural biases, meant that the class divisions of the pre-1944 education system were maintained via this selection process. The children from more middle class backgrounds, with greater resources, were more likely to receive support and training to pass the test from their parents, again reinforcing the class divide. This selection process at age 11 set the pattern of opportunity further up the education system, with proportionally more children from higher social classes attending university than those from working class backgrounds.

In the 1970s there was a growing increase in comprehensive education and a reduction in the number of local authorities using the 11+ system of selection. Some researchers have argued that the comprehensive system has made little difference to the the class inequalities within the education system, but other scholars dispute this. Research based in Scotland, where the introduction of comprehensive schools was more widespread, seems to indicate a narrowing of the gap between the performance of middle class and working class children in examination performance.

However, another factor impacting upon equitable educational opportunities was the policy of streaming that took place in a number of comprehensive schools. Children were allocated to different ability levels and again this often replicated the class background of the children, with the more financially well off in the higher group. The preconceived expectations of the teachers towards different streams could lead to a differential curriculum and therefore educational opportunity was restricted to some pupils.

Another Interesting piece of research conducted in the early 1980s examined the role a school had on children from the same class background. This study seemed to indicate that those children in the more selective or fee paying schools did better than those in a non-selective school. One can therefore conclude that class plays a determining factor in the type of school that children ended up going to, but also that the type of school reinforced those opportunities and made a difference to the type of education received and the ability to achieve academically.

395 words
Level 12
Education passage questions

1. What act was passed in 1944? (F)
2. What is the 11+ exam described as in the text? (F)
3. Why was the 11+ system not used for children at comprehensive schools? (I)
4. What did the research from Scotland indicate? (F)
5. What in the passage suggests that the comprehensive system was not compulsory for all local authorities in England? (I)
6. What process replaced the 11+ as a potential source of educational inequality? (I)
7. In which schools did children do better according to the 1980s research? (F)
8. What did research in the 1980's examine? (F)
9. Based on the passage, what do you think one of the aims of removing the 11+ system was? (I)
10. Were the grammar schools of the 40s the same as the fee-paying schools of the 80s according to the passage? Explain your answer. (I)

Answers

1. Education Act
2. type of intelligence test
3. test used for entry to secondary school
4. That comprehensive education did lead to a narrowing of the difference in performance between children from different social classes
5. more widespread in Scotland
6. process of streaming
7. selective/fee-paying
8. the role a school had - or the effects of different schools - on children from the same class background
9. reduce inequalities in educational opportunity
10. No - grammar schools were free
3. Politics passage

The revolutionary writings of Leonardo Panchas have only just come to light. For years he lead a guerrilla war against the military government who controlled the once idyllic island of Limonique. In 1985, after a wave of industrial revolt in the fishing fleet and cannery industry, the government imposed draconian laws that outlawed all forms of protest. Many of the opposition forces took to the hills and mountain jungles of the interior of the island and began an armed insurgency movement against the police, the army and government officials. Supported by the peasants, the guerrillas launched a long term strategic war against the forces of oppression, which in 2005 lead to the overthrow of the Mourinio regime.

Now in power, the coalition movement of guerrillas and peasants lead by Panchas have begun to reveal the ideological rationale behind their struggle. Many have assumed that the guerrillas followed a Marxist view of politics and history, especially as their movement blossomed during the trade union struggles of the 1980's. Now in power the new regime are following a more liberal, quasi-capitalist route to social reform. There has not been whole-scale nationalisation of key industries, apart from the fisheries and transport. Banks are still in the control of multi-national corporations, as indeed are the power companies and telecommunications. There have been promises of massive investment in education and health, but as of yet, little has been delivered.

Panchas's recently published series of short essays reveals his commitment to a programme of social reform and limited powers given to big business and a free market economy. This mix of ideological opinions stems from a merging of the industrial trade union movement that spawned the guerrilla movement and the peasant movement who strive for control of the land. Many of the peasant leaders have taken control of the large farming estates on the island, and as a means of appeasing the old colonial powers, Panchas has promised to leave certain sectors of the economy in the hands of the traditional elite. This has caused a degree of friction within the movement, with the old trade unionists calling for greater nationalisation of industry. Neither are the remnants of the old regime happy, for although they still control the banks and other sectors of the economy, they have lost a great deal within the agricultural sector.

389 words
Questions
11. In which industries did the industrial revolt occur? (F)
12. What was the name of the island? (F)
13. How long did the guerrilla war last? (I)
14. Whose regime was overthrown in 2005? (F)
15. Of what does the coalition government comprise? (F)
16. Do you think the guerrillas are for or against capitalism? (I)
17. Who or what controls the multinationals? (F)
18. Who or what has promised investment in health and education? (I)
19. What did the revolutionary writings reveal? (I)
20. When did the peasant leaders take control of the farming estates? (I)

Answers
11. Fisheries and cannery industry
12. Limonique
13. 20 years
14. Mourinio
15. guerrillas and peasants
16. neither - for some aspects and not others
17. Banks
18. The Panchas coalition government
19. Panchas' commitment to social reform
20. After 2005 when the old regime was overthrown
4. Deviant behaviour text

A longitudinal study has just revealed that the prime indicator for deviant behaviour in the late teens amongst both boys and girls is early literacy skills. The research team at the University of Pavlinka conducted a twelve year study examining the educational and social progress of 973 children from their first year at school, when they were six years old, to when they completed their education, aged eighteen. Children were selected randomly, but a balance was given to gender, and second language speakers with less than three years experience of the native language were excluded. Measures of reading and spelling were taken when the children entered the education system and systematically every year until they were ten. After this, data were obtained from national examinations at age fifteen and eighteen. Specific weighting was given to grades awarded for language skills and application of number. This information was then correlated with school disciplinary records such as suspensions and expulsions as well as police and court records of those cautioned, arrested or charged with criminal offences. A points system was applied to both levels of literacy and levels of deviance and these two factors were compared to see if a statistically significant correlation could be made.

The authors of the research contend that they have found a significant relationship between levels of literacy and teenage deviant behaviour. They are advocating that the government invest heavily in early years literacy programmes as a means of saving long term costs to society. However, other academics have criticised the approach taken by the research team as they have failed to rule out possible confounding variables. The geographic location of the schools targeted in the study was also criticised. Matha Kreig at the Centre for Neurological and Psycho-Social Studies has analysed the data herself and cross-referenced them against the neighbourhood the children lived in as an indicator of socio-economic status. She concludes that it is not literacy skills that are the key issue, but class background and economic status. Professor Kreig asserts that changes in the educational system alone will not combat problems of youth crime, but rather that the underlying issue of poverty needs to be addressed. Only then, she maintains, will deviant behaviour be reduced.

Words = 371
Read = 12
Questions and answers for deviant behaviour text

1. What was the name of the University? (F)
2. How long did the study last? (F)
3. How many children were tested? (F)
4. In what type of country do you think the research took place? (I)
5. Why were children selected randomly? (I)
6. When did the children start school? (F)
7. Why do you think second language speakers with less than three years experience of speaking the native language were excluded from the study? (I)
8. What is the relationship that the authors think that they have found? (F)
9. Why are the geographical locations of the schools important? (I)
10. What variables does Martha Kreig consider to be of chief significance in causing deviant behaviour? (F)

Answers

1. Pavlinka
2. 12 years
3. 973
4. East European
5. So as not to bias the results on other grounds such as class, race, gender, ability etc
6. Age six
7. Their language skills might reduce their scores on the literacy measures
8. A link between literacy difficulties and crime/deviant behaviour
9. They might represent a particular class based/economic catchment area where most of the pupils who attend the school come from
10. Social class and economic status
5. Organisations

Much work has been done on the development of the theory of organisations. Scholars have examined and interpreted the ancient civilisations of Greece, Rome and Egypt, compared and contrasted their societies and related the key components of these to the organisation of society. Of particular interest was the contrast between the notion of democracy within Greek society compared with that of Egypt and Rome. These Greek democratic principles had implications for the organisation of society, particularly political, legal and other aspects of civil life. For example the complicated and bureaucratic system employed in choosing a jury for court trials typified the notion of democracy at this time. Of course, such democratic freedoms only applied to citizens of the state, many people who inhabited Athens, and other areas of Greek influence, were slaves, who had no rights to speak of at all. Ancient Greek society reflected the norms of a slave economy and the organisation of such a system was reflected both in the attitudes of people and the organisational structures that evolved as a result.

In modern societies the structure of large state run organisations or private companies also reflects the wider norms within the society. Today, in a capitalist economy, most organisations tend to be hierarchical and focussed on generating profit or reducing expenditure. If we take the example of Laudings Aerospace, one of the largest aeroplane manufacturers in Europe, we can see how the internal structure of the company reflects the external demands of the world economy. The company is run by the chief executive, who sits on the board of directors who control the day to day running of the company. These individuals, all white middle aged men, are responsible to the shareholders of the company who meet bi-annually to hear reports on company progress. In fact, what the shareholders are really interested in is how much profit they have made from their investment. It is this driving force, the profit motive, that is the central rationale behind the way the whole company is organised. For example the headquarters of the company are still located in their prestigious offices in Geneva, whilst manufacturing has been relocated to South East China and Mumbai, India. Distribution of parts is located at large depots, located at the seven busiest airports across the globe. Just in time methods of distribution are employed to ensure costs are kept to a minimum.

399 words
Reading level 12
Questions

1. What three ancient civilisations have scholars examined? (F)
2. What notion was of particular interest to them? (F)
3. How does the passage describe the jury system in Ancient Greek society? (F)
4. Why did Greek citizens think slavery was normal? (I)
5. How are the economies of Ancient Greece and Modern Societies different? (I)
6. How often do the shareholders meet? (F)
7. What do you think is contained in the company progress reports? (I)
8. Who runs Laudings Aerospace? (F)
9. Why do you think the directors are all white middle aged men? (I)
10. Why do you think that manufacturing has been relocated to India and China? (I)

Answers

1. Greece, Rome and Egypt
2. Greek democracy
3. Bureaucratic
4. Because it was part of everyday life / most citizens had slaves / slaves were common-place
5. A slave economy as opposed to a capitalist economy
6. bi-annually / twice per year
7. The amount of profit generated by the company and other financial/statistical information (turnover/costs/losses etc)
8. The chief executive
9. Because white middle aged men tend to hold more power in western society than other social groups
10. To save money on wages / to reduce costs
1. Chronic illness

The term 'chronic' illness refers to a condition that is long lasting and one that has a profound impact upon the sufferer. Illnesses including cancer, stroke, multiple sclerosis, psoriasis and epilepsy can all be described as chronic. Medical intervention is usually palliative rather than offering a cure to the condition. Often the main consideration for the health professional is to improve the quality of life for a patient with a chronic illness.

The impact that such illnesses have on an individual are not just health related. It is often harder to obtain full-time employment and several researchers (Markhall, 1998; Fratton, 2002) have pinpointed a link between chronic illness and indicators of poverty. The patient also has to begin to deal with the psychological aspects of coming to terms with the illness, which again can have repercussions with regard to other aspects of their health. They need to consider what the repercussions of a loss of independence on a day to day basis might be. The impact such a condition might have on the patient's family should not be ignored as it is often the family members that are the main carers in such situations. A parent, sibling or other close relative may have to take responsibility for a variety of household chores and transportation.

A further consideration may be access to state benefits. Expensive adaptations may be required to residential accommodation, adaptive means of transport may be necessary, living allowances required if work is not possible. In recent years a number of charitable organisations have been established to support the needs of sufferers of chronic illnesses and their carers. One such organisation is CAURI (Care and Understanding for Respiratory Illnesses), which was established in 1987 by a group of ex-miners and their families. This organisation began in a community centre in Barnsley as a result of the difficulties that miners were having in accessing benefits and support as a result of their breathing related difficulties and the adverse affect this was having on their lives. They now have a permanent office in the town centre and employ half a dozen staff who run a helpline and offer individual support to those who need it; particularly with regard to making claims for appropriate financial support. Last year they had over eight thousand enquiries.
Questions

1. What is a chronic illness? (F)
2. Apart from cancer, stroke and MS, what other two illnesses are described as chronic in the text? (F)
3. Why is the medical intervention palliative? (I)
4. Why is someone with a chronic illness likely to be poor? (F)
5. Name one of the two researchers mentioned who have pin-pointed a link between illness and indicators of poverty. (F)
6. Why do you think family members are the main carers for those with a chronic illness? (I)
7. Why do you think the organisation known as CAURI set itself up in Barnsley? (I/GK or T)
8. When was CAURI established? (F)
9. What does CAURI stand for? (F)
10. Why would miners with respiratory illnesses require financial support? (I)

Answers

1. Long lasting and a profound impact upon the patient
2. psoriasis and epilepsy
3. The patient is not expected to get better
4. Difficulty in finding employment
5. Marshall OR Fratton
6. They care more about the patient than anyone else / lack of support provided by the state
7. Barnsley is in a mining community (lot of people with respiratory illness)
8. 1987
9. Care And Understanding of Respiratory Illnesses
10. adaptations expensive/cannot work
2. Elder abuse passage

In the United States it is estimated that each year over a million elderly persons are abused, neglected or exploited by their family or care-givers. Unfortunately, abuse of the elderly is difficult to identify because victims are unlikely to report their abuse, especially if they are isolated from others, as many elderly are, and often signs of abuse are quite subtle and can easily go undetected.

Previous research on abuse in the home has tended to focus on child abuse and spouse abuse. Very little data have been collected on elder abuse by family members. In 1980 the U.S Senate Special Committee on Elder Abuse reported that between 500000 and 2.5 million cases of geriatric abuse, neglect or mistreatment occur in the U.S each year; producing a statistic of one in every 25 people over the age of 65 experiencing some form of abuse. However, one of the problems of compiling statistical information is obtaining a consensus as to the exact definition of elder abuse, whether it consists of physical violence, neglect, deliberate social isolation or all three.

There are a number of causative theories for elder abuse. Three main models exist: the Psychopathological Model, the Learning Model and the Situational Stress Model. The first of these three identifies the pathological abuser, prone to alcohol and/or drug abuse and associated bouts of violent behaviour. The Learning Model purports that violent parents who abuse their children create the potential abusers of the elderly later in life. The final model is focussed on a build up of stress due to the situation that the carer finds themselves in. This stress can take many forms including physical, psychological and financial, leading to exhaustion and anger and potential violence.

In order to deal with and intervene successfully in a situation of elder abuse, a multi-agency approach is required, using both hospital staff and social services. Staff who are involved with the care of the elderly should be trained to spot potential signs of abuse and know the appropriate protocols to follow. Local authorities need to have policies in place to deal with this growing problem and need to liaise with carers to ensure that they are able to cope with a caring role.

Word count 370
Elder abuse questions

1. Why is elder abuse difficult to identify? (F)
2. Where does most elder abuse take place? (I)
3. List all three signs of elder abuse that are contained in the passage? (F)
4. How old do you have to be to be classed as an elder? (I)
5. According to the text, what percentage of elders is likely to suffer some form of abuse? (I)
6. When was the US senate committee report published? (F)
7. What problem did the US senate committee have in compiling statistics of elder abuse? (I)
8. Which of the three models could include anyone in a caring situation? (T)
9. Who should be involved in a successful intervention? (F)
10. Who needs to have policies in place to deal with this problem? (F)

Answers
1. Victims do not report the abuse and the signs are difficult to detect
2. In the victims home / family home
3. physical violence, neglect and deliberate social isolation
4. Over 65
5. 4%
6. 1980
7. disagreement about definition of abuse
8. The Situational-Stress Model
9. Multi-agency, hospital staff/social services
10. Local Authorities
3. Inequalities in health

In 1977 a research group was convened to establish the nature of inequalities in health within the United Kingdom. The group, chaired by Sir Douglas Black and consisting of a number of health professionals and academics, published their findings three years later. The working group concluded that people of all ages in lower socio-economic groups had worse health than their counterparts in more affluent middle or upper class occupations and professions. It was also discovered that those from lower social groups actually used the health service less than the healthier and richer sectors of society. The authors of the report made a number of recommendations including: improving information about health, better health care planning, a focus on preventative and primary care health, improving the economic well being of poorer sections of society by introducing more benefits for children and those with disabilities and improvements to the quality of housing for the poor.

The report was submitted to the Secretary of State of the new Conservative administration. The government tried to ignore the report, duplicating only 260 copies and refusing to give a press release concerning the report. The authors held their own press conference and soon the contents of the report were disseminated by the press, academics and interested trade unions. It appeared that by attempting to ignore the report, the government actually drew more attention to it. However, the government refused to act upon the 37 recommendations made, citing a number of reasons why they had rejected the report. Firstly, the Secretary of State contended that the report did not adequately explain the causes of health inequality, secondly that new evidence disproved the fact that poorer people suffered from worse health and finally that there was no evidence to suggest that more money spent on health care would actually improve the health of the population.

In 1986, the government commissioned a new working group to look into and update the evidence collated by the Black report. This new evidence, published the following year, reinforced and supported the findings of the Black report. Once again, the government was confronted with evidence that they did not want to receive, and once again, the press report to announce the findings was cancelled, this time within one hour of the scheduled time.

379 words.
Reading level 12
Questions

1. Who chaired the research group? (F)
2. In what year did the research group publish their findings? (I)
3. Why didn’t the authors of the report confine their recommendations to health care issues? (I)
4. What aspects of health care did the report recommend were improved? (F)
5. To who was the report submitted? (F)
6. Why did the authors hold their own press conference? (I)
7. How many recommendations did the report make? (F)
8. In what year did the government commission a new report? (F)
9. Why do you think that the government did not want to receive the recommendations of the second report? (I)
10. Why do you think the government cancelled the press conference for the second report? (I)

Answers

1. Sir Douglas Black
2. 1980
3. Because the causes of poor health were social and economic
4. two from the following: more information about health, improved health care planning, improved preventative care and improved primary health care
5. The Secretary of State
6. The government refused to hold a press conference or publicise the report
7. 37
8. 1986
9. It would mean spending a lot of money on health care and social reforms for the poor
10. They did not want people finding out the outcome of the report
4. NHS management

The NHS was created in 1948 as a means of providing free health care to all that needed it. It was organised by the state and funded through general taxation. However, at its conception the NHS had to deal with the inequalities of health care provision across the country, with the more wealthy regions having considerably more services available than poorer areas. In the 1960's there was an increase in the provision of acute care hospitals, with the building of a number of large district general hospitals (DGHs). In the 1970's further improvements were made. Attention was given to the organisational structure of health care at the regional level, with links being made within regions between different health care providers.

In the first thirty or more years the NHS proved to be extremely successful, delivering good quality health care free to the whole population relatively cheaply. However, the system was also fraught with a number of problems. The cost effectiveness of the system meant that there was a built in ethos to restrict and ration more expensive services to patients. This lead to the development of waiting lists for more expensive treatments. Another evolving issue was the fact that the NHS was a national organisation, with very little control exerted at the local level. Consequently health care providers could not quickly respond to local demands but were rather driven by a national political will. A further issue that was implicit in the conception of the NHS was the control maintained by the medical profession. GPs kept their independent status whilst consultant hospital doctors did not have any accountability to the hospital management where they worked. Doctors were independent and fiercely kept control of their own working practises.

In 1983 the Griffiths report began the process of restructuring the NHS along more market centred principles. The reforms proposed by Griffith also gave more control over doctors to general managers, producing a hierarchical and single chain of command within the organisation. It was these sweeping changes that began the modernisation of the NHS, which has continued under a similar ethos to this day. General Managers were often appointed on three-year contracts, with performance targets to meet. These performance indicators and targets have now slowly filtered their way through the bureaucracy to become paramount in the delivery of health care in the UK today.

391 words
Reading level 12
Questions

1. When was the NHS created? (F)
2. Why, prior to 1948, did wealthy regions have better health care than the poorer areas? (I)
3. What type of increase in health-care provision occurred in the 1960’s? (F)
4. What type of treatments had waiting lists? (F)
5. Why was the NHS driven by a national political will? (I)
6. Why do you think it was important for health-care to be organised regionally rather than nationally? (I)
7. Prior to 1983 who controlled Doctors? (F)
8. Who chaired the committee who looked at UK health care in 1983? (I)
9. Why were Doctors put under the control of general managers? (I)
10. According to the passage, general managers were often appointed on what type of contract? (F)

Answers

1. 1948.
2. Most doctors worked where the patients had enough money to pay them
3. Acute care hospitals
4. More expensive treatments
5. It was controlled centrally by a national government
6. To cater to more local health care needs
7. Themselves
8. Griffiths
9. To make them accountable
10. Three year contracts
5. Palliative Care

Cancer is a common disease in the western world. Approximately one in three people in the West develop cancer and one in four of the population dies from this disease. This compares significantly with mortality statistics in the developing world. For example in Sierra Leone, one in five of the population die before they are five years old and life expectancy is approximately 30 years lower than the average figure for Western Europe. Likewise in Tanzania, Cancer is not listed as one of the top ten reasons for either adult or child mortality; mortality rates are more often associated with socially constructed or economic circumstances.

The incidence of cancer in the West has increased in recent years as a result of smoking and an increasingly ageing population. However, a significant number of patients recover; current estimates put this figure at one in three and many people survive for five to ten years after diagnosis. Research into breast cancer has revealed that an improved prognosis is achieved if the patient has a positive outlook, as opposed to a feeling of helplessness. It appears that the psychological well-being of the patient has a significant impact upon the outcome that is achieved.

Professionals often treat patients with an incurable or fatal disease using a process of palliative care. This refers to the total care of a patient and their family using a team of staff when the patient is not responding to curative treatments. A triad of care is used including symptom relief, psychosocial support and teamwork. Palliative care is patient-centred rather than using the disease as the focus for intervention. Patients are encouraged to lead as active and full life as is possible within a compassionate and caring environment. The partnership approach links the patient and their family with doctors, various therapists, social support and voluntary organisations. The key to a successful approach is the careful coordination of services that avoids a duplication of provision and deals with any potential conflict between professionals and the patient and their family. This approach hopefully ensures the best possible quality of life for patients under emotionally difficult circumstances.

353 words
Read = 12
Questions

1. How many people in the west develop cancer? (F)
2. Out of 100 people in the West, how many would be expected to die of cancer? I
3. If life expectancy in Western Europe was 68 years, what would it be in Sierra Leone? (I)
4. Apart from Sierra Leone, what other ‘developing’ country is mentioned in the text? (F)
5. According to the text, which two groups of society are more likely to develop cancer? I
6. What did research into breast cancer reveal? F
7. Why does the psychological well-being of the patient impact upon patient outcome? (I)
8. According to the passage, what is palliative care? (F)
9. What sort of medical intervention would be used with palliative care? (I/T)
10. Why is careful coordination of services important? (F)

Answers

1. one in three
2. 25
3. 38
4. Tanzania
5. elderly and smokers
6. better prognosis if positive outlook
7. If the patient believes they are going to survive they increase their chances of doing so.
8. The total care of a patient by a team of professionals when the patient is no longer responding to curative treatment.
9. None
10. To stop duplication of services and to reduce professional conflict
Appendix 5
Key word lists for:
A Nursing students
B Human Science students

A Nursing students

List of key words for Difficult pain problems passage.

List 1 for demonstration

Opioid (oh pee oid) = a drug containing an opium-based substance
Analgesics (an al jee zics) = a pain killer, a substance that relieves pain
Neuropathic pain (new row path ic) = pain resulting from damaged nervous tissue
Efficacy (ef I cas ee) = how effective something is

List 2: student participation

Incident pain (in sid ent) = pain resulting from an event, often for example when a patient is moved
Adjuvants (ad jew vants) = one substance, given with another to boost the activity or power of the second drug
Prognosis (prog no sis) = the forecast given about the development of a disease, the likely outcome
Visceral pain (vis sir all) = pain from internal organs
Somatically innervated structure (so mat I cally) = tissue containing a nerve supply from the peripheral nervous system which controls skeletal and muscle contractions
Coeliac plexus block (see Ii ak) = using a pain killing injection to block pain to the abdomen
Carcinoma (car sin o ma) = a cancerous growth
Tenesmus (ten ess mus) = a disease of the lower part of the large intestine e.g. dysentery, piles or a tumour.
Key words for Palliative Care comprehension passage

Mortality (more tal ity) = death rate figures

socially constructed (so shall ee) = a consequence of social/environmental factors

prognosis (prog no sis) = a forecast based on the likely outcome of a disease or illness

psychological (si co logical) = factors affecting the mind, mental state

palliative (pal ee a tive) = the total care of the patient, concentrating on relieving pain rather than the causes of the illness

triad (try ad) = three related things working together

psychosocial support (si co social) = support focusing on the mental health and social circumstances of a patient
List 1 (demonstration)

Paradigms (para dimes) = a theoretic model or approach

Vernacular (vern ac u lar) = language or dialect

Cognitive ( cog nit iv) = mental processes involved in thinking within the brain

Quantitative (kwan tit a tive) = an approach based on collecting numerical data

Section 18.6.1
List 2 (paricipant's use)

Methodology (method ology) = the practical approach to research, what tests were done and how they were carried out

Facilitate (fas ill i tate) = to encourage / support

Screening = to determine who or what is involved in a process and who is not

Reactivity (re act ivi ty = how someone reacts to a specific process or knowledge

Homogeneous (homoj en ous) = things that are similar / alike

Break characteristics = issues or characteristics that separate one group from another

Substantive (sub stan tive) = important / significant

Pertinent ( per tin ent)= relevant

Aquaintanceship (ak wane ten ship)= friendship / previous knowledge of someone
Key words for deviant behaviour passage

Longitudinal (long i tude inal) = a study that lasts a long time following the same participants throughout stages of their life/development

Weighting (way ting) = giving priority to / stressing that one thing is more important than another

Correlated (corry lated) = comparing one item/ type of behaviour with another

Advocating (ad vo cate ing) = suggesting

Confounding (con found ing) = confusing

Variables = factors that are being studied or that have an influence on a research project

Neurological (new ro lodge ical) = to do with the mind
Appendix 6
Report template for student feedback after intervention study

Summary report for the reading research project

Student name

Pre research test scores

Reading
Prose reading accuracy: th percentile
Prose reading comprehension: th percentile
Prose reading speed: th percentile
Single word reading: th percentile

Speed of processing
Digit naming task: time taken secs

General ability measures

Information
Similarities
Arithmetic
Vocabulary
Digit span
Letter number sequencing
Picture completion
Digit symbol coding
Block design
Matrix reasoning
Symbol search

Please find below your performance on the various reading passages given during the research programme and suggested strategies.

1. Table of reading scores obtained during the research process

Table 1: Reading passages and comprehension question scores

<table>
<thead>
<tr>
<th>Week</th>
<th>Passage</th>
<th>Method used</th>
<th>Comprehension score</th>
<th>Time taken</th>
<th>Words / minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Texthelp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Key words</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Mind maps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Summarising</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Pre-reading tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Course related reading passages and written summary scores

<table>
<thead>
<tr>
<th>Week</th>
<th>Passage</th>
<th>Method used</th>
<th>Comp. score</th>
<th>Time taken to read</th>
<th>Words / minute</th>
<th>Time taken to write summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Managing cancer pain</td>
<td>Texthelp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Incident and visceral pain</td>
<td>Key words</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Breathlessness</td>
<td>Mind maps</td>
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<tr>
<td>4</td>
<td>Skin care</td>
<td>Summarising</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Intestinal obstruction</td>
<td>Pre-reading tasks</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Feedback on each of the five methods used

Texthelp

Key words

Mind maps

Summarising and highlighting

Pre-reading strategies

4. Conclusion