

Volume 1

**AN EXPLORATORY STUDY OF
DEVELOPMENTAL CONFABULATION IN
CHILDREN**

By

Jane Hood

University College London

Continuing Professional Development

Doctorate in Educational Psychology

UMI Number: U593329

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

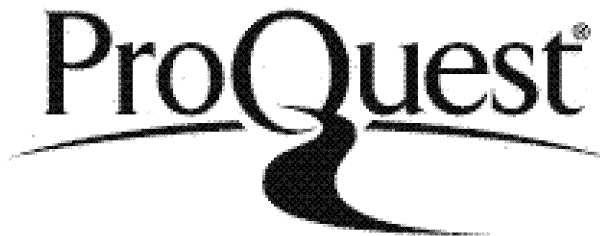
In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI U593329

Published by ProQuest LLC 2013. Copyright in the Dissertation held by the Author.
Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against
unauthorized copying under Title 17, United States Code.



ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Abstract

Background: This study was undertaken to investigate the phenomenon of confabulation in children following the presentation of several children with this condition to a neurodevelopmental clinic.

Aims: The study was conducted in order to investigate developmental and acquired confabulation in children from a neuropsychological and behavioural perspective. The study was also used to investigate options for managing confabulation in the home and school context. The literature relating to confabulation and the development and management of lying in children was reviewed.

Samples: Three children with developmental confabulation and one with acquired confabulation were investigated. Their ages ranged from 8:1 to 10:9 and only one child was female. They were matched with four non-confabulating clinic control children within the same age range.

Methods: A full neuropsychological assessment of each child was conducted and a log of their confabulations was kept over a four-week period by their parents to monitor the type of confabulation exhibited and its approximate frequency.

Results: The confabulating children showed specific difficulties with impulse control and self-monitoring that were not seen on neuropsychological testing of the control group. Children from both groups showed some executive difficulties. The logs of

the confabulator's behaviour showed that they exhibited spontaneous and forced confabulation.

Conclusions: Confabulation can exist as a persistent difficulty in children and appears to be particularly associated with an impulsive response style (a common feature of ADHD), although few children with ADHD confabulate. The confabulators also showed a specific difficulty with memory in that they remembered their false beliefs as real. A model showing a process for evaluating and managing confabulation is presented. Suggested strategies for the management of confabulation at home and at school and proposals for further study are made.

Table of Contents

	Page number
Section 1: Abstract	1
Tables and figures	7
Acknowledgements	8
Section 2: Literature Review	10
2:1) Abstract	10
2:2) Introduction	11
2:3) The normal development of lying	14
a) Summary of lies children tell	21
2:4) Children's memory and suggestibility	21
2:5) Confabulation and neurodevelopmental disorders	24
a) Types of confabulation	27
2:6) The neurocognitive skill of lying	29
2:7) The neuropsychology of confabulation	30
a) Do confabulators believe their stories?	36
2:8) The neural basis of confabulation – case studies	38
a) Imaging studies	42
b) Confabulation and alcoholism	44
c) Confabulation in Alzheimer syndrome and dementia	45
d) Delusional beliefs – schizophrenia	46
2:9) Summary of the neuropsychological profile of confabulators	49
a) Table 1: Summary of the process of confabulation	51
2:10) Managing confabulation	52
a) Figure A - Different circumstances under which	

children lie	61
2:11) Suggestions for further research	62
2:12) Summary	66
Section 3: Empirical Paper	67
3:1) Introduction	68
a) Confabulation and the development of lying	68
b) Studies of confabulation	70
c) Source-monitoring tasks	74
d) Summary of neuropsychological profile of confabulators	75
e) Research question	76
3:2) Method	77
a) Research design	77
b) Participants	78
c) Experimental group	78
d) Table 2: Experimental group	80
e) Control group	80
f) Table 3: Control group	81
g) Measures	82
3:3) Results	87
a) Case studies and information from logs	89
b) DC – case 1	89
c) AJ – case 2	94
d) BC – case 3	99
e) ST – case 4	105

f) Neuropsychological assessment results	110
g) Intellectual ability measures	110
h) Attention/Executive functioning measures	111
i) Memory measures	115
j) Behavioural questionnaires	119
3:4) Discussion	120
a) Research question	120
b) Table 16: Summary of the process of confabulation in children	125
c) Do the neuropsychological assessment results and case studies inform intervention at home and at school?	126
d) Recommendations for managing confabulation, including case study examples	130
e) Figure B: Managing confabulation and lying	136
f) Review of the effect of recommendations for case studies	137
g) Methodological issues	139
h) Future Studies	142
Section 4: Critical Appraisal	144
4:1) Introduction	145
4:2) Discussion	146
a) Reasons for conducting a small-scale study	146
b) Strengths and limitations of single and small-scale studies	148
c) Issues in the interpretation of small-scale study data	150
d) Is confabulation really that rare?	153
e) Difficulties with acquiring normal controls	155

f) The inclusion of a control group with neurodevelopmental disorders	156
g) The pilot study	157
h) Limitations of neuropsychological assessments for children	160
i) Reliability of data collection methods	162
j) Establishing a confabulation battery for children	164
k) Potential difficulties in working with confabulators	166
l) Developing evidence-based interventions	167
m) Relevance of the study to the field of educational psychology and other professional groups	170
n) Issues of confidentiality related to small sample size	173
o) Limitations of ethics permission	175
p) Personal reflection on research process	176
4:3) Summary	177
Section 5: Appendices	179
A) References	178
B) Ethical approval	203
C) Sample letter, information sheet and consent form	210
D) Source Monitoring 1 Protocol	215
E) Source Monitoring 2 Protocol	219
F) Sunderland Everyday Memory Questionnaire Results Table	224
G) Parental log sheet	230

Tables and Figures

	Page
Table 1: Summary of the process of confabulation	51
Figure A: Different circumstances under which children lie	61
Table 2: Experimental Group	80
Table 3: Control Group	81
Table 4: Intellectual ability measures	110
Table 5: Test of Everyday Attention for Children	111
Table 6: Delis-Kaplan Executive Function System Trail-Making	111
Table 7: Delis-Kaplan Executive Function System Colour/Word Interference	112
Table 8: Delis-Kaplan Executive Function System Verbal Fluency	112
Table 9: Delis-Kaplan Executive Function System Design Fluency	113
Table 10: Delis-Kaplan Executive Function System Tower	113
Table 11: Behavioural Rating Inventory of Executive Function	114
Table 12: Children's Memory Scale	115
Table 13: Sunderland Everyday Memory Questionnaire	116
Table 14: Source Monitoring Measures	117
Table 15: Strengths and Difficulties Questionnaire	119
Table 16: Summary of the process of confabulation in children	125
Figure B: Managing confabulation and lying	136

ACKNOWLEDGEMENTS

First and foremost I would like to thank all the children and families that contributed to this study. I also owe a debt of gratitude to my tutors, Professor Tony Cline (and originally) Dr Sandra Dunsmuir, for their expertise, humour, patience and flexibility because without these qualities the process of completing the doctorate would not have been an enjoyable one. Naturally Dr Sean Cameron, Helen Hosier, Stephanie Douglas, Mary Turner and Cassandra Wood also need acknowledgement for their extensive support and friendliness. My supervisor, Dr Elizabeth Isaacs, has provided the neuropsychological expertise for this study and has also been a great role model and source of inspiration throughout my clinical work. I would like to thank Professor Baird for encouraging me to study this area and providing so much guidance and enthusiasm for my work throughout my career.

This project would probably not have been possible without the financial support of the Guy's and St Thomas' Charity, the Charles Hawkins Fund and my grandmother, Molly.

I'd like to thank my husband, Dr Peter Rankin, for his endless support throughout this endeavour and for training me to complete the majority of the thesis in 15-minute slots between baby-care duties. I'd also like to thank my family, especially my parents, for continuously forcing me along the path of education and instilling in me an unerring belief that education should not be a privilege but a right and that all opportunities need to be fully appreciated. I'd also like to thank my young son, Stevie, for occasionally managing to sleep at the right times to allow me do some

work. Without the support of these people, this milestone would never have been reached.



Section 2: Literature Review

Abstract

Background: This review provides an introduction to the neuropsychology of confabulation in both children and adults. The review of the literature pertaining to confabulation in children includes an examination of relevant aspects of the process of the development of lying in typically developing children, so that the phenomenon of confabulation can be set within a developmental context. Strategies for maximising accurate recall in children are examined and the factors influencing suggestibility in children and the reliability of eyewitness testimony (as this also informs us about the progression of memory development in children) are discussed. Literature concerning the existence of confabulation in children and adults, particularly with respect to neuropsychological studies, is critically reviewed and the neuropsychological impairments associated with acquired and developmental confabulation discussed. The thesis concludes by considering any literature regarding the effective management of adults and children who confabulate.

Conclusion: Neuropsychological impairments in impulse control and executive retrieval of episodic memory are associated with acquired confabulation in adults and may therefore be associated with acquired and developmental confabulation in children. Areas for future study are proposed to investigate the neuropsychological profiles of confabulating children and to consider options for managing their specific difficulties.

2:2) Introduction

Confabulation is a fantasy that has unconsciously replaced fact in memory, and can be based partly on fact or be completely constructed within the imagination. In this thesis the term is used to refer to situations where a child has retrospectively described an event in a way that is clearly untrue, yet where they appear to believe their version to be correct. This review has come about because of the presentation of a number of children to a neurodevelopmental clinic with what appeared to be persistent confabulation that was not in keeping with either their chronological or developmental age. A subsequent literature search revealed little about this phenomenon in children although there was extensive neuropsychological information about spontaneous confabulation in adults as a consequence of a number of specific conditions. Comments from clinicians indicated that there was scepticism about the existence of confabulation in children and so a formal study of the presenting children was deemed necessary to investigate their difficulties further.

The use of the term confabulation in children has to be carefully distinguished from the more commonly used term 'lying'. There appears to be an expectation that all children lie and that it is a normal developmental stage. In order to study children who confabulate, the review must cover a number of areas. It will be useful to consider the normal development of lying so that incidences of confabulation can be considered within a developmentally appropriate framework. There are different types of confabulation, such as fantastic beliefs that could never be true versus malicious confabulation to get another child into trouble. Malicious confabulation should perhaps more appropriately be included under the term 'lying' as some intent

to deceive is involved. There are also different circumstances in which confabulation can occur, e.g. *provoked* confabulation, which occurs in response to specific questions, and *spontaneous* confabulation, which presents as the production of false memories with no prompting (Kopelman, 1987).

There are fields of study that have looked at accuracy of recall in children, such as in child protection and witness testimony, and these will be reviewed briefly, particularly as they might help to provide information about reducing incidences of confabulation in children.

This review covers a broad range of areas in order to provide a rationale for the structure of the study. Confabulation is a relatively unresearched area in terms of children who confabulate. Confabulation has been studied in adult neurological patients for over 100 years (e.g. Pick (1905) and Bonhoeffer (1904), as cited by Schnider, 2004) but there is still debate about the exact definition of the term (Metcalf, Langdon and Coltheart, 2007). It is broadly used to indicate that someone has a memory disorder that leads them to give false answers to questions but they believe their answers to be true. In terms of considering children who confabulate, only one case of acquired confabulation could be found. Meguro, Suzuki, Tsukiura, Fujii, Yamadori et al. (1999) describe a 9 year old girl who began to confabulate following a traumatic brain injury. Because of the diffuse nature of her injury and because she had a range of memory difficulties, it was not possible to attribute the confabulation to any specific aspect of her injury. This is in contrast to a large literature on adults with acquired confabulation. Its most striking occurrence is in the population of patients with acquired head injuries, such as aneurysm of the anterior

communicating artery, and specific syndromes, such as Korsakoff's, Alzheimer's and schizophrenia. It has not proved possible to give a figure indicating the prevalence of this condition as it can occur secondary to a broad range of conditions and research studies do not appear to have amalgamated figures across the different study groups. However, confabulation does occur as a feature of certain conditions, e.g. Korsakoff's psychosis as a consequence of acute alcoholism. A study in Glasgow (Ramayya & Jauhar, 1997) reported 47 patients with Korsakoff's from an adult population of 160,000. Figures vary across countries but the prevalence appears to be tens of patients per million people. The study of confabulation in people with acquired injuries and conditions is particularly useful in helping to pinpoint the precise injuries that can lead to confabulation in a brain that was otherwise developing normally, and to look at possible neuropsychological measures that might help to identify regional impairments in neuropsychological functioning.

There are a number of possible causes of confabulation and one might be that subjects fail to distinguish between real experiences and thoughts. This type of problem with reality-monitoring can be seen in people with delusional belief systems, such as those with narcissistic personality disorder, delusions of grandeur and delusional schizophrenics. There have been a number of studies assessing reality monitoring in delusional schizophrenics and so these are reviewed. It is hoped that tasks used to assess reality-monitoring will prove useful for creating reality-monitoring tasks for children.

Similar to problems with reality-monitoring, some confabulators show problems with source monitoring (source monitoring refers to the ability to recall where information

was learned or seen). This also occurs in Alzheimer's patients with frontal-temporal dementia and studies with this patient group are discussed briefly.

The review is used in conjunction with the findings of the empirical study to consider how psychologists can contribute to the management of children who confabulate as there will be implications for the ethical management of children who confabulate and the parents and professionals who are often the unwitting victims of children's confabulation. It is also important to ensure that even the child who confabulates is believed when they should be and a system for identifying those times will be discussed with a case study example.

2:3) The normal development of lying

Lying refers to an untrue or deceptive statement deliberately used to mislead and or deceive. Lying has numerous forms, such as white lies and tall tales. The development of lying is a gradual and continuous process throughout early childhood (McGaughan, Laurence & Wylie; 1969) and begins early at around 3 years of age. By the age of six it is generally thought that all children can lie. However most experts argue that between 3-4 years children lack the skills required for deliberately lying (AACAP 2003) and that before 4 they do not fully appreciate the benefits and importance of honesty (Bussey & Grimbeek, 2000). The development of lying in young children is important and can be viewed positively in that it marks the time when they begin to understand that their own mind is different from others, i.e. that the other person may not know what the child knows. This time scale ties in with the likely timing of the early development of theory of mind (Hughes, Jaffee, Happe, Taylor, Caspi et al., 2005; Jenkins & Astington, 1996). It is particularly perplexing to adults when children continue to maintain that their version of events is true even

when the evidence to the contrary is clear to both parties. It is possible that this stage of the development of lying is part of testing the boundaries of credibility and theory of mind.

The development of lying is complex. It is not a single step stage of development. There are many different circumstances in which people lie and for many different reasons, and children need to learn to differentiate between these different processes (Bussey, 1992). Bussey (1999) examined this ability to categorise and evaluate lies and truthfulness and concluded that although 4 year-olds categorised lying as negative, they were less able than children of 8 or more years to evaluate degrees of negativity, i.e. that white lies may be less socially negative than antisocial lies.

By around 4 years of age, when most children lie it is often for the same reasons that adults do, e.g. to avoid punishment (Wilson, Smith & Ross; 2003) or to make themselves appear important. In the early stages of the development of lying, children include details that are not so credible, saying what they want to be true but without taking their listener's likely knowledge into account. As they become more competent and aware liars, between around 4 and 5, they can adapt the information they give to try to make sure their listener is able to believe them.

Young children have vivid imaginations and a rich fantasy life and at this stage they are still not always able to distinguish fantasy from reality. The development of imagination and creativity in children is also an influential aspect in the development of lying. Certainly children have vast imaginations and often have difficulty in separating 'fantasy world' from reality, though purely describing their fantasy world

is not lying. However, when young children embellish a story and add details from their own imaginations, these details can become part of their memory. Therefore, it is important to note that when children are asked about an event and they recall it in detail, their ability to provide specific and vivid detail does not necessarily signify that they are telling the truth (Ceci, Loftus, Leichtman, & Bruck, 1994).

Through elaborative story telling, both real and imagined, scenarios are often depicted without necessarily defining for the child what is real and what is not. Parents also play a role in the development of lying as they tell numerous lies to their children e.g. telling them that the tooth fairy, Father Christmas and the Easter bunny exist, and pre-school children find these adult-promoted fantasy characters the hardest to categorise as either fantasy or reality. Sharon and Woolley (2004) examined children's ability to distinguish between fantasy and reality and concluded that children during the pre-school years are actively working out how to think about fantastic entities and while they do not necessarily consider them to be totally made up, they do categorise them as different from real entities in terms of the properties they attribute to them. It is important when considering the susceptibility of children's belief systems to fantastic imagery to remember that much of this is taught by adults and is socially motivating, i.e. children are rewarded for believing in these fictional characters.

Between around 6 and 8 children become more sophisticated liars and can lie for a broad range of reasons, including sparing someone's feelings. However, until around 9 years of age, children still find it hard to distinguish between things they have been told and things they have experienced themselves when questioned (Ackil &

Zaragoza, 1998). As they mature, children become better at distinguishing between things that are simply familiar and things that are specifically associated with an incident, i.e. they become better at source-monitoring (Czernochowski, Mecklinger, Johansson & Brinkman; 2005; Farrant, Blades & Boucher, 1998). There are three types of source monitoring;

- 1) The ability to remember the source of information, e.g. which of your colleagues presented a particular report at a meeting you attended.
- 2) The ability to differentiate between memories generated from within yourself, e.g. when recalling the meeting, you can distinguish between the things you said and the things you merely thought at the time.
- 3) The ability to distinguish between internally and externally derived information, e.g. what your colleague said at the meeting and what you said at the meeting. This is also referred to as reality monitoring.

In a study by Sussman (2001), she examined children's ability to maintain an accurate record of a series of events that they had either been told about or actually participated in (reality monitoring). She found that of the four ages examined (4, 8 and 12 years old and adults), the two younger age groups had the most difficulty with distinguishing between events they had experienced and those they had simply heard about, i.e. they remembered the information they had been told as if they had actually experienced it. This may help to explain why, for example, parents find themselves marching into school to demand explanations from the teacher about something that their child said happened to them only to find that it happened to someone else and occurred in another class entirely.

There are many different forms of lying and many circumstances in which people can lie, for good or bad social reasons. One important aspect of the development of lying is thought to be language and the power it can elicit over both people and surroundings; this intrigues children to want to explore the concept of lying further. For example, children appear sometimes to believe that by saying something they wish to be true it will consequently become true. This is referred to as wishful thinking and is often used to cover up bad behaviour or mistakes. Lying is also promoted by the need to avoid stressful/unwanted situations e.g. being punished or criticised. For example, children may say they feel ill to avoid going to school rather than say they are worried about a test or they may claim to have witnessed an event at school that they merely heard about in order to gain attention and positive regard. Talwar, Lee, Bala and Lindsay (2002) conducted a study to investigate the effect of children's moral understanding of the implications of lying on their preparedness to tell the truth. They found that children often use lying to conceal their own misdemeanours but they also concluded that once children have acquired an adequate conceptual understanding of truth telling and lying, getting them to promise to tell the truth significantly reduced lying.

The role of children's moral development should perhaps be considered in conjunction with discussion of their preparedness to lie, as it is their regard to and concern about the morality of lying that may well influence the frequency of their lying and the circumstances under which they are prepared to lie. Piaget (1932) described a cognitive developmental theory that proposed that by the age of 11 to 12 children are able to lie with intention and that it is the intention to deceive that makes a statement a lie. Similarly they are able to judge whether an act is wrong according

to the intention behind the act. Following on from Piaget, one of the key models in the development of morality was provided by Kohlberg (1958), who proposed a staged model of morality. He described 6 stages of moral development:

- 1) Obedience and punishment orientation
- 2) Individualism and exchange
- 3) Good interpersonal relationships
- 4) Maintaining the social order
- 5) Social contract and individual rights
- 6) Universal principles

The first stage is similar to Piaget's view; that there is a set of rules that must be obeyed and these are extrinsic to the child. During the second stage, children realise that individuals can question rules and there can be more than one view about rules. There are right and wrong reasons for doing things. At this stage they are still thinking at an individual rather than a societal level. By the third stage, during their teens, children are able to recognise the needs of society, usually within their own family or community, and can understand that there is such a thing as good behaviour driven by good motives. Like Piaget, Kohlberg believed that people had to move through the stages in a linear fashion.

There have been frequent revisions and discussions about the accuracy and usefulness of this model (e.g. Krebs & Denton, 2006; Gibbs, 2006), with suggestions made that a more flexible, pragmatic approach to considering moral development might provide greater insight into everyday moral decision-making. Gilligan (1982) criticised Kohlberg's staged theory for its focus on male morality as none of the participants in his study was female and she suggested that females might have a

different focus on empathy at different stages. For example, females may make more use of 'prosocial lying' to spare people's feelings and to make them feel good compared to males or may perhaps be earlier to develop this skill.

Given the social importance of lying and that it is part of normal development, it is useful to consider at what stage normal development becomes a pathological problem, i.e. when lying becomes abnormal and developmentally inappropriate. Gervais, Tremblay, Desmarais-Gervais & Vitaro (2000) conducted a longitudinal study of a group of girls and boys over three years (ages 6 to 8), asking their parents and teachers to rate their lying and behaviour. The teachers then rated them again at 10 and 11 years. Gervais et al. concluded that lying is part of normal development, and should not present as a significant problem. However, by the age of around 7/8, children should be able to limit their lying and recognise when it is important to tell the truth. It is at this stage that parents and teachers tend to become concerned if children are presenting as persistent liars. Persistent lying was found to be associated with other disruptive behaviour problems. Stouthamer-Loeber (1986) reviewed the empirical data on the development and occurrence of children's lying and found that lying in childhood was predictive of behavioural and adjustment problems in adulthood. Therefore, although it is recognised that children will normally lie, there comes a point at which they will be able to understand the importance of telling the truth and to recognise situations where telling the truth is more important than self-protection.

Kohlberg (1958) believed that people passed through the stages of moral development at different rates and stopped at different points. He proposed specific

teaching, e.g. the cognitive-conflict model, to help people develop a more sophisticated moral understanding if they had failed to move on to the later stages of development (Blatt and Kohlberg, 1975). The management of persistent lying will be discussed in the final section of this review.

2:3a) Summary of lies children tell

- Exaggeration to boost self-esteem, e.g. my Dad's the fastest runner in the world
- Lying to avoid punishment or criticism – self-protection
- Lying to harm others – to exact revenge on someone

2:4) Children's memory and suggestibility

As noted above, children's ability to distinguish fantasy from reality develops by the age of around 8. During this developmental stage, children's memories are very suggestible. Suggestibility refers to how easily individuals can be influenced by ideas provided by other people. People's susceptibility to suggestion was studied extensively by Gudjonsson (e.g. 1984; Gudjonsson & Clark, 1986) and led to the development of the Gudjonsson Suggestibility Scale (Gudjonsson, 1987). The scale could be used to determine how easily people were coerced in interview by misleading questioning and negative feedback. Gudjonsson used the scale to demonstrate that low IQ and poor memory led to higher levels of suggestibility.

Ackil & Zaragoza (1998) demonstrated that through exposure to misinformation, children often later displayed false memories about a witnessed event. This

occurrence of false memory even occurred when children had initially denied that the untrue information was correct, i.e. they were able to assimilate the incorrect information into their memory of events. They were more susceptible to suggestibility than adults. Thus suggestibility can be highly important to note where children are witnesses. However, there is some evidence that, from the age of around 7, the accuracy of children's recall of events is enhanced by allowing them to freely recall the event and by providing incentives for accurate recall (Koriat, Goldsmith, Schneider & Nakash-Dura, 2001).

Children's control over their recall and their ability to resist misinformation improves with age. Schacter, Kagan and Leichtman (1995) reviewed the literature on source amnesia, confabulation and false recognition in young children and compared the presentation of these aspects of memory development with studies of adults with frontal lobe damage. They found that there are similarities between the performance of young children on these memory tasks and that of adults with frontal lobe damage and suggested that these similarities might be associated with immature frontal development in the children, i.e. that children's suggestibility is due to immaturity of the frontal lobes.

When people remember what has been said to them they tend to remember the gist rather than what has been said word for word. Similarly when they have viewed an event, they remember key details but not every image of everything they have seen. Information needs to be selectively remembered because there is limited capacity for storage and people also need to make information meaningful in their memory. This process of selection and storage allows for personal interpretation of information as it

is being stored. The process of retrieval of remembered information also involves information selection and errors can be made on recall. This is where suggestibility occurs. Examples of how suggestible people's memories are have been an essential element of studies of recall for eyewitness testimony. The phrasing of a question about an event can make a significant difference to the details people recall (Loftus & Zanni, 1975). For example, if people were asked to view a film clip of a robbery taking place and were asked, 'Did you see the man walking his dog?' or 'Did you see a man walking his dog?' the use of the definite article can make significantly more people recall something that was not in the clip at all.

Once people have been led into recalling erroneous facts, they tend to retain these memories. In a study by Garven et al. (Garven, Wood & Malpass, 2000), during interview they showed that children aged 5 to 7 years could be made to make false allegations against individuals and to recall 'fantastic' events by receiving reinforcement from the interviewer, an important factor in the consolidation of all memories. Their false claims remained stable even when the reinforcement was discontinued. Therefore children can be led to remember false information and believe it to be correct, perhaps indicating why children seem to find it hard to admit their errors when challenged about their false beliefs.

Zaragoza, Payment, Ackil, Drivdahl and Beck (2001) investigated this phenomenon further when they studied a group of adults whom they engaged in a forced confabulation task. One to two months later the adults' memories for the forced confabulations were much greater if they had received confirmatory feedback than if they had received neutral feedback. Therefore they concluded that this positive

reinforcement, i.e. increased social motivation, increased the promotion and retention of false memories. This finding stresses the importance of interviewers remaining neutral when questioning children about events as interviewers' responses can shift the child's memory of events and those shifts remain stable over time.

In terms of interviewing children, the Cognitive Interview (CI) was developed by Geiselman, Fisher, Firstenberg, Hutton, Sullivan et al (1984) and was designed to incorporate knowledge about psychological techniques into the interview procedure to maximise recall, e.g. establishing rapport and encouraging the interviewee to feel in control of the process. Interviewees are encouraged to use contextual cues to increase their recall. However, although it was found to be useful for assisting interviewees to recall more information, it also meant that they made more errors in their recall and included more intrusions (confabulations) (Memon & Stevenage, 1996). However, Larsson, Granhag and Spjut (2003) found that using the CI rather than the Structured Interview (SI) to question children (10 and 11 year olds) about a viewed event significantly improved the accuracy of the recall of the children and that these differences remained over both long and short time intervals. In a later study Larsson and Granhag (2005) looked at ways of developing a reality-monitoring instrument that could be used in conjunction with the CI to evaluate the reliability of children's interviews and ensure that the CI could be used safely.

2:5) Confabulation and neurodevelopmental disorders

The only studies of confabulation in children as a disorder rather than as an experimentally induced event appear to have been with children with

neurodevelopmental disorders. For example, Wells, Bruns, Wender and Stein (2005) presented the case of an eleven-year-old boy who was a persistent liar, which was thought likely to be associated with his diagnosis of ADHD. However, while this paper indicated the authors' belief that the lying was probably associated with ADHD, the only studies looking at whether children with neurodevelopmental disorders have specific difficulties with, for example, source-monitoring, have been with children on the autistic spectrum and have elicited no pertinent findings. For example, Farrant et al. (1998) investigated whether children on the autistic spectrum are prone to confabulation and compared their performance on a source-monitoring task with the performance of a control group and did not find a significant difference. Bowler, Gardiner, Grice & Saavalainen (2000) examined whether the memory deficits sometimes found in people with Asperger syndrome would make them more susceptible to memory illusions. They found this not to be the case. It is not clear why there was an expectation that autistic children might be particularly susceptible to confabulation. Many are excessively pedantic and 'honest' and have difficulty understanding about deceiving and manipulating others (Yirmiya, Solomonica & Shulman, 1996).

Although Farrant et al. (1998) found no differences in reality monitoring between autistic and normal children, there is a case reported by Teaford, Shaw, Reiss & Lotspeich (2002) in which they describe a 14 year old girl with a Pervasive Developmental Disorder who was admitted to hospital for malnutrition. During the course of her treatment, staff observed her to tell exaggerated stories about her life. This pattern of behaviour was long-standing and usually occurred whenever she was

asked about anything emotional or abstract. It was considered to be attention-seeking. She also claimed to have occasional visual or auditory hallucinations.

Her early history was fairly typical of PDD and medical investigations led researchers to conclude that she was exhibiting *pseudologica fantastica* (confabulation) in the absence of psychosis or any other known causes. They recommended a number of management strategies for her parents, such as ignoring her elaborative stories and asking her to ask when she did not understand questions, e.g. if they were too abstract. They found that if they confronted her about her lying, she would acknowledge that she was lying but the incidence of lying still increased. They therefore saw her confabulation as a stress response and moved to use a cognitive behavioural therapy approach to teach her alternative strategies for coping with stress. This led to a rapid reduction in symptoms. Given that she acknowledged she knew she was lying, it seems that she was not confabulating as, for the purposes of this study, confabulation is defined as occurring when children believe their stories. However, Teaford et al.'s study may provide useful information about the management of impulsive responding; another important factor in the production of confabulations.

Therefore, although there have been a few case studies describing children with neurodevelopmental disorders and confabulation, their scarcity suggests that this is not a typical feature of any specific neurodevelopmental disorder.

Confabulation does occur in children who have been through sustained trauma. The development of children's brains is affected by trauma and abuse, particularly the

frontal lobes (Glaser, 2000), which has implications for the development of their executive skills (Lansdown, Burnell & Allen, 2007). The assumption when dealing with traumatised children is that their experiences make them lie, either through having poor role models or for self-preservation, but it is also possible that the altered development of frontal functioning makes them more susceptible to confabulation.

2:5a) Types of confabulation

Confabulation is different from lying in that it refers to the phenomenon whereby individuals with a specific memory disorder say, and appear to believe, things that are not true. The nature of the confabulation can vary, for example children might make the following claims:

- Fantastic claims – at a developmentally inappropriate stage, the child claims things that are physically impossible, e.g. that they can see dinosaurs/fairies etc.
- Feasible but untrue claims – e.g. saying that a child took their possessions but the child was not in school that day. Despite being faced with this fact, the child continues to say they are telling the truth.
- Malicious claims – e.g. of abuse. There may be intent to cause trouble.
- Fictitious desirable claims – e.g. claiming things are true simply because they want them to be, e.g. that they have a brother when in fact they are an only child.

It may be only the first two categories that can be termed 'confabulations' as these occur without intent and the child believes them to be true. The latter two are intentionally derived. The distinction should therefore be made on the basis of the child's ability to know whether what they are saying is true or not. However, it is clear that in normally developing children their ability to distinguish fact from fantasy is not stable until around 8 years of age. So perhaps it is the case that children cannot be described as confabulating until after they are 8 years old, when it becomes likely that they should be able to make this distinction. Determining whether children do believe what they are saying or not relies on parental and teacher judgement. There are, as yet, no means for distinguishing with absolute certainty, between confabulation and convincing lying in either the child or adult population. There are some more objective means for considering whether people are lying or telling the truth, such as latency measures (e.g. O'Hair, Cody & McLaughlin, 1981; Greene, O'Hair, Cody & Yen, 1985). Latency measures, which measure the time taken between the question and the production of the response, have been used to show variability between spontaneously produced lies, prepared lies and truth-telling. However, all were usually produced within 3 seconds (Greene et al, 1985). Latency measures have not been used routinely with children and can be unreliable in adults because they are affected by a person's willingness to manipulate others as well as whether what they are saying is true or false.

2:6) The neurocognitive skill of lying

Spence (2004) examined theories about how the adult brain deceives. He described lying as a skill that requires work and attention and that follows a developmental trajectory in children. While lying is not a wholly positive attribute, it is seen as normal and as we mature we are expected to exert control over it. Being unable to lie does not enhance a person's social skills. Spence outlined the role of the executive functions in managing lying and he described lying as a cognitively complex task primarily regulated by the prefrontal cortex. The term executive functioning refers to the set of skills required for planning and organising an approach to novel problem-solving and includes such skills as impulse control, sustained attention and cognitive flexibility. It is probably not possible to demonstrate a clear dissociation between executive skills and attention, as levels of attention underpin all aspects of executive control. Therefore, the terms executive functioning and attention control are considered to be similar entities for the purposes of this thesis.

While lying, the individual has to inhibit the true response and create a new response. This should require more prefrontal activity than telling the truth, a cognitively simpler task. Spence assessed this by scanning volunteers (fMRI) while they were lying and telling the truth. He found that response times were longer for lying and that the prefrontal areas (ventrolateral prefrontal and anterior cingulate cortices) showed greater activation when volunteers had to generate a lie. He commented that the volunteers had to inhibit correct answers, which may have increased response time. This study indicates that normal adults need to apply greater energy and

cognitive control when intentionally lying to formulate their lie and withhold the truth.

2:7) The neuropsychology of confabulation

It is important to consider the cognitive basis of confabulation in order to determine the extent to which it is a problem with memory, i.e. that people cannot remember what happened accurately, or a problem with monitoring their recall, i.e. that people are saying the first thing they think of without checking its veracity. Memory and executive skills are linked in that executive skills are required for the systematic organisation, storage and retrieval of memories. For example, there is an executive component to monitoring the environment in order to select the information to be stored. The information needs to be categorised and organised for systematic storage and when information is to be recalled, the executive system needs to consider what information would be appropriate for answering a question accurately, access the storage system and monitor the relevance of retrieved information. So even with intact memory storage capacity, it would seem possible to have memory difficulties as a result of executive difficulties alone.

In cognitive terms, there are believed to be two main types of confabulation; one that is primarily an episodic memory disorder, where the amnesic confabulator fills the gaps in their memory with erroneous information, and confabulation due to poor executive control, where the confabulator does not monitor what they are saying. But confabulation is not common amongst either amnesic patients (those with an episodic memory disorders) or those with executive dysfunction alone. It is likely that a

combination of memory and executive deficits contributes to confabulation (DeLuca, 2000). Duff, Schoenberg, Scott & Adams (2005) studied the relationship between memory and executive functioning and found the two domains shared 55-60% of variance. Therefore, when there is a memory problem, problems with executive functioning need to be considered and investigated, and vice versa, because the two domains are so inter-dependent.

The prefrontal cortex is largely responsible for an individual's executive skills and the medial temporal lobes for long-term memory storage. The importance of the relationship between the prefrontal cortex and the medial temporal lobes for the formation and retrieval of long-term memories is reviewed by Simons and Spiers (2003). They integrate information from studies of computational modelling, neuroimaging and neurophysiology to consider how these two regions interact for the purposes of storing and retrieving information in long-term memory. They conclude that it is the interaction between the two areas and the way they modulate each other at each stage of encoding, storage and retrieval that is key to successful memory retrieval.

Theories of confabulation indicate that confabulation involves poor monitoring of the retrieval of memories (Cabeza, Locantore & Anderson, 2003). As Spence's (2004) paper discusses, telling lies in normal adults involves inhibiting correct memories. Perhaps in confabulation, dysfunction of the ability to inhibit incorrect memories prevents people from being able to tell the truth. This possibility is supported by a study of four patients with acquired confabulation (ruptured anterior communicating artery) by Gilboa, Alain, Stuss, Melo, Miller et al. (2006). They found that a crucial

aspect of confabulation was the individual's ability to monitor their retrieval. They described the process of retrieval in two stages, the first of which is rapid and pre-conscious and it is problems with this aspect that are essential for confabulation. The second stage, which is conscious and elaborate retrieval, may not need to be involved in confabulation. They commented on the possible different constellations of deficits causing different forms of confabulation. For example, they discussed circumstances where confabulations are real memories that are confused in time, which they suggested would involve ventromedial damage. Confabulation also appears to be affected by the subjective feeling of remembering (i.e. how confident the individual feels that their memory is accurate), and they concluded that orbitofrontal damage was essential for spontaneous confabulation to occur.

Schnider, Bonvallant, Emond and Leeman (2005) reached a similar conclusion in their study of a single patient, who produced spontaneous confabulations after suffering a ruptured anterior communicating artery. They reported that the defect causing spontaneous confabulation occurred in the memory retrieval process before conscious memory processing. They agreed with previous studies pointing to the orbitofrontal cortex as providing a filter mechanism that affects how relevant the memory feels to the person, before they consciously process the content. This finding supports Dalla Barba's earlier work (Dalla Barba, Mantovan, Cappelletti & Denes; 1998) in which he discussed Tulving's (1985) view that the retrieval of memories could be affected by whether the individual thinks that they either 'know' or 'remember' an event, i.e. semantic versus episodic memory, with semantic memories being less vulnerable to retrieval impairments. They observed that the confabulation

of one of their patients might be a consequence of impairment in the cognitive functions associated with the subjective feeling of remembering.

Attempts to delineate the brain regions involved in confabulation through neuropsychological testing of executive functioning have provided a mixed picture. For example, Fischer, Alexander, D'Esposito and Otto (1995) and Cunningham, Plishkin, Cassisi, Tsang and Rao (1997) reported the executive skills underlying confabulation were set-shifting and aspects of self-monitoring. These skills do not relate neatly to brain regions but do implicate the prefrontal cortex.

Nys, van Zandvoort, Roks, Kappelle, de Kort et al. (2004) also demonstrated the essential role of the prefrontal cortex in confabulation. They examined a patient who began to confabulate following a severe acquired brain injury that caused severe executive dysfunction. However, as he recovered, he ceased confabulating but continued to show broad executive deficits. Their assessments following his recovery indicated that the resolution of his confabulation occurred in conjunction with an improvement in the executive skill of mental flexibility and recovery of the dorsolateral prefrontal cortex. They therefore concluded that the dorsolateral prefrontal cortex and its role in mental flexibility are involved in spontaneous confabulation.

It appears that the content of confabulations may not be entirely random. Two studies have found that confabulations are more positive memories than those correct memories they are replacing, suggesting that there is an effect of motivation in confabulation, i.e. that there is an intrinsic reward in the selection of the

confabulations. Schnider (2003) looked at studies of confabulating patients and concluded that there must be some mechanism for the brain to monitor on-going reality, which is linked to the brain's reward system. Fotopoulou, Solms and Turnbull (2004) rated examples of one patient's confabulations and found that there was an element of wishful content in his statements. They concluded that motivation must be an essential part of accurate memory retrieval.

While there seems to be some agreement as to the brain areas contributing to confabulation in adults, the study of the phenomenon in children would have to take into account the developmental nature of their neuropsychological skills. Joseph, Gallagher, Holloway & Kahn (1984) conducted a study into the transfer of information between the two hemispheres of the brain in children which indicated that in the earlier stages of their development, when they are still mastering the skills of lying, entirely different processes might be contributing to their monitoring of reality. Confabulation can occur as a consequence of the deficient transfer of information between the two cerebral hemispheres via the corpus callosum. Transfer can be disrupted by trauma or surgery. The deficits exhibited in adult individuals with damage to the corpus callosum can be similar to those shown by young children with no damage. Joseph et al. conducted an experiment to investigate the transfer of information at three ages, 4, 7 and 10 years old and the degree of confabulation (the erroneous embellishment of a description) at different ages. They presented children with a variety of tasks, such as the Tactile-Form Recognition task, which required the children to identify objects by feel and then identify them by sight. They then had to do the same with the other hand and then use one hand to feel and the other to point (transfer trials). They found that at age 4 children had significant difficulty

performing tasks that required the transfer in information between hemispheres. They were also much more likely to confabulate than the older children, particularly when describing pictures presented to the right hemisphere. They suggested that the confabulation was a consequence of the language centres trying to make sense of the limited information available by filling in the gaps. This may occur because there is separation between the left-sided language centres and the sources of information pertaining to the question. They also suggested that immaturity of the inferior parietal lobe, which is important in transferring information to Wernicke's area and assimilating information, might also have contributed to the errors made.

A case study (Dalla Barba et al., 1998) illustrated the likelihood that there is a temporal criterion reflected in the storage of long-term memories, both semantic and episodic. They described a patient, PL, who developed an amnesic confabulatory syndrome after a heart attack. When she was assessed she presented very little memory for the past or present. She was naturally very disorientated and could not recognise her own room or nursing staff. She showed primarily provoked confabulation, i.e. in response to direct questions, but some spontaneous confabulation. When she was shown photos of her family and experiences, she confabulated more and gave fewer correct responses as the photos became more recent, giving mostly correct responses for photos from the fifties and mostly confabulatory responses for more recent decades. She was always confident that she recognised the photos. They concluded that it is probable that memories are stored according to strength and stability and that older memories are stronger and more stable than newer ones.

Evidence for a dissociation between semantic and episodic memory comes from a case study by Klein, Loftus & Kihlstrom (2002) whose patient, D.B., suffered extreme amnesia as a consequence of a hypoxic brain injury following a heart attack. This affected his memory for his personal experiences (episodic memory) but not for non-personal learning (semantic memory). This dissociation within long-term memory is now well documented in adults and children (e.g. Schacter & Tulving, 1994; Vargha-Khadem, Gadian, Watkins, Connelly, Van Paesschen et al., 1997). They also found that his ability to anticipate future events (prospective memory) was affected. The distinction between semantic and episodic memory is perhaps also important with respect to source monitoring in that the retrieval of semantic information is not usually source-dependent, i.e. semantic memories are not remembered contextually and therefore their retrieval should not be affected by source-monitoring difficulties.

A recent paper by Metcalf, Langdon and Coltheart (2007) provides a critical review of models of confabulation and suggest a cognitive-neuropsychological framework for considering confabulation. They concluded that two deficits must co-exist; an executive retrieval deficit and an evaluation deficit. It is interesting to note their use of the term 'delusional belief formation' as a key factor in the formation of confabulations. The role of delusional beliefs will be discussed further in the empirical paper when the case studies are discussed.

2:7a) Do confabulators believe their stories?

However fantastic their claims, confabulators usually appear to believe their confabulations. It would be useful, therefore, to determine whether this really is the case, particularly in those cases where the confabulations are credible but false. A seemingly useful tool for the investigation of confabulation is the lie detector, the Polygraph, as this should help to determine whether people who confabulate really do believe the stories they are telling. While children who are lying and know they are lying, e.g. to avoid trouble, would be expected to show a normal physiological response to their lying, i.e. show an increase in heart rate, blood pressure, sweating and rate of breathing, confabulators may not have this physiological response if they believe their stories. A study into the use of 'lie detectors' (i.e. polygraphs that measure skin conductance response (SCR)) showed that sociopaths do not show the normal SCR when they lie (Kolak 1993). Although they are aware they are lying, they feel no emotional responsibility for their lies. This information is important because adults tend to rely on their own instincts when determining if children are lying and these instincts may also be misleading when dealing with children who do not believe they are lying or who feel no empathic involvement because they may not show the normal signs of lying that people look for, however subconsciously.

Craig and Molder (2003) reviewed the use of lie-detector tests with children for law enforcement purposes, a practice that occurs only in the US and not in the UK. They found that polygraph examiners tend not to use such tests with children below twelve, but for those over twelve they do not make any modifications to their testing procedure, i.e. they test them as if they were adults. Craig and Molder expressed

concern that there is very little research into the use of lie detectors with adolescents in order to establish whether they are reliable and to determine whether children's SCR to lying is equivalent to that of adults. There are also problems regarding children's cognitive ability and developmental age, and their ability to sit still and maintain concentration for the duration of the testing procedure, as movement artefacts could interfere with readings. Therefore, although the polygraph is widely used to detect deception in adolescents in the U.S., there are potentially significant limitations to the accuracy of the instrument with this population. Even within the adult population there are serious reliability problems with the use of lie detectors, as the measured physiological response to lying can be caused by a number of other factors. These can be emotional, e.g. anxiety and fear, or physical, e.g. being unwell on the day of the test.

However, a recent study into the use of fMRI techniques for determining whether people are lying or not may resolve some of these issues. It identifies the processes involved in generating a lie and does not depend on an emotional response for its accuracy. For example, Mohamed, Faro, Gordon, Platek, Ahmad et al. (2006) proposed that fMRI can now be used more reliably than traditional lie-detectors, producing 92% accuracy at detecting when people were lying and 70% when they were telling the truth. They found activation in the limbic system during lying, which probably was related to anxiety experienced when lying. They also found activation in the frontal lobes as subjects tried to suppress the truth and activation in the temporal lobes that was probably associated with memory encoding and retrieval. A polygraph test was used simultaneously and while this was as good as fMRI at determining when people were lying, the results were less clear when people were

telling the truth. While there were some acknowledged limitations to this study, such as one of the researchers not being blind to whether the subjects were lying or telling the truth, the results do suggest that fMRI might provide a way of determining the veracity of people's claims that is not dependent on their emotional reaction to their situation. Similar caution would need to be exercised in using fMRI with children as with the polygraph. For example, while children's brains are at different stages of development, they may use different brain regions when truth-telling and deceiving and be more susceptible to anxiety, which would affect their responses.

2:8) The neural basis of confabulation – case studies

Until recently the main way of attempting to determine the neurological origins of confabulation has involved studies of individual subjects with specific acquired brain injuries resulting in confabulation. Conclusions about brain regions affecting confabulation were mainly dependent on single case studies (see Gilboa and Moscovitch (2002) for a review of these cases).

In the case of confabulation, often the reported brain damage is a rupture (aneurysm) of the anterior communicating artery, the impact of which can vary from person to person. It essentially results in an interruption in the oxygen flow to associated regions of the brain, usually the frontal lobes and/or the basal forebrain. Cells in the basal forebrain produce acetylcholine, which is transmitted around the brain and is important for learning. The frontal lobes are important for the executive control of actions and thoughts, and damage to the frontal lobes, whether through insult or

oxygen deprivation, can have a significant impact on an individual's ability to inhibit impulsive behaviour.

Confabulation can occur in association with certain acquired conditions, e.g. as a consequence of severe alcoholism or forms of dementia. In these cases larger groups can be studied but there are more likely to be other brain regions impaired which affects the clarity of the data available for examination.

The brain changes or injuries leading to confabulation appear to have been narrowed down to a combined effect on two key regions, the medial frontal cortex and the temporal areas involved with episodic memory (Benson, Djenderedjian, Miller, Pachana, Chang et al., 1996). Hashimoto, Tanaka & Nakano (1999) discovered that a patient developed amnesic confabulatory syndrome after suffering a right focal basal forebrain haemorrhage, implying that the simultaneous dysfunction of the two circuits involving the medial and frontal lobes are necessary for the development of this condition. This was also the conclusion reached by Demery, Hanlon and Bauer (2001) who studied a man, JL, as he recovered from a traumatic brain injury that caused severe anterograde amnesia and provoked confabulation. They reported that in his case amnesic-confabulatory syndrome existed when both medial temporal lobe damage and ventrofrontal damage co-occur. However, it is not clear that the temporal lobes need to be damaged or whether the communication between them and the frontal lobes needs to be interrupted in some way.

Dalla Barba, Boisse, Bartolomeo & Bachoud-Levi (1997a) and Dalla Barba, Cappalletti, Signorini & Denes, (1997b) describe a number of single case studies

where patients have developed amnesic-confabulatory syndrome following damage to different brain areas and conclude that confabulation can manifest itself in different ways, and this may be specific to the location of damage. For example, they describe two cases, one with a rupture of the left posterior communicating artery and the other to the anterior communicating artery. The first patient showed severe impairment on episodic memory tasks and it was concluded that the patient had impairment in the subjective feeling of remembering. In the latter case, the confabulation was indicative of a specific problem with personal temporality in that the confabulation only related to autobiographical aspects of memory and not to episodic learning tasks or reality monitoring. These few cases underline the need to be specific about the type of confabulation being exhibited in terms of neuropsychological variables.

The dysfunction of the frontal lobes can also often be seen in patients' behaviour. In 1997, Papagno and Baddeley presented a case study of a man, MM, who demonstrated specific difficulties with persistent confabulation following damage to his frontal lobes. His prospective, retrospective and autobiographical memories were unaffected. His behaviour suggested frontal dysfunction, such as distractibility and impulsivity. Although following rehabilitation the man made good progress on neuropsychological testing, his behaviour remained very challenging. When he was confabulating, he supplemented the correct information with invented facts. He did not stop when he had answered a question but continued to add details. They suggested that MM was retrieving memories of similar experiences to those being discussed and was failing to exert executive control to inhibit incorrect associations.

These findings are supported by more recent work by Schnider (Schnider, 2001; Schnider, Valenza, Morand, & Michel, 2002 & Schnider, 2003) who has been looking at spontaneous confabulation and reality monitoring. He describes patients who have developed spontaneous confabulation after damage to the anterior limbic system. When his patients were asked to describe past events, they appeared to create memories based on combinations of previous memories, rather than current relevant memories, and absolutely believed their recall to be correct. They consider that subjects were failing to suppress previous memories that did not pertain to current events. Imaging studies suggest that the anterior limbic system acts as a reality monitoring system which checks the relevance of evoked memories to the current situation. It may enable people to distinguish between real memories and memories of thoughts. This develops further a theory proposed in 1997 by Wheeler, Stuss and Tulving that the pre-frontal cortex plays a supervisory role in allowing adults to mentally represent and be aware of their own subjective experiences and remember them by retrieving them from episodic memory.

2:8a) Imaging studies

Now that certain scanning techniques enable researchers to observe the brain in action, imaging studies are increasingly being used to identify the areas of the brain responsible for prevention of confabulation. For example, Cansino, Maquet, Dolan & Rugg (2002) conducted an fMRI (functional Magnetic Resonance Imaging) study in which they measured brain activation during a task in which normal participants were required to encode items for later retrieval. Their source memory was also tested, i.e. their ability to recall the source of the learned information. Cansino et al.

found that the left prefrontal cortex was activated during both encoding and retrieval of items in memory (the executive component). The right occipital region was also highly activated during encoding (visual processing component) and the right hippocampus during retrieval (episodic memory component). Only visual stimuli were used in this experiment, which is likely to explain the activation of the occipital regions and the emphasis on right-sided activation. This study demonstrates that the two regions, the frontal and temporal cortices, interact during retrieval of information.

Takahashi, Ohki and Miyashita (2002) conducted an imaging study to investigate the brain regions responsible for source memory and concluded that the left frontal operculum, left premotor cortex, SMA and anterior cingulate cortex contribute to successful reality monitoring.

Schnider, Treyer & Buck (2000) used a PET (Positron Emission Tomography) study to determine the functional status of brain tissues and to demonstrate the respective roles of the medial temporal structures and orbitofrontal regions in the selection of memories. Leading on from this study, Schnider (2003) concluded that the anterior limbic system is always involved in cases of confabulation.

A recent study by Turner, Cipolotti, Yousry and Shallice (in press) concluded that the critical deficit for confabulation to occur is located in the inferior medial frontal lobe. Turner et al. scanned patients with focal frontal lesions while they completed a confabulation battery and found that patients with orbital, medial and left lateral damage confabulated in response to questions about episodic memory and those with

orbital, medial and right lateral damage confabulated in response to questions about temporal information. They also concluded that neuropsychological tests are insufficiently sensitive to assess the functioning of these areas without neuroimaging.

However, all these studies indicate that confabulation is not an automatic consequence of broad frontal lobe damage and even widespread frontal lobe damage does not necessarily lead to confabulation. These studies suggest that very specific regional deficits lead to confabulation and the various types of confabulation appear to be caused by slightly different patterns of damage.

Confabulation also occurs as a feature of certain acquired conditions, such as in certain forms of dementia and as a consequence of long-term alcohol abuse.

2:8b) Confabulation and alcoholism

Confabulation can occur within Korsakoff's amnesia, a severe memory disorder associated with long-term alcohol abuse. Sufferers' pre-alcoholism memory is usually intact but they have difficulty forming new memories. Not all sufferers of Korsakoff's experience confabulation, but those that do appear to confuse their memories and fill the gaps in their memories with incorrect information. Schwartz, Parker, Deutsch, Rosse, Kaushik et al. (2002) investigated source monitoring in abstinent alcoholic patients compared with a non-alcoholic control group. The alcoholic patients were significantly worse than the control patients at remembering the source of recently presented information. These deficits were unrelated to neuropsychological deficits found on two measures; the Wisconsin Card Sorting Test (WCST) and Benton Facial Recognition Test. They concluded that it might be

possible to use source-monitoring tasks in addition to executive tasks to evaluate cognitive deficits in neurobehavioural disorders.

Benson et al. (1996) presented a case study of a patient with acute alcohol-induced Korsakoff's amnesia. On neuropsychological testing they discovered severe learning/memory deficits and impaired performance on some frontal tasks. Imaging showed hypoperfusion in the orbital and medial frontal regions and the medial diencephalic region. Four months later, following an alcohol detoxification programme, her confabulation had ceased although the severe amnesia remained. Neuropsychological testing now showed normal frontal functioning. They concluded that the confabulation had been a consequence of disordered self-monitoring which was a consequence of frontal executive control dysfunction. Confabulation is clearly not a consequence of poor memory alone.

2:8c) Confabulation in Alzheimer syndrome and dementia

Another group of patients where confabulation can occur is in the elderly with certain forms of dementia. These patients provide interesting information about the temporality of confabulations because it is often observed that their confabulations are simply previous memories, recalled in great detail, but disoriented in time. Studies comparing groups with different forms of dementia have indicated that, as with other confabulators, it is a specific frontal impairment that leads to the confabulation, not a general executive and/or memory disorder, e.g. LaVoie, Willoughby and Faulkner (2006). Similarly, Nedjam, Devouche and Dalla Barba (2004) compared the confabulation and neuropsychological functioning of patients with Alzheimer's disease and patients with probable frontotemporal dementia. Both

groups of patients completed a range of executive measures and the authors did not find any differences in their executive/frontal performance on these measures. However, they discussed the problem that executive measures primarily assess tasks associated with dorsolateral dysfunction and the impairments associated with confabulation are more likely to be orbitobasal frontal. They concluded that frontal/executive dysfunction does not necessarily produce confabulation. In their patients they observed that disturbance of temporality appeared to be a prominent feature of confabulation. They also suggested that the existence of confabulation might be a useful way of distinguishing between patients with Alzheimer's and those with frontotemporal dementia, as the executive measures alone are insufficient.

Simons, Verfaellie, Galton, Miller, Hodges et al. (2002) assessed patients with semantic dementia using a source monitoring paradigm and an associative memory test. They used volumetric imaging techniques to assess the hippocampi but found no positive correlation between recollection and volume of the hippocampus. However, they did find that source discrimination and associative memory correlated highly with performance on a battery of frontal lobe tests, with the entire experimental group performing at floor level on source discrimination. This group also showed atrophy of the frontal lobes and the researchers concluded that the frontal lobes have a clear role to play in source monitoring.

These studies have enabled researchers to investigate groups of people where confabulation is a common and often distressing feature of an evolving condition. This has enabled them to assess the confabulation as it develops and also, in the case of alcoholism, as it is treated. However, although studies of these groups enable

researchers to go beyond single case studies, the conditions themselves have a more heterogeneous and more widespread area of impact on the brain so research findings may be less neat in terms of locating the source of confabulation.

2:8d) Delusional beliefs - schizophrenia

The majority of psychological research into reality monitoring and source monitoring has been in studies of adult schizophrenia (Johns, Rossell, Frith, Ahmad, Hemsley et al., 2001) and hallucinations (Rankin & O'Carroll, 1995). These studies therefore provide a useful source of experimental tasks for assessing confabulation. This is also considered an important area of literature to review because some of the group of children that prompted the empirical study had been initially described as possibly hallucinating because they claimed to have seen things that could not possibly be true.

A particularly neat source-monitoring task was described by Brebion, Gorman, Amador, Malaspina and Sharif (2002) in their study of 40 adults with schizophrenia. They used a range of memory measures, looking particularly at recognition and source memory. Their source memory task involved the use of eight categories of objects, e.g. furniture, animals etc. For each of the categories, the researchers would give a verbal example from that category, present a picture of something from that category and then ask the subject to think of and say a third example. Using this procedure, 24 items were generated. After five minutes, the researcher then read out the 24 items and mixed them with another 24 items that had not been in the original group (distractors) and subjects were asked to differentiate between those items from

the original group and the distractors. For the original items, they were also required to say whether the item had been presented verbally by the examiner, as a picture, or whether the subject had thought of it themselves. The accuracy of their source memory was then evaluated. Brebion et al. discussed their findings in terms of the links between source memory problems and the positive and negative symptomatology of schizophrenia. This study was considered important because it included a source-monitoring task that appeared readily adaptable for use with children and it was therefore used as part of the empirical study. It required children to identify the source of a list of words, some of which the examiner had generated, some of which the child had generated and some of which had been presented as pictures. It appeared attractive to children and was straightforward to adapt, administer and score.

Schizophrenic adults tend not to be able to believe that their thoughts come from voices within themselves. While some of the confabulators clearly appear not to be able to separate out their thoughts from what has really happened, others appear very strongly to be interpreting what they have seen incorrectly and believing their misinterpretation to be correct (Edelstyn, Drakeford, Oyeboode & Findlay; 2003).

Stirling, Hellewell and Ndlovu (2001) conducted a neuropsychological study of patients with schizophrenia and concluded that deficits in self-monitoring were related to the degree positive symptoms of schizophrenia were exhibited. These findings were independent of any other broader neuropsychological deficits. An earlier study by Nathaniel-James and Frith (1996) indicated that schizophrenic

patients have specific difficulties (on neuropsychological testing) with suppressing inappropriate responses, which leads to confabulation during recall.

Moritz, Woodward & Ruff (2003) studied source attribution and memory confidence in schizophrenics. On a word recognition task, schizophrenic patients made a significantly increased number of source attribution errors and were significantly more confident that a false source attribution response was correct than healthy controls, suggesting that their sense of 'knowing' whether a memory is correct or not may be distorted.

Therefore, these studies seem to suggest that people suffering with schizophrenia have difficulties with the suppression of false memories and with source monitoring, particularly determining whether memories are internally or externally derived. This is important because all the children included in the empirical study appeared to believe their confabulations and it may be that their problems are not just related to difficulties suppressing false memories but also to differentiating between real and imagined events.

2:9) Summary of the neuropsychological profile of confabulators

The literature describing research into the neuropsychological profile of adult confabulators indicates that deficits in the functioning of the orbitofrontal lobes are strongly implicated and that when people confabulate, they fail to inhibit false memories and monitor the source of their memories. This affects the storage of temporal memories, i.e. the ability to remember when things happened so memories

from different time periods can become confused. They also have a strong feeling of remembering the events they are describing when confabulating and their ability to distinguish between information they remember rather than simply know is affected.

In terms of neuropsychological testing, there are no specific standardised tests that are sensitive to confabulation, and experimental measures of source monitoring have proved to be the most useful tool for distinguishing between confabulators and normal controls. Confabulators do show isolated rather than general executive difficulties on formal testing, indicating that there must be dissociations in their executive skills that are specific to confabulation (Cunningham et al.; 1997). In particular they show difficulties with aspects of sustained attention, monitoring and set-shifting. They also show a great difficulty inhibiting the retrieval of false memories and evaluating the likelihood of those memories to be correct. They do not necessarily have specific memory deficits, although episodic memory is usually affected, probably because of the relationship between the frontal lobes and the temporal lobes required for the organised storage and retrieval of information.

2:9a) Table 1: Summary of the process of confabulation

This table provides a suggested summary of the processes contributing to confabulation.

Process of answering a question E.g. What did you do yesterday? Correct answer – went on day trip to seaside.	What can go wrong	Theories relating to confabulation	Example
Prefrontal cortex accesses memory stores.	Wrong information requested by prefrontal cortex	Confabulation due to poor search strategy. Also poor checking of relevance of answer. (Cabeza et al., 2003)	Random information selected. E.g. Saw elephants flying through pink clouds.
Hippocampi retrieve relevant information and imparts to prefrontal cortex.	Wrong information selected by hippocampi		
Prefrontal cortex identifies correct answer from a number of relevant options through process of monitoring i.e. relating back to question and source-monitoring	Prefrontal cortex fails to select right answer and inhibit false answer	Confabulation due to source-monitoring deficit (e.g. Schnider, 2003).	Answer may relate to something person saw on television rather than what happened. E.g. Went to a football match.
		Confabulation due to temporal confusion (e.g. Schnider, 2003; Dalla Barba et al., 1998).	Answer from wrong time period. E.g. Went to movies with wife to see Gone with the Wind.
Correct answer given	Wrong answer given		

2:10) Managing confabulation

Adults generally consider themselves to be good at telling when children are lying to them. However, a study by Crossman and Lewis (2006) revealed that adults are as poor at telling when children are lying as they are at telling when adults are lying. Their results did show that some adults are better at determining the veracity of children's statements than others, and those individuals were those who had the most experience of working with children. This was also the conclusion reached by Chahal and Cassidy (1995) who asked groups of social workers, trainee teachers and students to rate whether individual children were lying. They found no significant difference between groups but did find that those who were parents were significantly better at detecting lying in children.

Lying is a common problem in childhood but most children grow out of it, benefiting from good parental role models and appropriate discipline (Leung, Robson and Lim; 1992). Wilson et al. (2003) conducted a longitudinal study over two time periods looking at the development of children's lying (ages 2-4 at time 1 and reassessed two years later) and how their parents' management style affected their lying. They found that the older children whose parents allowed them to lie more at the time of the first assessment were lying more at the time of the second assessment.

However, it is not clear whether, when children reduce the frequency of their lying, it is in response to good parental management or whether they simply grow out of it with maturity. The American Academy of Child and Adolescent Psychiatry produced a fact sheet for parents (2003), which outlined some strategies to reduce lying, such

as discussing the importance of telling the truth. The authors acknowledge that in some children, lying persists and they recommend seeking further help from a psychiatrist if that is the case as persistent moderate lying is associated with delinquency and maladjustment in adulthood (Stouthamer-Loeber, 1986).

Lying becomes a problem when it is no longer developmentally appropriate, i.e. when the child persistently uses lying to get attention, to avoid having demands placed upon them or to manipulate others. In these circumstances it is important to determine the cause of the lying so that the relevant issues can be addressed. For example, if a child is not going to school but says that he is, causes of school avoidance, such as bullying and learning difficulties, need to be addressed.

A useful summary of the current medical and psychiatric view of understanding and treating problems of persistent lying is provided by Wells et al. (2005). They individually review the case of an 11-year old child with repetitive lying presented by Dr Lewis, the child's paediatrician. The boy presented had been adopted by his maternal grandparents and had lived with them since he was two years old. Both parents had serious substance abuse problems. He had no contact with his mother. Contact with his father was infrequent and on his latest visit his father was very drunk and made his son promise not to tell his grandparents. The child himself, Scott, had been diagnosed with ADHD and was taking methylphenidate, which helped with symptoms of inattention. Scott was described as telling persistent lies, usually to get himself out of trouble, but even when faced with undeniable evidence that he was lying, he would not admit that. Each of the authors then discussed how they would

view Scott's difficulties and the treatment they would consider. It is interesting to note how these vary according to professional backgrounds.

Dr Wells described the genetic and environmental factors that are likely to have influenced Scott's behaviour. In particular, he took into account Scott's impulsivity, which is still not optimally controlled, despite his medication. He suggested that when Scott was about to be confronted about a situation in which he was likely to lie, his grandparents prepare him for this and tell him that they do not want him to answer straight away but to go to his room for a few minutes and think about how he is going to answer and to bear in mind that they will reward him for honesty. This method seeks to avoid pushing him into answering defensively and impulsively.

Dr Bruns discussed the case from a psychiatric diagnostic perspective, considering differential diagnoses, e.g. looking at the various diagnoses associated with lying, such as conduct disorder and bi-polar disorder, as well as ADHD. He focuses on the various medications that may help reduce symptoms of lying, for example, considering antidepressants to reduce negative feelings. He also strongly advocated psychotherapy to help Scott to resolve his self-defeating behaviours.

Dr Wender, a paediatrician, included a more cognitive rationale for Scott's behaviour, discussing his poor executive control of his behaviour and the effect this has had on his emotional control and development. She described a system for helping parents to focus on the desired behaviour that they seek from the child, i.e. how to structure the child's environment and put systems in place that enable information to be shared reliably between adults in order to reduce the burden on the

child of having to remember all the information. Her system was designed to ensure the child knew that specific information, such as homework requirements, would be checked so there was no point in trying to avoid tasks by lying. She also recommended reducing the moral burden on the child, i.e. over-reacting to lies and assuming whenever the child lied it indicated a lack of morality which would lead to greater problems in the future, such as the child becoming a criminal.

The final author, Dr Stein, a developmental paediatrician, described how he would question Scott about specific events to try to determine Scott's motivation when lying, his insight into his lies, his level of moral development, e.g. whether he feels regret or remorse, and how he might change his behaviour on later reflection. All these questions, while obvious when presented in this context, are probably not asked by people dealing with children who lie. The child's answers would provide extremely useful information about the management of their lying because they give some indication of what might need to change in order to enable the child to develop further. For example, if the child feels no remorse after the event, their motivation to tell the truth needs to be addressed. If the child feels remorse but cannot stop lying, their impulsivity might need to be addressed. Dr Stein recommended that Scott be assessed for depression and also advocated reviewing the medication dosage and considering whether an increase might reduce impulsivity. He recommended family therapy to help everyone involved to manage the situation more productively.

Through their pastoral systems and the Personal, Social and Health Education (PSHE) curriculum, schools aim to support the development of children's social skills, including their moral development. Through all the Key Stages, the

curriculum addresses issues to prepare children to play an active role as citizens. For example, in Key Stage 1, they cover recognising the difference between right and wrong, and in Key Stage 2, they are required to think about moral and social issues and to think about these from other people's perspectives. From the absence of studies into the effectiveness of this work on steering children's development, particularly those for whom these skills do not naturally develop, one might speculate that it is possible that such teaching makes little real difference. If a child has no learning difficulties or genetic predisposition to antisocial behaviour and is raised under fairly standard circumstances, one might expect that their moral development and integrity will develop along the lines suggested by Kohlberg. For those who only lack appropriate family circumstances, good teaching about morality might, through exposure to information they had not previously considered, enable them to develop a normal understanding of social behaviour. However, it seems clear that for those children who cannot inhibit their untruths, good teaching would be insufficient. Similarly, those who do not care about the consequences of their behaviour or who actively seek to cause problems, teaching would have little effect. For the former group, whose confabulation may be a consequence of specific difficulties with attention and impulse control, medication might be helpful. For those who persistently lie intentionally and lack either insight or empathy, the recommendations of Viding (2007) into the management of callous unemotional children might prove helpful. She suggested that, because callous unemotional children seem unmoved by punishments or by appealing to their caring side, they need to be motivated to act more socially by providing them with rewards that do motivate them, usually immediate concrete rewards, based on specific behavioural goals.

For the purposes of this review, which is looking at children who confabulate, it is important to consider strategies that might be helpful for children who cannot easily distinguish between fantasy and reality, who confuse the sequence of events in their memories or who may be confusing their thoughts with real events. For these children, it is useful to employ all the strategies that would be used with children who lie, such as: -

- Not condoning clear untruths
- Giving the child time to think about what really happened and change their story
- Encourage honesty
- Avoid introducing fantasies, such as mythical creatures, magical powers, etc.

There is a single case report of an adult, WF, with persistent delusional confabulation who was taught a self-monitoring technique to reduce the incidence of his swearing (Dayus & van den Broek; 2000). It was hoped that this increase in self-awareness would generalise to his confabulation and this was found to be the case. The improvement was maintained a few months later. A similar approach was tried with a girl with PDD who confabulated (Teaford et al., 2002) but in her case they found that focussing interventions on improving her reality monitoring only exacerbated the situation for her. She responded better to relaxation techniques, indicating that for her, confabulation might have been increased with increased arousal.

Unfortunately, there is no further literature relating to the management of persistent confabulation in children, and this is also the case for adults, despite the number of studies of confabulation in adults. In adults, spontaneous confabulation is usually a consequence of an acquired injury, in which case it may resolve with recovery, or a form of dementia, in which case there is unlikely to be improvement, or as a consequence of chronic alcoholism, in which case it usually resolves with improved diet (vitamin B1) and abstention from alcohol.

If it takes more cognitive control to lie than to tell the truth, the finding that confabulators have poor impulse control suggests that they find it harder to tell the truth than to lie. When they confabulate they are following the less cognitively effortful route and not suppressing false answers, merely saying the first thought that comes into their head. Their confabulation is not intentional but a consequence of poor monitoring and selection of information. So when children confabulate it may be that they need to exert greater cognitive control to locate the true response and withhold erroneous responses. If this is the case, it is anticipated that children with known frontal pathology, such as children with Attention Deficit Hyperactivity Disorder (ADHD) (Himmelstein, Newcorn & Halperin, 2000) will be most susceptible to confabulation, although there appear to be no reported group studies as yet. The effect of ADHD on tasks of explicit memory performance indicate that children with ADHD show a greater degree of difficulty than controls with activities that are effortful rather than automatic (Aloisi, McKone & Heubeck (2004). Children with developmental confabulation may improve with maturing of the frontal lobes during adolescence or from medication to improve frontal lobe functioning, such as

methylphenidate, which can rapidly reduce impulsive responding (Hood, Baird, Rankin & Isaacs, 2005).

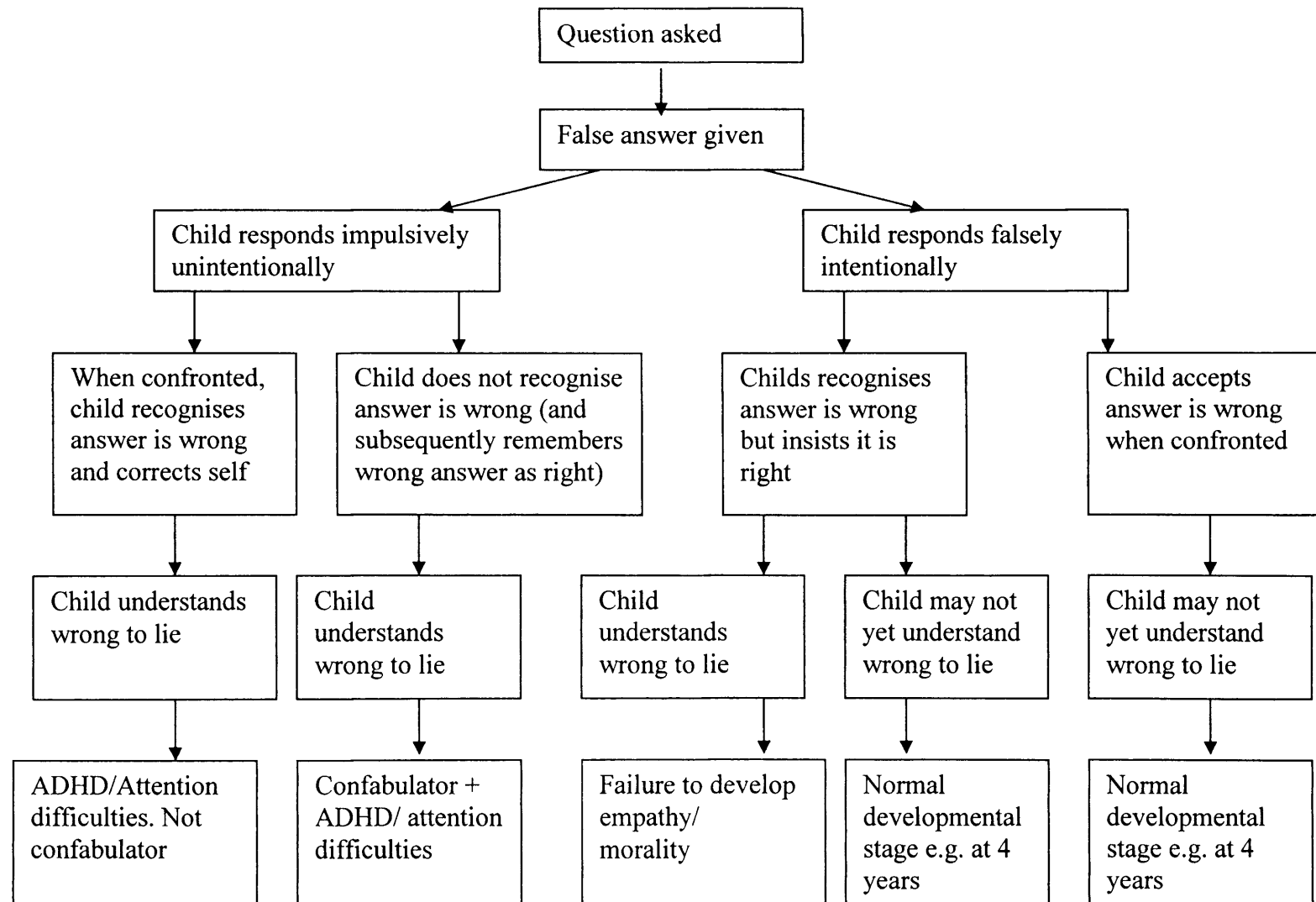
There is also an association between neurodevelopmental disorders and sleep disorders (Quine, 2001), and sleep plays an important part in the consolidation of memories. There is a sleep-induced hallucinatory syndrome which is a well-described neurological phenomenon that can occur when one is waking up (hypnapompic) or going to sleep (hypnagogic). Hypnagogic hallucinations refer to the vivid hallucinatory imagery at the onset of sleep and they occur most commonly as a symptom of narcolepsy, excessive daytime sleepiness. During hypnagogic hallucinations, very realistic images and sounds can be experienced. Although visual and auditory hallucinations are most common, experiences can range from hearing your name whispered to ones involving all the senses, including touch. They are in essence dream experiences that are occurring while you are awake. These waking dreams can be bizarre and terrifying. They are different from night terrors as night terrors usually occur within 1-4 hours of falling asleep but children usually have no memory of their dreams when they wake from night terrors.

Hypnagogic hallucinations are so realistic that people believe their hallucinations are real and narcoleptics have been diagnosed with schizophrenia, as they have been believed to be suffering from florid delusions. It is clear from their experiences that memories acquired during this state can interfere with the accurate consolidation of previous waking memories and the hallucinations become consolidated instead. It is possible that children with disturbed sleep patterns are particularly susceptible to hypnagogic hallucinations and that these interfere with their memories for the day's

events. Aldrich (1998) suggested that these hallucinations can occur while maintaining an awareness of your surroundings, i.e. they are not necessarily succeeded by sleep. It is interesting to note that one of the treatments for narcolepsy is methylphenidate, the stimulant medication prescribed for the treatment of ADHD. Children with ADHD are frequently reported by their parents to have disturbed sleep although this is usually related to overactivity during sleep – Restless Limb Movements in Sleep (Sadeh, Pergamin & Bar, 2006).

Strategies that might be helpful for children who confabulate will be added to Figure A (below) following the analysis of the results of the neuropsychological assessments and case studies presented in the empirical paper.

Figure A – Different circumstances under which children lie



19

2:11) Suggestions for further research

Only two children with confabulation were found in the literature, one with acquired confabulation (Meguro et al., 1999) and one with developmental confabulation (Teaford et al., 2002), plus one with ADHD described as a persistent liar (Wells et al., 2005). Since the children who triggered the empirical study were presenting at an assessment clinic for children with neurodevelopmental disorders, it was thought likely that confabulation might be associated with particular neurodevelopmental disorders. However, although the only child reported in the literature with developmental confabulation also had a diagnosis of Pervasive Developmental Disorder, the review does not support the notion that there is an association between autistic spectrum disorders and confabulation.

Having reviewed the literature, it is clear that there have not yet been any neuropsychological investigations of children with persistent confabulation. This appears to be a worthwhile area of study, given the wealth of information within the adult literature, because such children do exist. Following the initiation of this study, the cases that had been presented were discussed at a regional meeting of paediatricians and the response to the discussion was that there are children who persistently confabulate but that people did not recognise it as a specific condition and so had not attempted to label or manage it beyond punishing children for lying and rewarding truth-telling. Such children do present as a significant problem with respect to their management and treatment. Their frequent and sometimes credible claims can have an extremely negative impact on families, especially where claims of abuse are made, and they affect the social integration of the affected children

because people do not trust them and cannot understand their difficulties. It is not clear whether such problems persist into adulthood, but there are certainly cases of adults from apparently uneventful backgrounds who perpetually get themselves into difficulties through persistent lying, e.g. going as far as perjuring themselves in court to defend themselves against 'libellous stories' that are blatantly true.

In terms of evaluating the nature of confabulation in children, it would be useful to conduct an Antecedent-Behaviour-Consequence analysis of the circumstances under which the confabulation is occurring in order to determine whether there are any maintaining features in parent and teacher management.

Collating data about the confabulations would demonstrate whether there are different types of confabulation exhibited by different individuals that might, in turn, relate to different neuropsychological profiles. The role of memory in confabulation should be investigated to determine whether the affected children have poor episodic memories.

It is also important to think about the circumstances under which one must believe a confabulator. If a child is known to confabulate and adults are naturally sceptical about the child's claims, the child becomes very vulnerable to abuse. Methods of questioning confabulating children, with respect to literature regarding children's suggestibility, should perhaps inform interview techniques.

If a child makes a fantastic claim, asking for more details does not allow one to determine whether someone is telling the truth as confabulators elaborate well. Giving limited response options may limit confabulation, as recognition of the correct answer might be better than retrieval of memories. However, asking multiple-choice questions necessitate providing the child with a false answer option, which may exacerbate the problem and confuse them further. Questioning will need to be done very carefully to avoid leading the child into saying things that are not true because what they then say will quickly become the truth in their minds.

In terms of future studies, it would be useful to determine whether children who persistently confabulate demonstrate a similar neuropsychological profile to adult confabulators. However, it is important to bear in mind that the clear distinctions between neuropsychological domains that exist in adults may not be reliably demarcated in children and so it may be harder to use the test batteries available to identify clear neuropsychological deficits in children, particularly in the area of attention, which is rapidly developing throughout childhood.

Children with either developmental or acquired confabulation should be investigated. If impulsivity, possibly as a consequence of immature or deficient frontal lobe functioning, was found to be a factor implicated in confabulation, the effect of treatment with a stimulant medication could be investigated. If children are found to confabulate primarily as a consequence of impulsivity, more efficient and selective memory storage and retrieval might be brought about by the use of stimulant medication.

2:12) Summary

The subject of confabulation is an important area for study because, although relatively few children seem to be affected, the consequences for their social life and independent functioning can be quite extreme. The adults that have been studied have significant difficulties with managing independent living because they are so removed from reality, particularly in their interactions with others. Children are perhaps shielded from some of the effects of their difficulties because their lives are so much more externally managed, e.g. by parents and teachers. Their difficulties may only be realised gradually because of the expectation that all children lie. It is only when their lying persists or is especially fantastic or apparently malicious that parents consider it to be a problem. There is also the possibility that many more children confabulate than is currently realised.

CONFABULATION IN CHILDREN

Section 3: Empirical paper

3:1 Introduction

This study came about because of the presentation of a number of children to a neurodevelopmental clinic with what appeared to be persistent confabulation that was not in keeping with either their chronological or developmental age. Confabulation is a fantasy that has unconsciously replaced fact in memory.

3:1a) Confabulation and the development of lying

The use of the term confabulation in children has to be carefully distinguished from the more commonly used term 'lying' as lying is usually a normal developmental stage. Lying refers to an untrue or deceptive statement deliberately used with the intention to mislead and/or deceive. The development of lying is a gradual and continuous process throughout early childhood (McGaughran, Laurence & Wylie; 1969) and begins early at around 3 years of age, and by the age of six it is generally thought that all children can lie.

In early childhood, children have vivid imaginations and a rich fantasy life and can often have difficulty in separating 'fantasy world' from reality, though purely describing their fantasy world is not lying. When young children embellish a story and add details from their own imaginations, these details can become part of their memory and, although they often claim to be confident that what they remember in detail really happened, this may not be the case (Ceci, Loftus, Leichtman, & Bruck, 1994).

Between around 6 and 8 children become quite sophisticated liars and can lie for a broad range of reasons, the main ones being; exaggeration to boost self-esteem, e.g. my dad's the fastest runner in the world, lying to spare someone's feelings, lying to avoid punishment or criticism, i.e. for self-protection, and lying to harm others, e.g. to exact revenge on someone.

Talwar, Lee, Bala and Lindsay (2002) conducted a study to investigate the effect of children's moral understanding of the implications of lying on their preparedness to tell the truth. They found that children often use lying to conceal their own misdemeanours but they also concluded that once children have acquired an adequate conceptual understanding of truth telling and lying, getting them to promise to tell the truth significantly reduced lying. However, until around 9 years of age, children still find it hard to distinguish between things they have been told and things they have experienced themselves when questioned (Ackil & Zaragoza, 1998).

As they mature, children become better at distinguishing between things that are simply familiar and things that are specifically associated with an incident, i.e. they become better at source-monitoring (Czernochowski, Mecklinger, Johansson & Brinkman; 2005). Source monitoring refers to the ability to remember the source of a memory (Farrant, Blades & Boucher, 1998). There are three types of source monitoring;

- 1) The ability to remember the source of information, e.g. which of your colleagues presented a particular report at a meeting you attended.

- 2) The ability to differentiate between memories generated from within yourself, e.g. when recalling the meeting, you can distinguish between the things you said and the things you merely thought at the time.
- 3) The ability to distinguish between internally and externally derived information, e.g. what your colleague said at the meeting and what you said at the meeting. This is also referred to as reality monitoring.

Given the social importance of lying and that learning to lie is part of normal development, it is useful to consider at what stage the failure to manage the distinction between fact and fantasy becomes a pathological problem, i.e. when lying becomes abnormal and developmentally inappropriate. By the age of around 7/8, children should be able to limit their lying and recognise when it is important to tell the truth. It is at this stage that parents and teachers tend to become concerned if children are presenting as persistent liars (Gervais, Tremblay, Desmarais-Gervais & Vitaro, 2000). Persistent lying tends to be associated with other disruptive behaviour problems and is predictive of behavioural and adjustment problems in adulthood (Stouthamer-Loeber, 1986). Therefore, although it is recognised that young children will normally lie, there comes a point at which they will be able to understand the importance of telling the truth and to recognise situations where telling the truth is more important than self-protection.

3:1b) Studies of confabulation

Confabulation has been studied in adult neurological patients for over 100 years (e.g. Pick (1905) and Bonhoeffer (1904), as cited by Schnider, 2004) but there is still

debate about the exact definition of the term (Metcalf, Langdon and Coltheart, 2007). It is broadly used to indicate that someone has a memory disorder that leads them to give false answers to questions believing their answers to be true. There are different types of confabulation, e.g. provoked confabulation, which occurs in response to specific questions, and spontaneous confabulation, which presents as the production of false memories with no prompting (Kopelman, 1987).

Confabulation is a relatively unresearched area in terms of children. Only one case of acquired confabulation could be found in the literature. Meguro, Suzuki, Tsukiura, Fujii, Yamadori et al. (1999) describe a 9 year old girl who began to confabulate following a traumatic brain injury. There are two reported cases of developmental confabulation. One discusses the case of a boy with ADHD who was described as a persistent liar, rather than a confabulator, but it is not clear that there is a distinction to be made from the description of him (Wells, Bruns, Wender & Stein; 2005). Teaford, Shaw, Reiss & Lotspeich (2002) describe the case of a 14 year old girl with a Pervasive Developmental Disorder who was observed to tell exaggerated stories about her life.

Schacter, Kagan and Leichtman (1995) reviewed the literature on source amnesia, confabulation and false recognition in young children and compared the presentation of these aspects of memory development with studies of adults with frontal lobe damage. They found that there are similarities between the performance of young children on these memory tasks and that of adults with frontal lobe damage and suggested that these similarities might be associated with immature frontal development in the children, i.e. that children's suggestibility is due to immaturity of

the frontal lobes. It remains to be seen whether the problem of developmental confabulation resolves with age as the frontal lobes continue to develop into adulthood.

These three cases are in contrast to a large literature on adults with acquired confabulation. Its most striking occurrence is in the population of patients with acquired head injuries, such as aneurysm of the anterior communicating artery (e.g. Dalla Barba, Boisse, Bartolomeo & Bachoud-Levi (1997a); Dalla Barba, Cappalletti, Signorini & Denes, (1997b)), and specific syndromes, such as Korsakoff's (e.g. Schwartz, Parker, Deutsch, Rosse, Kaushik et al. (2002)), Alzheimer's (e.g. Nedjam, Devouche and Dalla Barba (2004)) and schizophrenia (e.g. Johns, Rossell, Frith, Ahmad, Hemsley et al., 2001). The study of confabulation in people with acquired injuries and conditions is particularly useful in helping to pinpoint the precise injuries that can lead to confabulation in a brain that had otherwise developed normally, and to look at possible neuropsychological measures that might help to identify regional impairments in neuropsychological functioning.

It is likely that a combination of memory and executive deficits contributes to confabulation (DeLuca, 2000) although for a long time, problems with confabulation were thought to be caused primarily by specific memory difficulties (Myslobodsky & Hicks, 1994). However, more recently the role of attention in the process of memory retrieval has come to the fore. As Spence's (2004) paper discusses, telling lies in normal adults involves inhibiting incorrect memories and it is thought that for a normal person to lie takes greater effort and skills than telling the truth. Perhaps in

confabulation, dysfunction of the ability to inhibit incorrect memories prevents people being able to tell the truth reliably (Gilboa, Alain, Stuss, Melo, Miller et al., 2006; Cabeza, Locantore & Anderson, 2003).

Attempts to delineate the brain regions involved in confabulation through neuropsychological testing of executive functioning have not provided definitive answers. For example, Fischer, Alexander, D'Esposito and Otto (1995) and Cunningham, Plishkin, Cassisi, Tsang and Rao (1997) reported the executive skills underlying confabulation were set-shifting and aspects of self-monitoring. These skills relate neatly to the prefrontal cortex but not neatly to regions within it.

Most of the research to determine the neurological origins of confabulation has involved studies of individual subjects with specific acquired brain injuries (see Gilboa and Moscovitch (2002) for a review of these cases). However, more recently, imaging studies have combined the use of neuropsychological tests, confabulation batteries and imaging (fMRI) to study groups of confabulators. For example, Turner, Cipolotti, Yousry and Shallice (in press) found that patients with orbital, medial and left lateral damage to the frontal lobes confabulated in response to questions about episodic memory and those with orbital, medial and right lateral damage confabulated in response to questions about temporal information. They concluded that the critical deficit for confabulation to occur is located in the inferior medial frontal lobe.

3:1c) Source-monitoring tasks

Source monitoring difficulties (Type 2, as described above) have been found to be a significant problem for people suffering from schizophrenia (Stirling, Hellewell and Ndlovu, 2001; Moritz, Woodward & Ruff, 2003). As it has been possible to undertake group studies rather than mainly single case studies with this group of people, particular source monitoring tasks have been devised for experimental purposes. One particularly neat source-monitoring task was described by Brebion, Gorman, Amador, Malaspina and Sharif (2002) in their study of 40 adults with schizophrenia. They used a range of memory measures, looking particularly at recognition and source memory. Their source memory task involved the use of eight categories of objects, e.g. furniture, animals etc. For each of the categories, the researchers would give a verbal example from that category, present a different pictorial example from that category and then ask the subject to think of and say a third example. Using this procedure, 24 items were generated. After five minutes, the researcher then read out the 24 items and mixed them with another 24 items that had not been in the original group (distractors) and subjects were asked to differentiate between those items from the original group and the distractors. For the original items, they were also required to say whether the item had been presented verbally by the examiner, as a picture, or whether the subject had thought of it themselves. The accuracy of their source memory was then evaluated. This task proved to be a useful tool for assessing people's source monitoring accuracy.

3:1d) Summary of the neuropsychological profile of confabulators

For a long time, problems with confabulation were thought to be caused by specific memory difficulties (Myslobodsky & Hicks, 1994). However, although memory is clearly involved, it is no longer considered to be the primary deficit and the role of attention in the process of memory retrieval has come to the fore.

The literature describing research into the neuropsychological profile of adult confabulators indicates that deficits in the functioning of the orbitofrontal lobes are strongly implicated and that when people confabulate, they fail to inhibit false memories and monitor the source of their memories. This affects the storage of temporal memories, i.e. the ability to remember when things happened, so memories from different time periods can become confused. They also have a strong feeling of remembering the events they are describing when confabulating and their ability to distinguish between information they remember rather than simply know is affected, i.e. they can remember the experience of something happening rather than just knowing that it did happen.

In terms of neuropsychological testing, confabulators show isolated rather than general executive difficulties on formal testing, indicating that there must be dissociations in their executive skills that are specific to confabulation (Cunningham et al.; 1997). In particular they show difficulties with aspects of sustained attention, monitoring and set-shifting. They also show a great difficulty inhibiting the retrieval of false memories and evaluating the likelihood of those memories to be correct. Their episodic memory is usually affected, probably because of the relationship

between the frontal lobes and the temporal lobes required for the organised storage and retrieval of information.

A recent paper by Metcalf, Langdon and Coltheart (2007) provides a critical review of models of confabulation and suggests a cognitive-neuropsychological framework for considering confabulation. They concluded that two deficits must co-exist; an executive retrieval deficit and an evaluation deficit. It is interesting to note their use of the term 'delusional belief formation' as a key factor in the formation of confabulations. This will be discussed further in the conclusion as the formation of delusional beliefs may prove to be the distinguishing factor between impulsive liars and confabulators.

The purpose of this research was to provide an exploratory study to investigate the basic neuropsychological patterns in confabulating children and to consider options for their management.

One key research question was proposed as a consequence of the literature review.

3:1e) Research question:

Do children who confabulate present with a similar neuropsychological profile to adults with acquired confabulation?

3:2) Method

3:2a) Research design

A broad neuropsychological assessment of each child was undertaken, including:

- Standardised measures of executive functioning and memory
- Observational data from parents
- Questionnaires completed by parents
- Experimental data using source monitoring paradigms.

The results of the formal assessments were scored to determine whether, relative to the normative data, the experimental group showed significant impairments in aspects of executive functioning (primarily disinhibition) and episodic memory. Data from parental questionnaires was also analysed to add to each individual's profile.

A control group of children with similar neurodevelopmental diagnoses were administered the same test protocol to determine whether it is possible to have the same neuropsychological profile as the confabulators and yet not confabulate.

Qualitative data collected by the parents of the confabulators over a two-month period were used to determine the type of confabulation exhibited by each child and to consider whether specific triggers for different types of confabulation could be identified. The data collection took the form of an Antecedent-Behaviour-

Consequence chart to record possible triggers and maintaining factors in each child's behaviour.

3:2b) Participants

3:2c) Experimental group: Children were included if their confabulation occurred:

- 1) More than once a week.
- 2) At a level that was inappropriate for their developmental stage (i.e. older than 8)
- 3) They appeared to believe their incorrect statements to be true.

All children attending the clinic who showed a persistent pattern of confabulation (for at least the past 12 months) were included in the study. The children were aged between 8 and 11, with no global learning difficulties (Full Scale IQ of 80 or above). It was important to rule out general learning difficulties because if a child was developmentally delayed, it would not be possible to be sure that their confabulation was not appropriate for their developmental level. Children with developmental confabulation were included if they had diagnoses of Attention Deficit Hyperactivity Disorder (ADHD) and/or an Autistic Spectrum Disorder (ASD), but not with any diagnosed psychiatric impairments or history of abuse. These exclusion criteria were to ensure that children did not have psychotic illnesses (and might be hallucinating) or were not from complex backgrounds where they might have suffered emotional trauma.

The three developmental confabulators were referred to the clinic for a multi-disciplinary neurodevelopmental assessment by their local paediatricians. An additional child (ST) was believed to have acquired confabulation as a consequence of long-standing cardiac problems. He was born with a congenital cardiac complaint and had cardiac surgery as an infant. He did not have a neurodevelopmental diagnosis. During the initial clinical interview parents raised concern about confabulation and the research protocol was therefore included, with parental permission. Parents collected data about their child's confabulation over two months subsequently. Each child is discussed fully in their case histories.

At the time of their assessments, only one of the children, AJ, was taking medication for their attention. AJ was taking Atomoxetine but it was found to be having no discernible effect and was stopped soon after the assessment. ST was taking Warfarin (a blood thinner) for his heart condition.

3:2d) Table 1: Experimental group

Confabulation Grouping	Name	Diagnoses
Developmental Confabulator 1	DC	Pervasive Developmental Disorder and ADHD
Developmental Confabulator 2	AJ	Autistic Spectrum Disorder, ADHD, Oppositional Defiant Disorder
Developmental Confabulator 3	BC	Asperger syndrome, aggressive unsocial conduct disorder
Acquired Confabulator 1	ST	Congenital heart disease requiring surgery for arterial trunk repair

The developmental confabulators all had diagnoses placing them on the autistic spectrum but none presented with severe autism and they were able to engage well with the assessment process.

Although ST is included as an acquired confabulator because his difficulties are likely to have been caused by his cardiac condition, these occurred so early in life that he could also be considered to be a developmental confabulator.

3:2e) Control group: The control subjects were selected after the experimental data had been gathered. Since it was possible to use normative data to determine whether the confabulators showed unusual clinical profiles, it was considered necessary to determine whether it was possible for a child to show the same profile and not confabulate. However, although an audit of the database of neuropsychological profiles of all children for whom data had been collected elicited no children with

exactly the same profile of difficulties as the experimental group, it cannot be concluded that it is not possible for this profile to exist and not lead to confabulation. In order to provide some control data, the most useful comparison was therefore considered to be a group of children of similar ages and abilities who had also attended the clinic for neurodevelopmental diagnoses but who did not confabulate.

Three control cases were selected for the developmental confabulators. They were selected if they were within the same age group as the confabulators (i.e. between 8 and 16), with no global learning difficulties. They were included if they had diagnoses of ADHD, ASD or both but this was not a condition of inclusion. The control group had undergone full neuropsychological assessments as part of their original clinic assessment for their neurodevelopmental diagnosis. In particular, children with impulsive ADHD and/or ASD were examined to determine what was different about their profiles that meant they did not confabulate.

3:2f) Table 3: Control group

Child	Initials	Diagnosis	Medication
Control child 1	MH	Asperger syndrome	None
Control child 2	CT	ADHD	Clonidine
Control child 3	JR	ADHD/ASD	None

In order to provide a control for the child with acquired confabulation, a child was selected who had undergone similar initial cardiac surgery for a similar condition. SM was born with serious cardiac problems. At 10 days old he underwent surgical cardiac repair with reconstruction of his aortic arch and pulmonary homograft

replacement. He had further surgery at 8 years old to replace the pulmonary homograft and close the residual ventricular septal defect. He was referred to the neurodevelopmental clinic, as there was a query about whether he showed indications of an autistic spectrum disorder. Since his second surgery he had become extremely anxious and had developed an obsession with time and being late. SM's assessment suggested that he had developed episodic memory problems following his second surgery. These problems are thought likely to be a consequence of hypoxia during his operation as he required resuscitation and was deprived of oxygen for up to four minutes.

3:2g) Measures

The following assessments were completed by all participants: -

- 1) Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) or Wechsler Intelligence Scale for Children (WISC-IIIUK; Wechsler, 1991) or Wechsler Intelligence Scale for Children (WISC-IVUK; Wechsler, 2003)
- 2) Test of Everyday Attention for Children (Manly, Robertson, Anderson & Nimmo-Smith, 1998) - Walk, Don't Walk subtest (A measure of response inhibition. Children are asked to take one step along a paper path, using a pen, after each tone they hear on the tape. Unpredictably one tone ends differently from the rest, meaning the next step should not be taken. To make sure they don't take this step,

children must sustain their attention on what they are doing and not get "carried away" into a task driven, "automatic" style of responding.

3) Delis-Kaplan Executive Function System (Delis, Kaplan, & Kramer, 2001) -

- Trails - The Trail Making test consists of a visual cancellation task and a series of 'join-the-dots' type tasks. The Number-Letter Switching task provides the primary executive measure, assessing flexibility of thinking, while the other four give information about the component processes for performing the task.
- Design Fluency - This test measures the child's ability to draw as many different designs as possible in 60 seconds. The response conditions vary. Condition 1 provides a basic test of fluency, Condition 2 measures fluency and response inhibition and Condition 3 measures design fluency and cognitive flexibility.
- Colour/Word Interference - This test is similar to the Stroop in design and assesses the child's ability to inhibit an over-learned verbal response. It consists of four conditions. Condition 1 requires the child to name the colour of printed squares. Condition 2 requires the child to read a list of coloured words. In Condition 3 the child must name the colour of the ink with which different colour words are printed. It is in this condition that the child must inhibit their over-learned response to read what the word says. In

Condition 4 the child must switch between reading the words and saying what colour ink they are printed with.

This condition provides a measure of inhibition and cognitive flexibility.

- Word Fluency - This test comprises three conditions: Letter Fluency, Category Fluency and Category Switching. The test measures the child's ability to generate words fluently, either from letter prompts (a phonemic format), from word prompts (a categorical format) or while shifting between concepts.
- Tower - The child uses an array of three wooden pegs on which discs of varying sizes are placed. Their task is to move the discs on the pegs to replicate positions shown in a picture. They must achieve their goal in as few moves as possible and as quickly as possible, while obeying a number of rules governing the movement of the discs. This provides a measure of skills including spatial planning, rule learning, inhibition of impulsive and perseverative responding and the ability to maintain set.

4) Children's Memory Scale (Cohen, 1997) – Verbal Immediate, Verbal Delayed and Delayed Recognition Indices. The two subtests given were Stories (which involves the child being read two stories, which they are required to recall immediately and again after a 30 minute delay) and Word Pairs (which involves the child learning a list of pairs of words over successive trials for immediate and delayed

recall). The Delayed Recognition Index measures the child's ability to recognise the initial target items rather than recall them.

Three IQ options were included as the WISC-III was replaced by the WISC-IV during the course of the study. Only a brief IQ score was needed to rule out global learning difficulties and for some children the WASI was the more clinically appropriate tool. All three tools were felt to be sufficiently interchangeable to be included. Two children had WISC IIIs, three had WISC IVs and three had WASIs. Correlations studies between the WISC-III and WISC-IV (as reported in the WISC-IV technical manual) indicate that WISC-III Index scores tend to be a few points higher than WISC-IV scores. DC is the only child who completed the WISC-III who is close to the borderline for inclusion on the grounds of IQ and it may be that if the WISC-IV had been administered, she would have been excluded. However, it is also possible that she would have scored better as her lowest score on the WISC-III was on a subtest (Object Assembly) that is not part of the WISC-IV. The WASI scores were found to be a few points higher than the WISC-IV. MH, JR and SM completed the WASI.

The D-KEFS was used in favour of the Behavioural Assessment of the Dysexecutive Syndrome for Children (BADS-C) because it allows the separate analysis of specific executive skills, such as set-shifting and monitoring, which the BADS-C does not.

The CMS was used in favour of the Rivermead Behavioural Memory Test for Children (RBMT-C) because the CMS is co-normed with the Wechsler scales and allows analysis of predicted scores for different IQ levels. It also allows a clear

distinction between verbal and visual memory, immediate and delayed memory and recall versus recognition memory.

Parents were asked to complete three questionnaires: -

- 1) Sunderland Everyday Memory Questionnaire (EMQ; Sunderland, Harris & Baddeley, 1984)
- 2) Strengths and Difficulties Questionnaire (SDQ; Goodman, 1999)
- 3) Behaviour Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy & Kenworthy, 2000).

There is no reliability or normative data for the Sunderland EMQ for use with children. The SDQ shows good informant reliability (Mellor, 2004). The BRIEF shows good internal consistency (0.80 to 0.98) but less stable Inter-rater Reliability (which is likely to reflect children's different behaviours in different environments).

Two source-monitoring tasks were used. The first, Source Monitoring 1 (adapted from Brebion et al., 2000) involved the use of five categories (Animals, Food, Clothes, Furniture and Vehicles). The examiner gave the child two examples from each category, one as a spoken word and the other as a picture. The child was then asked to generate their own example from that category. When this had been done from all 5 categories, a list of 20 words was read which included each of the examiner's words (5), the pictures (5) and the child's words (5), plus one distractor (5) from each category. For each word the child was asked if the word was one that had been in the first group and whether it was spoken or presented as a picture. If it

was spoken, the child was asked whether they or the examiner had said it. Scores out of 20 for accuracy of recall were given. Brebion et al.'s original task consisted of a higher number of target items (24 in all) and a higher number of distractors (also 24).

The second source-monitoring task was adapted from the reality-monitoring task described in Rankin and O'Carroll (1995) by reducing the amount of information to be learned. The children were asked to learn 7 pairs of related words over two trials. One word from each pair was then read out over repeated trials and they were asked to imagine rather than to say the paired word. After 5 trials their memory for each pair was checked and then they were asked to say how often they had heard each word being read. Their accuracy for the read words versus the imagined words was compared to determine whether they had been able to distinguish between their thoughts and what they had heard.

These tasks were chosen as they appeared readily adaptable to use with children. However, they were used experimentally and there were no available data for their reliability for using in this way. Issues of interpretation of the data produced are dealt with in the critical appraisal paper. The protocols for each of the source monitoring tasks are included in Appendices E5 and E6.

3:3) Results

Each child's case study is presented, with discussion of their individual neuropsychological presentations. The subsequent section contains the specific

assessment results from the protocol outlined above. The results of the source monitoring tasks are included here but discussed fully in the critical appraisal as, upon analysis, they did not prove to make a useful contribution to the study.

3:3a) Case Studies and summary of information from logs

3:3b) DC – case study; 11 years old

Background

DC was included in the case study because of her long-standing history of confabulation. When she was initially assessed, aged 7, she was a very active, impulsive and distractible child. She also had significant difficulties with social understanding, not just in terms of her interpersonal relationships but also in her understanding of the wider world. For example, when her language was being assessed she asked the therapist if he had a bed. When he said, yes and that everybody has a bed, she asked how he knew this. She also asked him if he had ever been a baby. This lack of understanding about the world was seen throughout the session. Her thinking was also perseverative and thoughts from previous topics of conversation became confused with the current topic. She was diagnosed with ADHD and ASD.

Examples of confabulation

DC made a series of accusations to her school about her parents harming her. She said, for example, that her mother tried to strangle her and her parents had bruised her, did not want her and were seeking to have her adopted, raising concerns about child protection. She said that her father was not her real father and she seemed very convinced of this.

She made other claims that were known to be false, such as that her aunt was killed in the Twin Towers and that her mother had a new baby.

All her claims were said with conviction and were vividly described. The claims placed her school in a difficult position because, although they did not believe them, they had to decide whether to report those claims that had child protection implications. Through discussions with parents and the hospital, contact with child protection was avoided and, over time, DC's confabulation became less damaging but possibly more frequent. Her parents have found these problems embarrassing and distressing.

DC was 12 when the confabulation log was completed. Her mother reported a high rate of confabulation, suggesting that DC confabulated almost whenever she was asked a question. For example, on one occasion DC denied having said something, despite her mother and brother hearing it very clearly. When confronted about it, DC insisted she had not and became cross because her mother could not prove she had said it. On another occasion, DC's mother needed to pick DC up from school because she was claiming to be unwell. To her mother she looked fine while another girl in her class clearly was ill and had just been sent home. Once home, DC was sent to bed. When DC's mother returned from a short walk, she found DC had filled the biscuit tin with a new packet of biscuits and eaten several. DC admitted filling the tin but denied eating any biscuits.

A clear trigger for DC's confabulation appeared to be confrontational questioning. She was very impulsive and instantly denied responsibility for something, even if she was not being asked about something that would get her into trouble.

Analysis of DC's assessment results

DC's intellectual ability was found to be within the low average range. While DC had some specific difficulties with elements of the tests presented, she would not be considered to have significant general learning difficulties. DC's verbal memory was also assessed using the CMS and all her scores were within the normal range and also within the range expected of someone of her intellectual ability.

DC's score on the Walk, Don't Walk subtest of the Test of Everyday Attention for Children was very low, indicating high impulsivity.

On the Delis-Kaplan Executive Function System DC's scores were indicative of significant executive functioning difficulties. A number of tasks presented her with great difficulty and these tended to be those requiring the shifting of attention, i.e. integrating two tasks. For example, if she was asked to name as many foods and vehicles as she could and to alternate between the two groups, e.g. sweet, car, banana, van, crisps, etc., she was only able to give lists of foods then vehicles. The switching aspect of the task was too challenging for her. She reliably demonstrated this difficulty on a number of practical and spoken tasks.

DC was very poor at monitoring her responses and tended to continue to make the same mistakes repeatedly (perseverative errors). Her responses were also highly repetitive. Once she had responded in one way, she repeated that method for later items, whether it was correct or not.

DC found it hard to generate strategies for problem-solving and, when given an open-ended problem-solving task, she usually had no idea how to start. If she was given initial explicit instructions, she could follow them well. Further problems then arose if that method stopped being effective and she had to generate a new method.

These results indicate that DC has some very good skills in certain areas. For example, her response speed was good when tasks were clear and structured. She had good word fluency and expressive language skills. However, she had significant problems with managing tasks that made demands of executive functioning skills.

Following the assessments, the findings were explained to DC and she was not surprised to learn that she genuinely has more difficulty with remembering information than other children. In particular, she found it very hard to remember the roles of different individuals in particular scenarios. She also admitted that sometimes she did lie to get out of trouble, i.e. when she was not confabulating. It was therefore explained to DC that it is very important that she is honest about letting her parents know when she really cannot remember what happened. This would enable them to distinguish between normal teenage behaviour and real examples of her specific difficulties. If they were able to tell when she was really

having problems they would be more able to help her and would become less frustrated with her. DC agreed that she could see this would be helpful.

DC-summary

From these assessments it was clear that DC had difficulties with higher order thinking skills, i.e. those skills required for everyday problem-solving tasks, planning and monitoring an approach to situations and learning from her experiences. In addition to this, she appeared to have significant and unusual memory difficulties. For example, she could not always remember accurately who said what and when, or what she herself did and when. She had a tendency to remember her thoughts about things happening as if they really happened. If she could not remember an event, such as where she left her bag, and she thought about what might have happened, she then remembered this thought as if it really did happen. This may be why she became so angry when she was not believed, because as far as she could remember, she was telling the truth.

Her results were indicative of someone with significant problems with controlling her attention and they provide some possible explanations for DC's behaviour. She found it hard to attend to two things at once and, if required to do so, her performance deteriorated dramatically. Many real life situations that she was faced with required her to interpret information from a variety of sources simultaneously, such as when her teacher was talking while DC was working. She had very limited ability to inhibit her most impulsive reactions and so tended to act before thinking of the possible consequences. Her attention problems were more of a challenge at

school in terms of her learning but her confabulation had significant implications for management.

As to the causes of her confabulation, DC's poor attention skills may be such that she simply did not observe events the same way as other people or she may have interpreted them differently. DC was only able to hold a small amount of simple information in her head at any one time or she became confused. Accurate interpretation of social situations is a complex task and may well be something that DC could not yet do. She found it easier to think about things when they were presented as a narrative than when she had to consider them in real-life, as they were happening. In the narrative version, she was only given the relevant information as a linear presentation. In real-life, she had to select out and interpret the relevant information for herself and remember it in a meaningful way. From observations of DC's attempts to deal with complex information on formal testing, it is likely that accurate interpretation and recall of social situations was overwhelming her.

3:3c) AJ – case study: 9 years old

Background

AJ was referred for assessment because of increasing behavioural difficulties. He had diagnoses of an autistic spectrum disorder, oppositional defiant disorder and ADHD. Attempts to manage his behaviour medically had not proved successful. Methylphenidate caused an adverse reaction and Atomoxetine had no discernible effect.

AJ had significant behavioural difficulties, despite being compliant and attentive in a 1:1 setting. He was conspicuously impulsive, even when trying to comply with requests.

AJ had a tendency to embellish events that did happen and to describe/invent events that did not. The more he was questioned about these events, the more he embellished them. Even if other witnesses contradicted his claims, he would not change his view. His stories were not stable over time and he often added more details with each re-telling.

At school, AJ's problems were mainly related to social behaviour. He frequently told tales on other children as he had a strong sense of what was right and wrong. He did not understand the social consequences of this habit. His lack of attention and impulsivity did present problems in the classroom. In formal situations, such as at school, AJ tended to have strong beliefs about things and did not like to be challenged on those beliefs. If challenged about events that he had remembered wrongly, he would confabulate to justify or prove his belief. AJ frequently returned from school with things that did not belong to him and reported that he either borrowed them or was given them when neither was true. He appeared to have no recognition that his memory for his acquisition of these items was not correct.

Examples of confabulation

The majority of AJ's confabulations seemed to be elaborate story telling, where he was describing imaginary events in his everyday situations, and he often spontaneously volunteered this information. For example, when AJ saw a squirrel on the footpath on the way to school, he told an adult friend, who was walking him to school, that he caught a squirrel and held it in his coat so that the squirrel would not bite him and then he kept it in a box. On another journey to school, he told a friend how a tiger had chewed one side of a stick he was carrying and his dog chewed the other.

On one occasion, when AJ's mother was Hoovering, he tried to convince her that he was controlling the on/off switch with his laser eyes. AJ claims to have a number of magical powers as a result of having laser eyes. For example, he can stick paper together using his eyes and can shoot holes through paper and cut down trees. The latter claim was made when he and some friends came across a tree that had been blown down by the wind.

AJ's stories were usually prompted by an event, although the detail is fictional. For example, one day AJ saw his friends walking home across a field and went home to tell his mother that he had seen a farmer shooting at cows in the field and dragging a dead cow across the field. He also told a group of friends how he caught a sick fox and looked after it until it got better. Then it had babies, which he brought to his house because the fox died.

The latter story was one told shortly before the assessment and so AJ was specifically questioned about it during the assessment. The details of the story changed with each telling but pointing out these variations to him made him exasperated. When asked about the fox he caught, he said that it initially attacked him and that it was a really big one. When he mentioned it again he said that it was quite small and might have been a baby. When he was alerted to the fact he had previously said it was big, he again said that it was big and had come at him. He had had to defend himself with a stick. The process of describing the story appeared to make it more real to AJ, despite the big variations. During the clinic assessment AJ confabulated a number of times. For example, he said that he had a potion that he could drink to turn him into a dog.

AJ had also made claims of abuse; on one occasion he accidentally hurt himself in front of his parents and then said that his father had bruised him. He has been observed harming himself in clinic and blaming others. He also claimed that his grandmother was a keen skydiver, also not true.

AJ's mother was convinced that he believed his stories. His mother also reported significant paranoia as AJ often was convinced people were 'out to get him'. He held grudges and when he thought someone was after him or had slighted him in some way, he would seek revenge. He even felt angry about things that had happened years ago to his ancestors but his anger remained real and current.

Analysis of AJ's assessment results

AJ's assessments showed him to be of average intellectual ability but with some significant and specific difficulties with aspects of attention control, impulsivity and executive functioning. These observations were commensurate with his diagnosis of ADHD. It may be that AJ had difficulties with reality monitoring, i.e. that he was not good at distinguishing between what really happened and his own thoughts, ideas or daydreams about the event afterwards. It certainly appeared that his memory for events was not stable and he was very poor at monitoring for himself whether what he was saying was true or even possible.

The memory assessments show that AJ had a good ability to learn and remember verbal information (as shown by his CMS results). For example, when two stories were read to him, he was able to recall these to an average level for his age. However, after a 30-minute delay, he forgot much of the detail, which reduced his score to the lower end of the average range. This might indicate a rapid decay in his memory, as his immediate memory was good but quickly faded.

The measures of executive functioning, the Delis-Kaplan, indicated that although AJ could complete complex tasks quickly, he was not good at monitoring his approach or effectiveness as he worked. In several of the subtests he sacrificed accuracy for speed and, because he did not notice his mistakes, he did not change his approach.

The results of the TEA-Ch show that AJ had significant difficulties controlling motor impulsiveness.

AJ-summary

In his daily life, AJ might be less observant than other children of his age regarding what is going on around him. He also might forget the details of events as time passed and, when he later recounted the event, his impulsiveness led him to say whatever came into his head without him checking whether it really happened. Most people have a tendency to embellish stories sometimes to add interest, or they add details that support their interpretation of events. However, they are usually aware that they are doing this and if they had to, would be able to distinguish between what really happened and their own 'spin' on the story. It is this latter element that AJ seemed unable to do and it is not clear whether he could not remember that something different happened in reality or whether he was extremely stubborn or inflexible and would not back down and admit what he had done. It is his mother's view that she could tell when he was lying, i.e. intentionally misrepresenting the truth, as opposed to when he was confabulating, and this led her to conclude that he genuinely believed his confabulations.

3:3d) BC – case study: 8 years old

Background

BC had a diagnosis of Asperger Syndrome and aggressive unsocial conduct disorder when he was referred for an assessment. BC was attending a specialist unit for children with ASD and was being educated at home for two days a week because of

the difficulties he was experiencing in school. At school his behaviour was physically aggressive and he had hurt other children and a teacher. He had full time ancillary support.

Outside school his behaviour was much less of a problem and, aside from the occasional aggressive outburst, his mother found his behaviour largely manageable.

Of great concern was BC's aggression. He had a long-standing obsession with violence and he described voices in his head telling him to hurt people. Rewards and sanctions had little effect over his behaviour, as he seemed to have no control over it. During therapy sessions he has made verbal threats to staff, claiming to have seriously hurt people in the past. He appeared unaware of the inappropriateness of what he was saying. The referrer expressed concern that BC was not separating fantasy and reality and did not realise that the violence that he saw in videos and in computer games was not real and should not be part of everyday life.

Other reports described BC as using adult language. When he became aroused and angry his language became florid and he swiftly moved from topic to topic, making associations between thoughts that made him very hard to understand. BC enjoyed describing the violent things he would like to do to people. He showed no concern or empathy for his potential victims.

Examples of confabulation

BC was included in the confabulation study because of so many references to concern about his inability to distinguish between fact and fantasy. He seemed to live in a parallel world where he did not separate out the violence that he liked to watch on television and think about in his head from the day-to-day reality of what was going on around him.

However, he also exhibited clear confabulation in his spoken communication. Usually he confabulated in response to questions so that he could relate his answers to his violent fantasies. For example, when asked about his favourite possession, he claimed to have a number of real machine-guns at home that he likes to shoot. When interviewed he sometimes answered as another character, putting on different voices and assuming different characteristics. He also answered questions about his experiences with false answers and when questioned further, would elaborate happily until he was asked to stop. For example, when asked about his favourite animal he described a crocodile he had met on holiday in Africa that he befriended and could cuddle. None of this was true. He also claimed to be supported by an army of troops with whom he organised fights and during one interview, the number of troops rose gradually from four to fifteen.

During conversation, BC was extremely talkative, would quickly go off at tangents into his various fantasies and gave no indication that what he was saying was not true or might not be believed by the listener. He also paid little attention to the

listener to monitor their reactions. He did not like to be interrupted once he was relating a story.

BC was so convincing in his beliefs in his fantasies that his parents were concerned that, since he claimed he can fly, if the possibility of testing out his flying powers arose, he might take it. Similarly, they believed he might carry out his more macabre threats out of curiosity.

BC was reported to avoid sleep because he was scared of his dreams. He remained tense in his sleep.

His parents' understanding of the confabulation and aggressive behaviour was that he acted on his impulsive beliefs and thoughts and did not engage the part of the brain that would incorporate social understanding or consequence.

At school, BC's teachers were most concerned about managing his violent behaviour and were not concerned about his confabulation to any great extent. However, they did note that many of his rages were triggered by his misinterpretation of situations and people's actions towards him.

Analysis of BC's assessment results

BC's intellectual ability was within the average range. During the assessment, BC's social style was striking; he used a rather adult and forthright style of communication and was pedantic in his attention to detail. The most noticeable

feature of BC's behaviour was his confabulation. An example of this occurred when BC was asked to remember and repeat back two short stories (Stories subtest – Children's Memory Scale). Once he had recalled as much as he could of each story, he then continued each story, making up events that had not been read to him. He was able to remember sufficient details of each story to achieve scores within the average range but added many of his own. These additional details tended to be violent rather than following the theme of the story. After a short delay, BC was asked to recall the stories again. He was then able to remember a few more details and confabulated less. It was interesting to note that BC's recognition of the details of each story was well above average and he made only one error. This suggested that his confabulation occurred during free recall conditions, i.e. when he had to retrieve his memory of the details, rather than during recognition conditions, i.e. when he was given a choice of answers. BC clearly had a very good memory for the details of the stories but his memories became confused with other ideas when no structure for recall was provided. Over time, the accuracy of his memory improved somewhat.

BC scored well below average on the Walk, Don't Walk subtest of the Test of Everyday Attention for Children indicating that his ability to inhibit his motor responses quickly was an area of significant weakness.

On executive measures (from the Delis Kaplan Executive Function System) he showed significant difficulties with systematic problem-solving and self-monitoring. He found it hard to apply rules as he worked and was not able to alter his approach

even if he could see it was not working. Several of these subtests were too hard for BC as they required fluent reading ability or secure knowledge of the alphabet.

In the Verbal Fluency subtest (D-KEFS), BC was asked to think of as many words as he could that begin with a certain letter. For two of the three letters given, the second word that BC thought of each time was a rude word. He said these without any acknowledgment that it was socially inappropriate to do so. The letters given in this test are chosen specifically to prompt this type of response but most children and adults will inhibit the impulse to include these words. That BC did not do so provides further evidence of the difficulty he has with monitoring his own behaviour.

The results of the questionnaires completed by BC's parents supported the findings of the formal assessments; that BC had significant difficulties managing his behaviour, monitoring the effect his behaviour had on those around him and remembering events accurately.

BC-summary

BC had significant difficulties with attention, impulsivity, executive skills and everyday memory that were out of line with his good intellectual ability. He also had a confabulatory disorder that made it hard for him to distinguish fantasy from reality when he was asked to recall events or stories. He had a good memory for factual information but this was only reliably evident when he was given forced choice questions rather than free-recall.

3:3e) ST – case study: 8 years old

ST was referred for an assessment by another psychologist who had been helping the family to manage his behaviour. ST has had a serious heart condition for which he needed complex surgery at one month old. Following surgery he developed a cardiac tamponade and required two minutes of resuscitation. He required further surgery at two and three years old. He made a good recovery and was considered medically well.

He was referred because he appeared to have a rich fantasy life to the extent that it was not clear whether he was able, at the age of 8, to distinguish fantasy from reality. His parents described him as living in 'a fog of fantasy'. For example, ST lived much of his life as a fantasy character. He became so involved in these characters that he dressed as them and interacted with people as his character. His parents found it hard to speak to ST rather than the character and he managed to incorporate daily activities into his character's role.

ST had significant attention and concentration difficulties in class and was impulsive. He enjoyed role-play games with his friends in school and often ended up hurting his friends by becoming over-the-top in his fighting scenes. There did not appear to be any intended malice. When he was confronted about his actions, he concocted extremely elaborate scenarios that made it impossible for him to have been involved. He seemed absolutely certain that things happened as he described them and that everyone else was wrong.

Even when recalling non-emotional events he confabulated, either exaggerating stories or inventing entire events that did not happen. He became upset when he was not believed.

ST's parents described him as having an excellent memory for his own long-term past but he confused more recent experiences. His understanding of consequences was poor and he found it hard to relate sanctions to prior warnings and his own actions. His parents reported that he did not check or monitor his own behaviour.

At school, ST's teacher described him as immature and seemingly devoid of all emotion. He seemed distant from what was said to him. The teacher queried whether the behavioural problems could be due to a lack of boundaries, as ST seemed bright but unable to accept sanctions. He described ST as a liar to a worrying extent. He said that he had never seen someone lie like him. He completely fabricated events and lived in a fantasy world. The teacher felt this must be something that was encouraged at home.

The teacher said that he needed to be watched all the time and he felt very nervous taking him out of the school as he felt terrified he would run into the street – a behaviour he considered inappropriate for his age and ability.

Despite the teacher's concerns about some of ST's behaviours being learned, i.e. related to home environment, he acknowledged that his brother, whom he also taught, showed no similar problems.

Analysis of ST's assessment results

ST's intellectual ability was within the average to high average range. His verbal memory was above average.

ST's scores on the Walk, Don't Walk subtest of the TEA-Ch indicated that he had significant difficulties with impulsivity. Behaviourally he also exhibited clear attention difficulties as he was easily distracted, both by external events and by his own thoughts. He also found it difficult to hold the rules of a task in his head while he worked and became so fixed on achieving a goal that he broke rules, apparently unknowingly, to do so. This suggested poor monitoring of his performance.

ST's memory scores were good on formal testing although he showed clear difficulties with aspects of memory in his everyday life, particularly his sequential memory for recent events.

ST-summary

ST's attention skills could be good in structured, distraction-free settings but he had significant difficulties with impulsivity and with controlling the focus of his attention. He was very easily distracted by his own thoughts and ideas and could not over-ride these to concentrate on a specified task. Once he had started thinking about something else, he found it hard to shift his attention back to what he should have

been thinking about. This meant his behaviour was very much driven by his external environment or by free-flowing ideas as they occurred to him. He found it hard to manage his own behaviour according to social expectations or task demands.

These difficulties were reflected in some of his test scores, in particular the Delis-Kaplan and the TEA-Ch, and also in information provided by ST's teacher and parents. During testing, ST often found it hard to hold several rules in mind while he was working. His tendency was to over-focus on one aspect of the test to the detriment of others. If an idea occurred to him, he had to act on it or comment on it, he was unable to dismiss it or save it for later. This reflected his impulsivity in that he did not or could not stop to think of consequences before acting. Even if consequences were pointed out to him, he had to complete what he was doing or saying.

ST's academic work was suffering because he was often not able to concentrate in the presence of distractions and found it hard to maintain his attention sufficiently on tasks to be able to work through them systematically. It is possible that his variable attention affected his memory for recent events.

ST was confabulating on a regular basis, e.g. exaggerating details of real events as well as completely making up things that had not happened. This usually occurred when he was asked a question or during conversation, when he may have been trying to make his input more interesting. He did appear to believe these stories once he had created them, however improbable they were. When people confabulate it often reflects a poor memory for events coupled with a limited ability to inhibit

incorrect information or to filter out nonsense answers/ideas. ST appeared to have a good memory for events and factual information but certainly had difficulties with inhibition and monitoring of his ideas and responses.

3:3f) Neuropsychological assessment results

The 3 developmental confabulators are DC1, 2 and 3 and the acquired confabulator is AC1. The three developmental controls are C1, 2 & 3 and the cardiac control is C4.

The first column of each table provides a mean test score for the four confabulators, to simplify comparison with the individual controls. No mean score for the controls is given as they do not, and were not intended to, provide a homogeneous group.

3:3g) Intellectual ability measures

Table 4: Intellectual ability measures

Name	Conf/ Mean score	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Age	9:2	10:9	9:1	8:8	8:1	9:0	11:2	8:5	10:9
<i>Measures of IQ – standard scores</i>									
FSIQ: measure of child’s general intellectual ability	96	83	92	92	115	117	93	112	92
VIQ: assesses verbal expression, verbal concepts and abstract reasoning	102	90	93	104	121	117	91	116	100
PIQ: assesses visual and spatial organisation and perceptual reasoning ability	93	80	91	98	103	114	102	105	84

The IQ scores given are Standard scores, which have a mean of 100 and an average range of 85 to 115. The IQ measures indicate that none of the children included in

the study had significant global learning difficulties, i.e. their IQs were at or above 80.

3:3h) Attention and executive functioning measures

Table 5: Test of Everyday Attention for Children:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
TEA-Ch: Walk, Don't Walk Assesses response inhibition	3	3	3	3	3	12	12	4	11

Table 6: Delis-Kaplan Executive Function System (D-KEFS): Trail-Making:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Trails Visual Scanning	10	13	7	9	11	2	10	12	11
Trails Number sequencing	8	7	10	12	4	1	7	1	12
Trails Letter Sequencing	8	9	9	4	10	8	8	7	12
Trails Number-Letter Switching	6	2	11	3	6	11	8	6	11
Trails Motor Speed	11	10	11	14	9	11	13	13	11

Table 7: Delis-Kaplan Executive Function System (D-KEFS): Colour/Word Interference:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Colour/Word Interference 1	10	9	10	10	10	12	4	12	8
Colour/Word Interference 2	8	5	11	-	8	12	9	11	4
Colour/Word Interference 3	8	9	12	-	4	13	1	1	9
Colour/Word Interference 4	8	4	12	-	9	13	1	12	7
Colour/Word Interference 5	9	7	11	-	9	12	7	12	6
C/W – Error Analysis Inhibition	5	2	4	-	9	8	1	1	12
C/W – Error Analysis Inhibition/Switching	6	1	5	-	11	7	1	5	13

BC was unable to complete the C-W Interference Test as his reading was too weak.

Table 8: Delis-Kaplan Executive Function System (D-KEFS): Verbal Fluency:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Letter Fluency	10	9	8	9	12	13	4	11	9
Category Fluency	13	16	12	12	10	12	10	9	10
Category Switching/ Responses	8	12	7	1	12	12	3	10	11
Category Switching – Accuracy	9	6	11	5	12	15	10	14	12
Letter vs. Category Fluency	7	3	6	7	12	11	4	12	9
Category Switching vs. Category Fluency	6	6	5	1	10	10	3	11	11
Switching Accuracy	6	3	10	1	11	12	9	12	12

Table 9: Delis-Kaplan Executive Function System (D-KEFS): Design Fluency:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Filled Dots	11	12	12	10	8	15	12	8	10
Empty Dots	10	13	12	8	5	17	13	6	14
Switching	9	6	12	9	7	15	8	7	13
Composite Score	10	11	12	9	6	17	12	8	13
Design Accuracy	4	4	6	4	1	14	8	11	10

Table 10: Delis-Kaplan Executive Function System (D-KEFS): Tower:

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
Tower Achievement Score	8	4	12	6	8	9	11	9	8

Summary of assessments

All the confabulators scored significantly below average and below the controls for Walk, Don't Walk from the TEA-Ch battery and the Design Accuracy analysis of the Design Fluency subtest. There were no other consistently low scores across any of the groups although individuals scored poorly on some subtests.

Table 11: Behaviour Rating Inventory of Executive Function:

	Conf/ Mean score	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
<i>Executive Functioning Questionnaire – T- Scores</i>									
BRIEF – Behavioural Regulation	82	80	85	86	76	77	89	88	65
BRIEF – Metacognition	77	75	77	82	75	59	76	84	48
BRIEF – General Executive Composite	81	77	82	86	77	67	84	88	54

BRIEF scores are given as t-scores, which have a mean of 50 and an average range of 40 to 60. Individual domain scores are not included in the results table because for all the children who showed executive difficulties, there were no statistically reliable discrepancies between the domains. Therefore the composite scores provide the most reliable and useful measures of executive functioning.

All the children except C4 showed significant levels of difficulty with executive functioning tasks in their everyday lives. This is in line with the results from the standardisation sample of the BRIEF in which, when children with combined type ADHD were compared with controls, the children with ADHD were found to show pervasive problems with the executive skills of behavioural regulation and metacognition.

3:3i) Memory measures

Table 12: Children's Memory Scale:

The verbal scale subtests are designed to assess the child's memory for verbal material.

There are two delayed conditions; free recall and recognition memory. These assess episodic memory.

	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
<i>Standard Scores</i>									
Verbal Immediate	105	94	106	88	131	97	94	103	57
Verbal Delayed	95	85	94	72	128	103	91	94	57
Delayed Recognition	105	94	97	115	115	78	97	100	57

Scores are given as Standard scores. The delayed subtests are given around 30 minutes after the immediate memory subtests. Delayed recognition assesses prompted memory rather than free-recall. Index scores are reported in favour of scaled scores (Stories and Word Pairs) as they provide a more accurate representation of verbal memory skills. All but one of the scaled scores was within the average range. BC scored below average (Scaled score: 3) on Delayed Memory for Word Pairs which was thought likely to be due to loss of confidence and attention.

Table 12 – Sunderland Everyday Memory Questionnaire

	DC1	DC2	DC3	AC1	C1	C2	C3	C4
	DC	AJ	BC	ST	MH	CT	JR	SM
1) Forgetting where he has put something. Losing things around the house	1	1	1	1	0	1	1	1
6) Forgetting when it was that something happened; for example, whether it was yesterday or last week	1	1	1	1	1	1	1	0
7) Completely forgetting to take things with him, or leaving things behind and having to go back and fetch them	1	1	1	1	0	1	1	0
8) Forgetting he was told something yesterday or a few days ago and maybe having to be reminded about it.	1	1	1	1	0	1	1	1
10) Letting himself ramble on to speak about unimportant or irrelevant things.	1	1	1	1	1	1	1	0
14) Completely forgetting to do things he said he would do, and things he planned to do	1	1	1	1	0	0	1	0
15) Forgetting important details of what he did or what happened to him the day before	1	1	1	1	0	1	1	1
20) Getting the details of what someone has told him mixed up and confused	1	1	1	1	0	0	1	0

This questionnaire was completed by parents.

1= behaviour occurred more than once a week

0= behaviour occurred once a week or less

Specific memory difficulties that occurred more than once a week for all the confabulating children were related to;

- losing things
- forgetting when things happened
- forgetting to take possessions that they need
- forgetting things they have been told
- rambling on about unimportant things
- forgetting things they had said they would do or planned to do
- forgetting the details of things they have done
- confusing the details of things they have been told

Frequent everyday memory problems were also evident in the control group.

Table 14: Source Monitoring Measures

Name	Conf/ Mean scores	DC1 DC	DC2 AJ	DC3 BC	AC1 ST	C1 MH	C2 CT	C3 JR	C4 SM
<i>Experimental Measures</i>									
Source Monitoring 1	18.25	16	20	17	20	20	18	13	12
Source Monitoring 2	1.95:1	1.2:1	1.2:1	1.2:1	4.2:1	10.3:1	1.6:1	1.8:1	1:1

Scores for SM1 are given as a total correct out of 20. It is perhaps useful to note that although the control participants made more overall errors than the confabulators, all but one of the confabulators' errors were to do with the pictures. They recalled that the words had been spoken or were not included rather than seen as pictures. Of the 17 errors made by the controls, only 3 were related to the pictures.

Scores for SM2 represent the difference between the participants' scores for the words they heard spoken (odd words in the list) and the words they heard spoken and were asked to think but not say (even words in the list) (See Appendix E6). The correct ratio of odd to even words was 4.5:1. Although the confabulators scored similar ratios, their raw scores were very different. E.g. BC's raw scores were 91:79 and AJ's were 38:33.

The source monitoring tasks were experimental measures and so there is no normative data available for their analysis. It was anticipated that they would be useful for distinguishing between individuals who confabulate and those who do not, as has been shown to be the case in adult studies. This has not proved to be the case here and the issues raised are discussed fully in the critical appraisal paper.

3:3j) Behavioural questionnaires

Table 15: Strengths and Difficulties Questionnaire

	DC1	DC2	DC3	AC1	C1	C2	C3	C4
	DC	AJ	BC	ST	MH	CT	JR	SM
<i>Behavioural Screening Questionnaire</i>								
SDQ Emotional Symptoms	2	1	1	2	1	2	1	2
SDQ Conduct Disorder	2	1	1	1	2	1	1	2
SDQ Hyperactivity	1	1	1	1	1	1	1	2
SDQ Peer Problems	2	2	1	2	1	1	1	2
SDQ Prosocial	2	2	2	1	1	1	2	1
SDQ Total Difficulties	1	1	1	1	1	1	1	2
SDQ Impact	1	1	1	1	1	1	1	2

1=Abnormal

2=Borderline or normal

The results of the SDQ show that the everyday lives of all the children were negatively affected by their difficulties. None of the developmental confabulators showed difficulties with their prosocial behaviour, i.e. they were reported to have normal levels of concern for others and to respect the feelings of others. Only the child with acquired confabulation appeared to be having poor social experiences.

3:4 Discussion

3:4a) Research question

Do children who confabulate present with a similar neuropsychological profile to adults with acquired confabulation?

The assessment measures used were selected in order to evaluate the children's attention/executive skills and their episodic memory, as these were the areas found to be of most significance in the adult populations.

The results from the executive measures show that while there was some variability across many of the subtests of the D-KEFS, the subtest that all the confabulators scored below average on was the Design Accuracy component of Design Fluency. This subtest requires the child to create as many different designs as they can on a grid by joining up a specified number of dots. This score evaluates their ability to avoid repeating their designs and to follow the instructions of the task consistently. A low score on this test suggests difficulties with monitoring of output.

The only other measure that was significantly below average for all members of the experimental group was the Walk, Don't Walk subtest of the TEA-Ch. This subtest requires the child to inhibit their motor response to a stimulus once a response pattern has been established. It provides a good measure of their impulse control. While some of the control group achieved low/low average scores on this subtest, which would not be unexpected given their recognised attention difficulties, they

were not consistently of the severity of the confabulators, i.e. the confabulators scored 3 consistently versus the range of the control children, which was from 4 to 12.

It must be borne in mind that, given the large number of subtests administered to such a small number of subjects, it is possible that such a pattern of scores could have occurred by chance and it is not possible to confirm or deny this statistically (e.g. using a Bonferroni correction) because of the small sample size. However, the results do indicate, on an individual level, that each of the confabulators exhibits specific executive difficulties with impulsivity and monitoring.

The results from parental reporting of executive difficulties (i.e. the BRIEF scores) indicated that all but one of the children in both groups had executive difficulties in real-life settings. Therefore, as with the adult population, executive difficulties (related to frontal lobe functioning) are not generally responsible for confabulation. It appears to be difficulties with specific sub-skills within the domain of the executive functions that combine to result in confabulation.

Analysis of the memory assessments indicated that the confabulating children did not show significant memory deficits on formal testing. The assessment data indicate that from a clinical perspective, only one of the participants, SM in the control group, showed significant memory difficulties on the Children's Memory Scale. This participant, SM, is known to have an episodic memory impairment but he does not confabulate.

Only one formal measure of memory was administered, the Children's Memory Scale. This was selected because it provides measures of episodic visual and verbal memory, both immediate and delayed, and also has a recognition condition, allowing opportunities for children to give false positives. It is co-normed with the WISC batteries so it allows reliable comparisons between tests for determining clinical discrepancies in scores. None of the confabulators showed significant global impairments in their memory for information using the CMS. However, it is possible that the CMS was not sufficiently sensitive to the subtle episodic memory impairments that the children might be experiencing. Isaacs, Vargha-Khadem, Watkins, Lucas, Mishkin et al. (2003) used the Rivermead Behavioural Memory Battery and the Wechsler Memory Scale (similar to the CMS) to investigate episodic memory problems in different groups of children and they concluded that two specific skills tested by the RBMT (the Route subtest and measures of prospective memory, i.e. Appointment and Belonging) might more accurately assess the real-life episodic memory difficulties that the children were experiencing. In future studies of confabulation, it would be useful to include the RBMT as a measure of episodic memory.

The parents completed the Sunderland Everyday Memory questionnaire. Although there are not yet norms for children, the questionnaire provides qualitative information about where people's memories are failing in real-life settings and the problems any memory weaknesses present for them in their self-organisation and social interactions. Parental responses on the EMQ showed that the children across both the experimental and control groups were experiencing frequent memory lapses, i.e. occurring more than once a week. However, by selecting out only the

errors that all four confabulators show more than once a week, it appears that their memory errors are a combination of prospective memory mistakes (which are assessed by the RBMT but not the CMS), i.e. not alerting themselves to do things in the future (items 7 & 14 from the Sunderland questionnaire), errors made through poor monitoring of what is going on around them (e.g. items 10 & 15) and memories becoming muddled (e.g. item 6 & 20). They do not appear to be related to difficulties with learning semantic information or remembering familiar things like places and faces.

While all of the control children showed some difficulties with aspects of attention, executive functioning and everyday memory, none presented with both severe impulsivity (e.g. Walk, Don't Walk subtest) and poor monitoring of output (e.g. Design Fluency – Design Accuracy of the D-KEFS). For example, although SM (C4) had significant memory difficulties (according to the EMQ and CMS) he did not have executive difficulties or impulsivity and it was perhaps his ability to inhibit impulsive responding that prevented him confabulating.

The results of the neuropsychological assessments suggest that the confabulating children have similar neuropsychological profiles to the adults, i.e. they primarily show difficulties with impulsivity and monitoring (Papagno & Baddeley, 1997; Schnider, 2003). They do not show frank memory deficits although they do present with everyday memory problems, probably as a consequence of their poor monitoring of their environment. While the neuropsychological measures used are not specific enough for the assertion to be made that any child with this profile of

scores will confabulate, it is likely that this pattern of executive and attention difficulties presents a major contributory factor.

See Table 16 for a summary of how children's results might relate to the information from adult studies.

Chart 2

Summary of the process of confabulation in children

Process of answering a question	What can go wrong	Theories relating to confabulation	Confabulation in children
Prefrontal cortex accesses memory stores.	Wrong information requested by prefrontal cortex	Confabulation due to poor search strategy. Also poor checking of relevance of answer. (Cabeza et al., 2003)	
Hippocampi retrieve relevant information and imparts to prefrontal cortex.	Wrong information selected by hippocampi		Child impulsively selects answer (TEA-Ch scores).
Prefrontal cortex identifies correct answer from a number of relevant options through process of monitoring i.e. relating back to question and source-monitoring	Prefrontal cortex fails to select right answer and inhibit false answer	Confabulation due to source-monitoring deficit (e.g. Schnider, 2003).	Child fails to use a monitoring system to check answer (D-KEFS scores).
		Confabulation due to temporal confusion (e.g. Schnider, 2003; Dalla Barba et al., 1998).	
Correct answer given	Wrong answer given		Wrong answer given and child wrongly remembers the false answer as correct (not assessed in this study).

125

3:4c) Do the neuropsychological assessment results and case studies inform intervention at home and at school?

The neuropsychological assessments indicate that confabulation stems from poor impulse control, poor monitoring of output and poor monitoring of their environment. The cardiac control child (SM) has shown that it is possible to have severe episodic memory difficulties and not confabulate. It is also possible to have poor impulse control and good monitoring skills and not confabulate. (For example, C3 – JR scored 4 on the Walk, Don't Walk subtest of the TEA-Ch and achieved 11 for Design Accuracy on the Design Fluency test (despite parental report of difficulties at the 97th centile on the monitoring domain of the BRIEF)). It appears that the key to managing confabulation is to reduce the impulsivity of these children, i.e. to slow their response time to enable them to think about what happened without generating an erroneous answer.

If better control of impulsive responding reduces opportunities for confabulation, children's confabulation may be improved by maturation of the frontal lobes during adolescence or from medication to improve frontal lobe functioning. For example, medication such as methylphenidate, which can rapidly reduce impulsive responding (Hood, Baird, Rankin & Isaacs, 2005) may be helpful. In their case report of a child with ADHD, Wells et al. (2005) strongly recommended the use of well titrated stimulant medication as they anticipated that this would reduce his impulsivity and therefore his tendency to lie.

However, there are suggestions in the literature that other non-medical management solutions might be helpful, such as trying to prevent the child answering the question immediately by giving them a few minutes alone before answering. However, as soon as they are asked a question, confabulators will start to formulate their response in their head and it is possible that simply thinking their ideas rather than speaking them may still be enough for them to confuse their ideas with reality. If this is so, it will be important to prevent children thinking impulsively as well as speaking impulsively and it may not be possible to do this without medication.

The child who confabulated most frequently in the clinic, BC, showed a great improvement in the accuracy of his recall when multiple-choice answers were given rather than asking him to use free-recall. This strategy can only be used when the adult is able to give the child a choice of two answers and they know that one of them is correct.

It is interesting to note that the control group, despite diagnoses that imply significant attention and executive difficulties, performed well on so many measures of attention and executive functioning on formal testing. This is something that is frequently observed when assessing these skills in able and motivated children with neurodevelopmental disorders. Despite their observed difficulties managing their attention in real-life environments, the 1:1 clinic situation and lack of distractions enables them to perform to a good level. This occurrence is one reason why failure on formal testing of attention is not an essential aspect of the diagnostic process, according to NICE guidelines (2000). It is also noteworthy that all the participants showed a range of executive deficits, which is expected with their

neurodevelopmental diagnoses, but their profiles all varied across the different subtests. This finding supports the executive deficit theories of autism and ADHD (Ozonoff & Jensen, 1999) and perhaps also suggests why children with these diagnoses present as such a heterogeneous group in terms of their everyday coping skills.

As discussed in the review paper, if it takes more cognitive control to lie than to tell the truth, the finding that confabulators have poor impulse control suggests that they find it harder to tell the truth than to lie. When they confabulate they are following the less cognitively effortful route and not suppressing false answers, merely saying the first thought that comes into their head. Their confabulation is not intentional but a consequence of poor monitoring and selection of information. So when children confabulate it may be that they need to exert greater cognitive control to locate the true response and withhold erroneous responses. If this is the case, children with known frontal pathology, such as children with Attention Deficit Hyperactivity Disorder (ADHD) (Himmelstein, Newcorn & Halperin, 2000) should be most susceptible to confabulation, although there appear to be no reported group studies as yet and, indeed none of the control children experienced any episodes of confabulation. Therefore, as with the adult cases, confabulation in children is not a necessary consequence of poor frontal functioning but a much more specific deficit that is linked to, but not solely caused by, poor impulse control.

If the confabulators are questioned or challenged about their confabulations they seem to find it easy to embellish their stories and these embellishments become embedded in their view of reality. Therefore, trying to ‘catch them out’ and prove

their story cannot be true does not appear to help them to see that they must be remembering wrongly.

The literature on managing delusions in schizophrenic patients shows that it is important not to condone/reinforce hallucinations and false beliefs. The case studies, particularly AJ, suggest that it is the same for confabulators and adults need to make it clear that they do not believe the confabulations.

While there is no evidence for any method being effective, this is because developmental confabulation has not yet been recognised as a condition in children. Therefore, interventions will need to be tried, monitored and evaluated.

While confabulation presents as a normal phase in the development of lying in some respects, it appeared qualitatively abnormal in the confabulators as they seemed unable to distinguish truth from reality, i.e. they could not be persuaded to change their stories when they were given time to reflect on what they had said, when told that honesty would be rewarded or when told that what they had said was impossible. Typically developing children do not present in this way. This study has not provided information about why confabulating children seem to remember their erroneous thoughts. It is this aspect of confabulation that seems to differentiate it most clearly from lying and impulsive false responding. The idea of delusional beliefs was discussed by Langdon & Coltheart (2000) and was included in Metcalf et al.'s (2007) review of confabulation. It is the analysis of this aspect of confabulation that will probably be the most useful tool for understanding this phenomenon.

3:4d) Recommendations for managing confabulation, including case study examples

When addressing the needs of confabulators, it is important for the adults around them to establish a system for management that can be applied consistently across contexts, i.e. both at home and at school. For example, adults must be consistent in their own use of fantasy. Parents introduce characters such as Father Christmas, the Tooth Fairy and Witches and Goblins to develop children's imaginations. Confabulators may well know that these characters do not really exist but it may serve to confuse them about when it is okay to use fantasy and when it is not. It is important to ensure that adults around confabulators do not refer to fantasy characters without ensuring that they understand they do not really exist. It will also be important to use concrete language when describing events and not introduce elements of fate, magic, ghosts or other factors that might imply there are supernatural powers at work. For example, ST clearly enjoyed his imaginative play and his fantasy life. While this is good in the context of play, ST had real difficulties sometimes with placing limits on his fantasy life and he had a significant tendency to confabulate that was inappropriate for his age. ST did not appear to have clear boundaries between fantasy and reality and he may have needed his parents and teachers to create clearer boundaries for him in his play. If they encouraged him to believe in things that were not true, they risked reducing his understanding of what was real and what was not.

Challenging confabulators about their stories seems often only to make them more adamant that they are true. Even questioning them about their stories may reinforce them in their minds. Therefore, it may be best to keep a low-key, non-

confrontational approach and not challenge them too directly, i.e. to avoid trying to get them to admit they were wrong and to change their story. For example, when AJ said that he shot lasers from his eyes, his mother could have simply responded that it would indeed be fun to have laser eyes and asked him no further questions about the event. Similarly with his story about the fox, when his friends were able to confirm that the fox did not come near them, it might be best to say that it would have been scary if the fox had attacked him but foxes are usually very scared of people. Keeping responses brief and unemotional will at least prevent reinforcing storytelling as a means for acquiring attention. AJ's stories often seemed to portray him in a hero role or with super-powers and it would be preferable to reward him for real actions he carried out that were brave or helpful.

Confabulators also need to be taught the value of accurate recall and perhaps simple games of observation could be introduced. For example, when out and about with a group of children, AJ's mother could warn them that she is going to ask a question about something they have all just seen and give them a chance to look around them, then get them to shut their eyes and ask them a simple observational question, such as 'How many dogs are in the park?' or 'What number bus is at the bus stop?'. It is essential that these are factual questions and can be verified immediately when they open their eyes. Similarly, when watching recorded television programmes, questions about what happened could be asked, as it is possible to rewind the programme to prove the correct answer. AJ may well be good at this and it will help him to see the value of accurate recall if he is praised and rewarded for his successes.

Although the event-monitoring examples described above might seem sensible, there is no evidence that they will be effective. For example, Teaford et al. (2002) tried unsuccessfully to use reality-monitoring training as an intervention with their 14 year old confabulator. However, for those children who are beginning to acknowledge that their confabulation might be a problem it would still be worth trying. For example, DC did not appear aware that her memory for events was different from other people's, just that people frequently became cross with her. She was aware that she did not understand how people just knew things, e.g. that they could deduce things from observing their environment. Therefore she would probably benefit from improving her observational skills by talking through events with an adult and learning to comment on what she has seen rather than what she thinks probably happened.

Role play and video footage could be used at school to practise making accurate observations of social events and to help children to see that people can interpret the same event differently. Teachers and parents should also ensure that they alter their management of situations to prevent them strengthening the triggers for confabulation. For example, DC's confabulation seemed more related to impulsivity as, by the time of her assessment, her confabulations all occurred when she was questioned about events. Her ability to recall events and parental descriptions of her behaviour also indicated that she had a somewhat unstable memory of her own experiences. It is likely that she was poor at monitoring what was happening around her and her own actions. DC's parents and teachers will need to help her to monitor her surroundings, perhaps by commenting from time to time on their own observations and how they interpret these. Direct questioning, such as 'Where's

your school bag?’ tend to provoke false responses in DC. Since DC is now aware of her memory problems to some extent, it may be more helpful to ask her if she can remember where she left her bag and reassure her that it is fine if she cannot but that she should come to look for it. In order to help DC keep track of all her possessions, it would be most helpful to establish clear routines around where things should go and these should be made as simple as possible. For example, a peg by the door for her bag, a box beneath the peg for her shoes. The more of her daily routine that can be learned procedurally, i.e. as automatic and not requiring too much conscious effort, the more established these better patterns of behaviour might become.

Teaford et al. (2002) found relaxation methods helpful and it is likely that these would be worth trying, if only to train the children to pause before answering and to reduce their stress around being questioned about their actions. Similarly adults working with the children should try to remind them not to answer immediately but to take a few moments before answering and to say if they simply cannot remember what happened (Wells et al., 2005).

DC’s tendency to say that her parents were harming her had potentially serious implications for her family and teachers. Her teachers were put in a very difficult position regarding whether they should report what she had said to social services, even if they did not believe what she was saying. At one point DC was due to move to boarding school and that school contacted the clinic seeking advice about whether they should accept her as a pupil. They did not want to put their staff at risk of being on the receiving end of false claims, but nor did they want to ignore a child’s claims if they were being abused by a member of staff. Following our discussion, they did

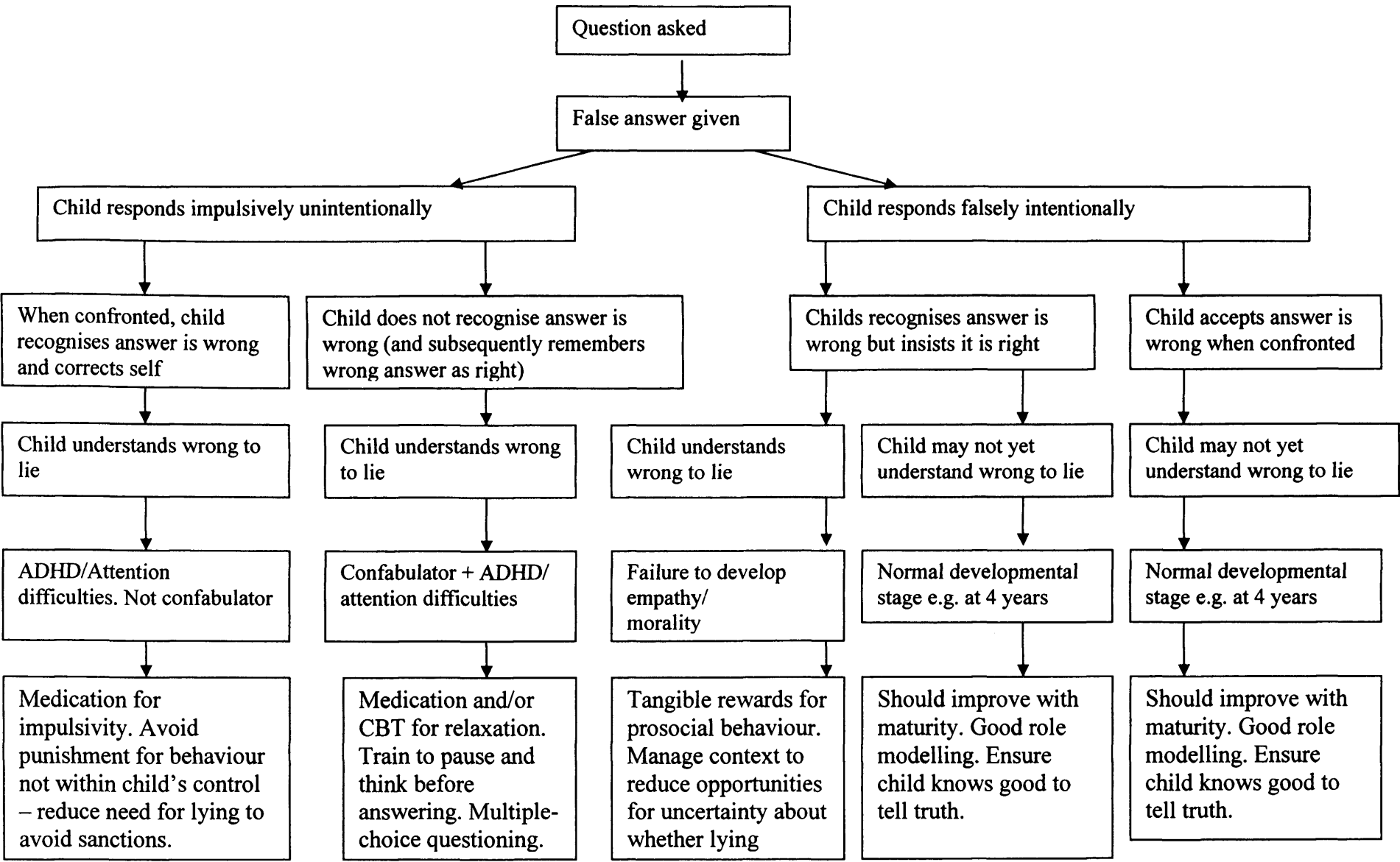
accept her as a pupil but they drew up specific guidelines for her management to ensure that, as far as possible, staff could neither be falsely accused, nor take advantage of her difficulties to abuse her. These, in fact, were similar to good practice anyway but staff were reminded of the need not to be alone with the child.

For all the confabulators, good liaison between home and school was essential. Particularly in DC's case, the school needed to monitor the situation closely because of their need to follow child protection guidelines but also to make sensible decisions about when these should be instigated. It was extremely useful for them to include the hospital staff in these decisions and reach a joint decision about the veracity of DC's claims. It is hoped that with better recognition of the existence of confabulation in children, it will be possible to link with child protection services to assist in future cases when there is doubt about the child's credibility in terms of their ability to distinguish between fantasy and reality.

Reports from children's schools suggested that confabulation was less of a problem there generally than at home but this may be because teachers felt less emotionally involved with the consequences of what the children were saying and just dealt with it as a minor behavioural problem. Parents may have felt it reflected badly on them as parents and were frustrated by the lack of effect of their interventions. Confabulation may also have occurred less at school because school provided a more structured routine and the behavioural expectations of school left less room for misinterpretation of events or motivations for behaviour. Executive problems generally tend to be more evident at home than at school during the primary years because of the high level of classroom structure (Meltzer, 2007).

Unfortunately, there is no further literature relating to the management of persistent confabulation in children and this is also the case for adults, despite the number of studies of confabulation in adults. In adults, spontaneous confabulation is usually a consequence of an acquired injury, in which case it may resolve with recovery, or a form of dementia, in which case there is unlikely to be improvement, or as a consequence of chronic alcoholism, in which case it usually resolves with improved diet (vitamin B1) and abstention from alcohol. It remains to be seen whether the developmental confabulators' difficulties resolve with maturation of their frontal lobes as they approach adulthood.

Figure B – Managing confabulation and lying.



3:4f) Review of the effect of recommendations for case studies

Following their clinical assessments, recommendations were made for the management of individual children's difficulties, based on the common sense advice discussed in the literature review and also on their individual profiles. It was not possible to rate the effectiveness of this advice formally as the original data gathered on the incidence of confabulation were not quantitatively reliable. This was partly because the triggers to and types of confabulation varied so broadly, but also because parents' ability to record data consistently varied so greatly. For example, DC could reliably be prompted to confabulate simply by asking her a direct question about something that had happened. Therefore frequency was within parental control to an extent. Her mother also noted that examples happened so frequently, she only recorded a sample. AJ could be prompted to confabulate by asking him about an event that had occurred that day. ST 'lived' in a fantasy world and BC confabulated almost constantly so frequency ratings would have been full time activities for parents. Therefore, the efficacy of interventions could only be recorded according to parental views on whether their children's confabulations were less frequent or whether they felt more able to control their environment to reduce their frequency. For all children parents reported that this was achieved although within limits. As with most unwanted behaviour, simply understanding that the child's behaviour was not as a result of malicious intent in the child or bad parenting helped to reduce stress levels and self-blame and parents were able to view their children more positively. This aspect alone appeared to help the situation. Understanding that impulsivity was driving the confabulations made it easier for parents to change their

questioning style and to remain calm when they knew their children were saying something that was not true.

In the past, DC has shown a great deal of forced confabulation and some spontaneous confabulation. Now aged 14, the spontaneous confabulation no longer occurs but forced confabulation still occurs, i.e. she gives a wrong answer when asked a question. Latest reports from the parents are that she is taking eyeQ, a food supplement of long chain fatty acids, and her parents say that this has been beneficial as her attention, impulse control and hand-eye coordination have improved.

AJ is currently taking Clonidine (an alternative to stimulant treatment that can be effective for ADHD and can also benefit children with tic disorders and sleep difficulties) and school reports indicate that this is having a beneficial effect on all his behaviours. AJ's mother still finds him hard to manage at home but confabulation is no longer a significant issue.

Since his assessment, BC began taking Risperidone (used to treat psychotic episodes and bipolar disorder, that can also be used as a mood stabiliser to reduce aggressive outbursts) which had a positive effect on his behaviour, including his impulsivity, but his parents felt the side-effects (weight gain) followed by a reduction in effectiveness meant that they could no longer justify giving him such a powerful medication. Most recent school reports indicate a slight improvement in his behaviour there, attributed largely to extreme persistence on the part of the school with the application of consistent systems for rewards and sanctions, good male role

models on the teaching staff and a more mature attitude from BC who can now remove himself sometimes from situations that make him angry. His parents no longer have concerns about his confabulation although he does still have a great fascination for violence.

The child with acquired confabulation, ST, could not take medication despite quite clear symptoms of ADHD, because it is contra-indicated with his heart condition. However, it is interesting to note that when he was re-assessed 3 years later, to provide advice for school, he was no longer confabulating at all. Although he continued to show symptoms of ADHD in class and to a lesser extent at home, he managed to achieve normal scores on formal measures of attention. This suggests that with maturity his frontal lobes were functioning more normally and he had more control over his attention, but there were still some residual difficulties evident in some situations.

3:4g) Methodological issues

One of the main methodological issues raised by this study is the difficulty of interpreting data meaningfully when they are based on such a small sample size. Ideally a study of this kind would have included a larger experimental group, e.g. 10-15 participants, so that clearer more reliable conclusions could have been drawn with respect to some degree of statistical analysis. Similarly an equivalent sized control group, age and IQ matched, would have been included for comparison. However, the sample size was limited by the small sample of participants available. The inclusion criteria, in terms of age and IQ, were kept as broad as possible to

maximise subject numbers. However, as this is the first neuropsychological study of confabulation in a group of children with neurodevelopmental disorders, the prevalence of the condition is not known and there is no national or local database from which to recruit subjects. Therefore this trial was used as an exploratory study and will be used to develop a further research protocol to examine confabulation in children.

As discussed in the review paper, neuropsychological tests for children are largely downscaled versions of adult tests, based on the assumption that children show similar skill dissociations to adults. However, they have been reasonably useful at showing when children have broad executive deficits as a consequence of frontal lobe damage or functional impairment. In that respect, they are not dissimilar to adult tests and they are certainly not specifically able to target regions within the frontal lobes. Executive measures appear primarily to assess tasks associated with dorsolateral dysfunction and confabulation appears more associated with orbitobasal function (Nedjam et al.; 2004). Therefore it seems executive tasks may help to identify more general executive dysfunction but cannot be used specifically to identify regional orbitobasal damage.

In order to make this study comparable with adult group studies, a confabulation battery would have been included (e.g. of the type devised by Dalla Barba, 1993). Although this was attempted, the pilot study into the usefulness of the two source-monitoring tests was insufficient to provide any useful comparative data between the two groups. Prior to conducting a larger scale study, it would be essential to establish some source-monitoring tasks that enable a distinction to be made between

the confabulators and non-confabulating controls. It is likely that these could be adapted from adult tasks but, given the developmental level of the group being assessed, it would be essential to check that any failure on the tasks is due to developmentally inappropriate confabulation rather than immature development of source-monitoring skills.

A more useful way of examining initial confabulation in children might be to use a task that elicits confabulation, such as a video clip about which children are subsequently asked questions. This would more closely represent the situation in which the children are exhibiting confabulation on a regular basis and may also provide a useful tool for monitoring the effectiveness of any interventions. The possibility of developing such a tool has been presented in the critical appraisal paper.

Until recently, imaging studies had focused on the use of MRI to determine structural damage and PET scans for assessing the functional status of brain tissue (Schnider, Treyer & Buck, 2000). However, in the past few years, functional imaging has produced a number of useful studies (e.g. Turner et al., in press) which have not only helped to delineate the brain regions implicated in confabulation but have also presented an imaging protocol that would be acceptable for use with children.

The small sample size and the lack of previous recognition of this perhaps very rare condition in children leads one to ask what the relevance of the study is for practising educational psychologists. However, the response from educational and clinical psychologists to presentations of this study has indicated that this type of

problem is not that uncommon and there does need to be some guidance for distinguishing between pathological liars and confabulators, as this will affect their management. Therefore, there needs to be good communication between hospital clinics, where these children are being treated medically and psychologically, educational psychologists, who are able to have the most impact on their school environments and to monitor the effectiveness of interventions, social services, to whom these children are likely to be presented at some point, and parents, who are usually the first to express concern. This paper has sought to help EPs to decide when lying has become developmentally inappropriate and how best to manage it. This thesis provides an outline of the evidence for each of these aspects and, in addition, alerts EPs to the existence of an apparently rare condition that can prevent children from being able to tell the truth. The discussion of the difficulties children with ADHD have with inhibiting false statements is also of relevance to EPs. It is by no means unusual for children with ADHD to be in trouble for lying and being pressured to tell the truth is likely to make them more anxious about telling the truth which in turn may make them more impulsive and more likely to give a false answer.

3:4h) Future studies

For further useful research to be undertaken in this area, it will be important to investigate the prevalence of this condition and to track its developmental course, i.e. to see whether the children do grow out of confabulating, albeit at a rate that is far behind their physical and intellectual development. The effects of medical and environmental management will need to be monitored over time. If sufficient

numbers of confabulating children do exist, it would be useful to develop a reliable confabulation battery that would help to identify confabulators and track their progress, as well as to use the tests in conjunction with functional imaging in order to determine the site of brain abnormality and to monitor the effect of medication on regional brain activity.

CONFABULATION IN CHILDREN

Section 4: Critical appraisal

4:1) Introduction

This study represents an initial, exploratory study into the existence and form of the phenomenon of confabulation in children. This condition is known to exist as an acquired disorder in adults but has not formally been documented in children, beyond two single case studies, one of acquired confabulation (Meguro, Suzuki, Tsukiura, Fujii, Yamadori et al., 1999) and one of pseudologica fantastica in a girl with PDD (Teaford, Shaw, Reiss & Lotspeich, 2002). Confabulation is potentially rare in children and during the course of this five-year study, only four children who met the criteria for inclusion presented to the hospital where the study was based.

Given these small numbers, the question should naturally be asked about the relevance of the study to the wider profession of applied psychologists. During the past five years, a larger number of children with confabulation were discussed via other team members and other clinics but many were found to have IQs within the low range or psychiatric or medical diagnoses which ruled them out of the study. However, the psychologists working with these children were still seeking some guidance regarding their management and they have subsequently found the recommendations from this study very useful. Their usefulness was determined from the degree to which parents reported them to be effective in at least minimising the impact of their children's difficulties. Giving parents some practical guidance helped them feel more in control of their children's difficulties and the explanations about the potential causes of their children's difficulties helped them to see their 'lying' as a special need rather than as a serious character flaw that might also have reflected badly on their skills as parents.

Despite all these positive aspects of the study, there are some significant methodological weaknesses that must be taken into account and issues that have had to be considered in interpreting the results. These will be presented and discussed below.

4:2) Discussion

4:2a) Reasons for conducting a small-scale study

Ideally a study of this kind would have included a larger experimental group, e.g. 10-15 participants, so that clearer, more reliable conclusions could have been drawn. Similarly a control group, matched for age and IQ, would have been found, including an equal number of participants.

While there were initially eight children put forward with confabulation, the children not included were ruled out because they had additional learning difficulties and, after assessment, it was considered likely that their confabulation was in line with their developmental age. Helping their parents to adjust their management strategies and expectations accordingly prevented further difficulties with confabulation. For example, a nine-year-old boy was referred with behavioural difficulties at school and confabulation. He had a diagnosis of ADHD when referred but his attention difficulties were considered mild, as he did not exhibit behavioural difficulties in class, therefore his parents were reluctant to use medication. He was being educated in a mainstream setting and was on School Action Plus. He had not undergone an assessment of his intellectual ability. When this was done, as part of the clinic

assessment, he was found to have significant learning difficulties (Full Scale IQ: 61). His parents and teachers had not appreciated the level of his language and conceptual understanding and had perhaps overestimated his reasoning ability and developmental level. The implications of the results were explained to his parents, i.e. that he had three possible reasons for having difficulties with telling the truth, 1) his ADHD, of which inattention was the predominant behavioural feature, might make it hard for him to maintain his attention to his surroundings and therefore he missed much of what was happening, 2) that it may still be developmentally appropriate for him to be testing out the effect of lying and how people react to it, and 3) that the time he spends watching fictional and fantastic programmes (which was considerable), coupled with his learning difficulties, might make it hard for him to dissociate fact from fiction.

Ways of helping their son to improve his accurate recall were discussed with the parents. For example, by explaining to them that his lies were perhaps less intentional/planned than they believed, they were able to correct what he had said and point out that they had seen him do what he said he had not. It was also suggested to them, that if they had seen him do the thing that they had asked him about, there was little point in asking him if he had done it. It would be more useful to tell him what he should have done instead, to model the appropriate behaviour for him and praise him for his attention. At school it transpired that the boy was receiving a great deal of 1:1 support from a support assistant assigned to another boy on his table and it seems that his support assistant was helping him so much with his work that his teacher had little direct involvement with him and was not aware of how he would struggle to cope without the support. They had attributed his

confabulation to a certain amount of eccentricity. Following the feedback from the clinic assessment, the support assistant was included in regular planning meetings for the boy and the teacher herself gave more direction to the support assistant to ensure that she was not over-supporting the boy. In terms of confabulation, the support assistant had not mentioned that as a problem to the teacher as she had not wanted to get the boy into trouble. Both she and the teacher were included in a discussion regarding how to minimise situations in which he was confronted about his actions.

It would not have been possible to include the children with developmental delay in the neuropsychological study. This is because it is not usually possible to determine a child's specific strengths and weaknesses on standardised neuropsychological tests with any degree of reliability if they have low IQ scores. It is also possible that their confabulation was in line with their overall cognitive development, i.e. that it was appropriate for their developmental level if not their age.

4:2b) Strengths and limitations of single and small-scale studies

Single case studies have provided the backbone of most neuropsychological research. It is the presentation of individuals with specific and unusual skill dissociations post-injury that have enabled neuropsychologists to identify dissociations between skills (e.g. Phineas Gage; discussed by Damasio, Grabowski, Frank, Galaburda & Damasio, 1994; Amnesic patient HM presented by Scoville & Milner, 1957). Single case studies are reasonably generalisable across the adult population because the mature adult brain is viewed as a reasonably static entity, i.e. its development is complete and to a certain extent, in the normal population, adult brains are

considered broadly comparable. This homogeneity cannot be assumed in the child population because their brains vary throughout development to adulthood so the timing of any injury has variable effects on the maturing brain. Similarly, in the child population there is much more scope for plasticity (Neville & Bavelier, 2000). For example, a severe left hemisphere injury in an adult may well have a permanent effect on specific aspects of language and communication (Ardila & Bernal, 2007). A severe left-sided injury in a child before 7 years old may result in less severe language damage if the language centres transfer to the right hemisphere (Liégeois, Connelly, Cross, Boyd, Gadian et al., 2004). However, such a transfer of skills may also have a detrimental effect on the functioning of the right hemisphere or result in a general lowering of IQ (Bates, Reilly, Wulfeck, Dronkers, Opie et al., 2001). Because of so many variables, single case studies in children can perhaps be viewed as of less use than in adults. However, it is exactly these variations in effect that make large case studies less reliable too. If apparently the same damage can have a variety of effects in a child, combining groups of children with similar damage may not tell us anything useful about the group because the results average out the different effects and final result may become meaningless.

Single case studies in children are particularly useful for identifying specific profiles of dissociation in individuals and then monitoring the effects of intervention. The systematic application of a single case design has as much importance in research as casework (Reason & Morfidi, 2001). Whenever working with an individual to provide interventions, their efficacy should be systematically evaluated. It is possible to evaluate generalisability of a method by the subsequent application of tried and tested methods to other similar individuals and evaluating efficacy. This approach

has similarities to precision teaching (Solity, 1991; Raybould & Solity, 1988), although precision teaching depends more on establishing a specific baseline for the skills to be taught, teaching those skills and reassessing. In neuropsychological case studies, the broader neuropsychological profile is assessed, hypotheses about the effect of specific difficulties on aspects of learning are proposed and neurocognitive interventions are developed accordingly with the intention of improving the neuropsychological deficit and/or its effect on everyday skills (see Rankin and Hood (2005) for an example of this process for specific memory impairments).

Unfortunately in this study it was not possible to establish a firm baseline for the frequency of confabulation for the children and to compare the frequency before and after intervention. This is because the sampling method incorporated too many variables. However, it was possible to determine the circumstances that triggered confabulation for each individual and since these varied so much across individuals, the results do show why it is not useful sometimes to combine results for individuals but more useful to consider them separately.

4.2c) Issues in the interpretation of small-scale study data

One of the most problematic issues with small and single case studies is the statistical analysis of data. There are three main ways of using data collected via single case studies:

- Standardised tests are used so the test scores of individuals can be compared to the normative data

- The scores of individuals are compared to their own scores under different conditions or at different time points
- The scores of the individual are compared to a small number of matched controls

This study used both the first and third method. The first method was used to evaluate scores from a clinical perspective, i.e. using the normative data to determine whether, as a group or as individuals, participants would be considered to have neuropsychological profiles that matched the adult participants with confabulation. The third method was used to compare the confabulators to a matched group of controls to determine whether their profiles, that were already considered to be indicative of confabulation, could occur in children with similar diagnoses without resulting in confabulation.

There are a number of statistical methods that can be used to show whether individual scores differ sufficiently from the norm to represent a statistically significant discrepancy (Crawford, Garthwaite and Gray, 2003). In neuropsychology, single case studies are routinely used to demonstrate dissociations between areas of skills, e.g. comparing deficits and preserved skills (Dunn and Kirsner, 2003). The most suitable form of analysis is the ANOVA (based on Fisher's (1920) Analysis of Variance model). The ANOVA is particularly useful in single case studies because it allows the comparison of even very small datasets. Despite its usefulness with small sample sizes, a review of the use of such methods (Parker, Brossart, Vannest, Long, De-Alba et al, 2005) indicated that out of the 124 psychology articles published within the last 15 years, only 11% used tests evaluating statistical significance,

confidence intervals and effect size. The majority relied on visual analysis. The authors discussed the reasons why there may be such reluctance to use statistical analysis and there were a number of possibilities, including the fact that the methods available for statistical analysis often yield markedly different results (e.g. Nourbakhsh & Ottenbacher, 1994)

However, Mycroft, Mitchell and Kay (2002) argued that comparisons of individual's scores with a control sample using ANOVA methods could produce good reliability, although results needed to be interpreted with caution when there was a degree of variance between the two groups.

Statistical analysis was not conducted as part of this study for a number of reasons. The first reason was that standardised tests were used and these enabled the use of the published data to establish significant discrepancies. For example, in this study, all the confabulators achieved Scaled Scores of 3 for the Walk, Don't Walk subtest of the Test of Everyday Attention for Children. The normal range for Scaled Scores is 7 to 13 and anything below 7 would be considered unusually low in a child who does not have more general learning difficulties. A Scaled Score of 3 is more than 2 standard deviations below the mean and is therefore likely to represent a clinically significant result. The validity of using such score comparisons is discussed by Sattler (2001).

When published tests are used and discrepancy data is available, it is probably less reliable to do additional statistical analysis because of the small sample size. The published tests used here provide data based on large standardised samples that are

probably more representative of the normal population than any small control sample used as part of the study would be. For example, the WISC-III norms were based on 814 children in the UK (2200 in the US). 1700 children participated in the standardisation of the D-KEFS, 293 in the TEA-Ch and 1000 in the CMS. If experimental tests were being used with no standardised data, then some statistical analysis would be essential. The Sunderland EMQ does not have normative data for comparison with controls and so has been used to provide a more qualitative example of which aspects of memory are problematic for them in their everyday lives.

Because of the small number of experimental participants available, it was not possible to conduct a large group study to examine the neuropsychological profiles of such children. Nor were there sufficient numbers of children in the experimental group to categorise them according to sub-types of confabulation, e.g. spontaneous confabulation versus forced confabulation (Kopelman, 1987). Such groupings would be potentially useful if it enabled observations to be made regarding whether the causes and effectiveness of the treatments of the different sub-types might vary.

4:2d) Is confabulation really that rare?

At the beginning of the study, there were eight children who had been put forward for inclusion on the basis of their confabulation by other professionals involved in the team. However, once the IQs of these individuals were assessed, it was clear that for the majority of those believed to be confabulating, their difficulties with telling the truth were probably developmentally appropriate, i.e. they had learning difficulties that would suggest their developmental age was some years less than

their chronological age and therefore it was likely they had immature source-monitoring skills. Once this was explained to their parents and the usual recommendations made for managing lying in younger children (e.g. to praise honesty, explaining that even when they do something bad it is better to be honest about it, not over-reacting to lying, reducing opportunities for lying through careful questioning, etc.) the problems resolved or were found to be manageable.

Although the children with low IQ were excluded from the study, they were still seen for clinical assessment and intervention and although parents were able to recognise that their difficulties with academic attainment, attention, self-help and independence could be features of learning difficulties, they were much less likely to view their lying as beyond their child's control. The parents had tried to manage their children's behaviour through punishment and appealing to the child's better nature, both of which seemed to exacerbate the problem. Once it had been discussed with them that their child's lying was part of a normal developmental process, they were successfully able to manage their behaviour and handle it less emotionally.

While it can be developmentally appropriate for children with learning difficulties to have delay in the development of their ability to distinguish fact from fantasy and to understand the moral implications of lying, it might also be possible for children with learning difficulties to confabulate, i.e. to have delusional beliefs that are not based on reality. No such children were encountered during the course of this study but that does not make the concept impossible. However, it would be difficult to conduct a neuropsychological evaluation of their skills because of the difficulties of establishing clear score discrepancies in children of low IQ (see Skeel, Sitzer, Fogal,

Wells & Johnstone (2003), for a discussion of issues regarding regression to the mean in discrepancy analysis). Once children's IQ scores are below the average range, certain statistical properties reduce the validity of results when compared with other test scores and can lead to false negatives in their interpretation.

4:2e) Difficulties with acquiring normal controls

When ethical approval had been obtained for the study, a number of local schools with whom good relations had been previously established, e.g. through casework or other research studies, were approached for permission to recruit their pupils for the control group. Three schools were initially contacted and happily gave permission. Fifteen consent forms were given to each school for the teachers to distribute to children who met inclusion criteria, i.e. within the correct age range and with no learning or behavioural difficulties. Based on the response from previous studies, this number of consent forms would have been sufficient to recruit around 15 participants. On this occasion, only two forms came back from one school and none from the others. When the schools were contacted to check whether teachers had handed out their forms, it was confirmed that they had. Therefore, it was concluded that parents were not happy for their children to participate with this study. Previous studies have included the same length of testing, which was to be carried out during the school day and would have involved missing about two hours of lessons. Therefore, it is unlikely that the length of testing was the only reason for parents not to consent. The timing of the recruitment had been discussed with the schools to check it did not clash with school exams or SATs, or any enjoyable activities that pupils would not want to miss. It was concluded therefore that it was the nature of

the study itself that put parents off. Or, if it did not actively deter parents, it did little to appeal to their altruistic natures in the same way previous studies have. A copy of the information sheet has been included in Appendix C.

It is also possible that the relevance of the study was not made sufficiently clear. When parents feel they are contributing to research that has a clear medical purpose or helps children suffering from the kind of medical condition or learning difficulty that engenders sympathy, they may feel more reward in volunteering to help. The nature of confabulation may not have brought about such feelings of sympathy or they may simply have insufficient understanding of what is meant by confabulation from the information sheet.

4.2f) The inclusion of a control group with neurodevelopmental disorders

At the beginning of the study, it was anticipated that the control group would consist of children with no learning difficulties, no neurodevelopmental disorders and no evidence of confabulation, i.e. a control group of children recruited through local schools. However, once several children had been assessed and their results considered in conjunction with those of the experimental group, it became clear that their data served no useful purpose. All they showed was that normal children who do not confabulate show no executive deficits or confabulation. This problem was considered at length and a more useful method for establishing the abnormality of the experimental group was decided upon. The control group's assessment results needed to show that the neuropsychological profile shown by the confabulators was different from other children with neurodevelopmental disorders and executive

deficits who did not confabulate, i.e. that it was their specific pattern of strengths and weaknesses that gave a clue as to the roots of their confabulation. Therefore, children with similar neurodevelopmental diagnoses (i.e. Attention Deficit Hyperactivity Disorder (ADHD), perhaps with co-morbid autistic spectrum disorders (ASD), Pervasive Developmental Disorders (PDD) or high functioning autism (HFA)) were used as controls. It was proposed that these children would show some executive/attention deficits on formal testing but, since they were not observed to confabulate, any neuropsychological differences between their test results and those of the experimental group might suggest the specific difficulties that lead to confabulation. The control group showed different profiles from each other so their scores cannot be combined to look at group differences.

4.2g) The pilot study

The structure of the main study was intended to include the neuropsychological assessment battery and the two source-monitoring tasks. There was no need to pilot the neuropsychological assessment battery as that consisted of a range of standardised assessment tools that were currently in regular clinic use so their administration and timing was already well rehearsed. The main need for the pilot was to determine the usefulness of the two source monitoring tasks. These were: -

a) A task based on Brebion, Gorman, Amador, Malaspina and Sharif's paper (2002) in which they used a source memory task involving the use of eight categories of objects, e.g. furniture, animals etc. For each of the categories, the researchers would give a verbal example from that category, present a picture of something from that

category and then ask the subject to think of and say a third example. Using this procedure, 24 items were generated. For five minutes the participants were given a break to get a drink of water and stretch their legs. After five minutes, the researcher then read out the 24 items and mixed them with another 24 items that had not been in the original group (distractors) and participants were asked to differentiate between those items from the original group and the distractors. For the original items, they were also required to say whether the item had been presented verbally by the examiner, as a picture, or whether the subject had thought of it themselves. The accuracy of their source memory was then evaluated. This task proved to be a useful tool for assessing people's source monitoring accuracy.

b) A task based on Rankin and O'Carroll (1995) which required participants to remember the source of the second of a pair of words they had learned. The children were asked to learn 7 pairs of related words over two trials. One word from each pair was then read out over repeated trials and they were asked to imagine rather than to say the paired word. After 5 trials their memory for each pair was checked and then they were asked to say how often they had heard each word being read. Their accuracy for the read words versus the imagined words was compared to determine whether they had been able to distinguish between their thoughts and what they had heard.

In order to pilot the source-monitoring tasks successfully the tasks needed to be tested on a group of confabulators and a group of controls. The controls were needed to ensure that normally developing children could complete the tasks successfully and monitor the source of the information provided. The tasks also needed to be

administered to confabulators to test whether they were sensitive enough to discriminate between confabulators and normal controls. At the time of the pilot study, three of the four confabulators had been identified. However, given the small number of confabulators available, the pilot study would have been the same as the main study for this particular task. It had been intended that the two source monitoring tasks would provide absolute measures, i.e. that normally developing children over the age of 8 would be able to achieve full marks for each test, i.e. that they would have a good ability to source monitor accurately, and the confabulators would make mistakes. The source monitoring tasks were therefore piloted on a small group of children belonging to willing friends, relatives and colleagues. On Source Monitoring 1, these children were able to achieve full marks so that result was considered sufficient to indicate that if the confabulators made any errors, they were showing source monitoring difficulties relative to the controls.

However, piloting SM2 was more problematic. It was not anticipated that children would be exact in their scores on SM2 but rather that they would be able to show a reasonably accurate evaluation of the relative frequency of the words that were always said out loud compared to those that they had only thought about. Therefore, it was thought possible that SM1 could have been used in the way described above, as an absolute measure, but SM2 would require a comparison of scores between the two groups.

Once SM2 started being administered to the experimental group, it became clear that their results were very varied, as were those of the controls, and that because for both groups they vastly over and/or underestimated the number of times each word pair

was heard, averaging their results across groups would be meaningless. It is possible that the variation in their results indicated that the children were too young for this type of task but observing them thinking about how to respond, it was considered more likely that they were all simply guessing. The task was too hard. Therefore, even if the group sizes had been large enough to provide good statistical analysis, it is likely that the results would have been meaningless.

Although SM1 was more successful at the piloting stage, once the experimental design was changed and children with neurodevelopmental disorders were introduced as controls, it became a less useful tool. This is because the children with neurodevelopmental disorders but no confabulation also made a number of errors. Therefore, SM1 was not useful for distinguishing between the two groups. At this stage the use and interpretation of both SM tasks was abandoned. However, the results of SM1 did suggest that children within both groups had specific difficulties with accurate monitoring of the sources of information. In particular, two of the confabulators misidentified the source of the picture words. The error rate in both groups may indicate why these children have such difficulties with their everyday memories, as reported by their parents' responses on the EMQ. Therefore, this test may have its uses, but not for distinguishing confabulators from non-confabulators.

4:2h) Limitations of neuropsychological assessments for children

As has been discussed in the review paper, neuropsychological tests for children are largely downscaled versions of adult tests, based on the assumption that children show similar skill dissociations to adults. For example, the Test of Everyday

Attention in Children (TEA-Ch; Manly, Anderson, Nimmo-Smith, Turner, Watson et al., 2001) is based on specific adult models of attention (e.g. Posner & Peterson, 1990). The assumption has been made that since these separate factors of attention exist in adults, they must be developing along linear channels throughout childhood and adolescence. While this may be a sensible argument, it is not clear at what point these specific attentional skills become measurably dissociated during childhood. Nor is it clear what constitutes a significant delay in one attention skill versus another at different points. Similarly, test batteries of executive skills, such as the Delis-Kaplan Executive Function System (D-KEFS), combine traditional executive measures based also on adult tests. The development of executive skills in children is a particularly complex area (Anderson, 1998; Dawson & Guare, 2004) and it is likely that in the future there will be tests that are developed from a developmental perspective that allow us to observe the development of executive processes and their interaction with each other, rather than use these adult tests that monitor children's progress towards adult dissociations without providing information about the other executive skills that they may be using on their way there.

Therefore, attention and executive tests are not evidence-driven tests based on clear knowledge of developmental pathways. However, they have been reasonably useful at showing when children have broad executive deficits as a consequence of frontal lobe damage or functional impairment but they are not specifically able to target precise regions within the frontal lobes. In that respect, they are not dissimilar to adult tests. Executive measures appear primarily to assess tasks associated with dorsolateral dysfunction and confabulation in adults appears more associated with orbitobasal function (Nedjam, Devouche & Dalla Barba, 2004). Therefore it seems

executive tasks, as they currently exist, may help to identify more general executive dysfunction but cannot be used specifically to identify orbitobasal damage. Given the lack of evidence for skill dissociation that is comparable to adults within this region, it is probably not a useful endeavour to attempt to create specific orbitobasal tests for children.

Until recently, imaging studies had focused on the use of MRI to determine structural damage and PET scans for assessing the functional status of brain tissue (Schnider, Treyer & Buck, 2000). However, in the past few years, functional imaging has produced a number of useful studies which have not only helped to delineate the brain regions implicated in confabulation but have also presented an imaging protocol that would be acceptable for use with children.

4:2i) Reliability of data collection methods

Although it is not straightforward to measure frequency of confabulation for the confabulators as a group to determine change, it would certainly be possible to measure it for individuals. One method would be to use the log that the parents in this study kept and, for each child, to decide exactly what type of confabulation will be recorded for frequency. For example, DC's mother was most troubled by DC's immediate lies when asked if she had done something, such as 'put her bag away'. Although the frequency of incidence was dependent on the frequency of her mother asking direct questions, if DC could be taught an alternative response system or if her mother learnt to present questions in a different way, the percentage of times DC

confabulated versus responded accurately could be recorded. This would mean that any change brought about by management style could be recorded.

The ABC chart (Bijou, Peterson & Ault, 1968; Reichle & Johnston, 1993) was used as a functional assessment tool that enabled data collection from the child's natural environment. It was used as a method of getting the parents to observe their children in an objective way although it only produces correlational rather than causal data. Parents' ability to complete these forms was very variable. It appears that several parents filled them in religiously, recording every example of confabulation or lying. Others recorded typical examples because there were simply too many incidents to record them all over such a time-frame. One parent recognised that she had some control over the frequency of her child's confabulation because she could trigger it simply by asking her a direct question about something she had done.

Therefore, as a means of recording incidents of confabulation and their triggers, the ABC charts were useful in that they provided a wealth of information. However, they were less useful for recording frequency and it is frequency that is required for assessing whether interventions reduce the incidence. However, given that the management strategies require such specific parental management of incidents, it is likely that frequency will also be affected by parental effectiveness as managers of interventions. If the recommendation were simply to give children a stimulant medication to reduce impulsivity, frequency recording might be useful. Since one of the recommendations for interventions is to reduce opportunities for confabulation, the frequency of subsequent confabulation will depend on how possible it is for parents to do that. Therefore, it is possible that the best measure of effectiveness of

the recommendation will be whether parents think they have helped them to manage their children's behaviour. The longer-term effects of the recommendations on the children's behaviour will be much harder to assess. It is possible that the specific difficulties that are causing confabulation will reduce with further brain maturity through adolescence, as was observed with the acquired confabulator in the study. It is also possible that if the interventions reduce the stress on the individual and provide them with more supportive environments, they will confabulate less and learn to use the strategies themselves, such as taking their time to answer and applying some reality-monitoring techniques. However, this remains to be seen and will require a longer-term follow-up. It proved difficult to quantify confabulation and parents also found it hard to deal with the frequency of incidents over such a time scale.

4:2j) Establishing a confabulation battery for children

Many adult group and case studies of confabulation use a series of experimental tests that elicit confabulation. For example, Dalla Barba (1993) conducted a study of an amnesic man, MB, and he used the following battery to provide opportunities for confabulation. He asked questions relating to the man's personal semantic information, his episodic memory, his orientation, his general knowledge and his verbal semantic memory. He also included 20 questions that the man would not know the answer to, 10 relating to general knowledge (e.g. What does Brad Pitt's father do?) and 10 relating to episodic information (e.g. What did you do on the 4th of October 1991?). In this study this type of questioning proved useful for eliciting

confabulation, particularly with respect to episodic information and temporal confusion.

However, having attempted to use tasks adapted from adult source-monitoring tasks, it did not seem that these were adequate for differentiating between the impulsive responding of ADHD and the erroneous responding of confabulators. The children's difficulties with respect to confabulation appear less evident on formal testing than in real-life situations. Asking children questions about an event they have witnessed would appear a suitable starting point as all the children were shown to confabulate about things they had seen. Therefore it might be most useful, at least in the initial investigation stages, to generate tests that more closely resemble real-life to elicit confabulation, before establishing more specific tasks. For example, children could be shown a short video clip of a scene and asked specific questions about it; some about things that they saw and some about things that were not in the clip to measure their susceptibility to confabulation. Questions could be asked about events that did not happen, simply as 'Did you see anyone get out of the blue van?', rather than, 'Who got out of the blue van?' to limit provoking false responses but to provide room for confabulation if that is the child's tendency. Perhaps an even more creative way to do this would be to develop a virtual environment, like those used by Beardon, Parsons and Neale (2001) in experiments with people with Asperger syndrome, to question children about their own actions as well as those of others.

Since the most challenging aspect of confabulators' difficulties appears to be their tendency to remember their errors as real, whereas children with ADHD may give false answers but can accept their inaccuracies after the event, the key test would be

to provide an environment that provokes confabulation. Children's subsequent ability to recognise their errors would then need to be measured.

4:2k) Potential difficulties in working with confabulators

Given the accusatory nature of some of the children's confabulations, certain precautions were made during the study. Whenever they were being assessed, a process that occurred 1:1, the assessor ensured that she made certain the child's seat was closest to the door. She also ensured that assessments were conducted in a room with a spy-hole on the door so that another member of the team could make regular inspections through the spy-hole to observe the proceedings. The door was left ajar and another member of staff was requested to look in from time to time. The observations were not disruptive to the assessment process but were undertaken to minimise the possibility of false claims against the assessor.

Although these precautions were sensible in the circumstances, it was not considered likely that claims would be made against the assessor. The false accusations were usually made against family members or in situations of conflict or heightened emotion. The children tended to enjoy the attention of the assessment and were very much on their best behaviour. The assessor had no expectation that the child with a tendency to violence would physically assault her because 1:1, the situation should be manageable. Similarly, she expected to be able to manage the environment to prevent personally involved confabulations. The regular door checks were made just in case she had mis-read the situation.

While individuals' confabulations were often complex and accusatory, causing great upset, the confabulators did not seem to be acting with any real pre-meditated intent to cause harm, i.e. they had not really thought through the implications of what they were saying. Therefore, although they might say someone was harming them intentionally, they did not appear distressed by their reported experiences and did not demand action. Rather they appeared to report incidents somewhat dispassionately and without embarrassment or fear of the consequences. This meant that although claims needed to be investigated, once children had reported them, if they were not asked about them again, they tended not to bring the topic up. It seemed that when that idea had passed, their thoughts moved on to something else. Therefore, the investigations were usually brief and quickly tied up, however upsetting they were initially.

4:21) Developing evidence-based interventions

All psychologists are required, as part of their professional practice, to apply interventions with regard to the evidence base. The concept of the scientist-practitioner became part of common practice in clinical psychology following the Boulder conference in 1949 (Corrie & Callahan, 2000). At this time the aim was to link the practice of psychologists with a sound research base and this was done by ensuring both were given equal emphasis in training (Petersen, 2007). While this model was readily adopted by clinical psychologists, it has historically been less central to the practice of educational psychologists (Hagstrom, Fry, Cramblet & Tanner, 2007; Huber, 2007). However, contemporary training courses for school psychologists in the US and educational psychologists in the UK are now

incorporating this model into their training and systems for psychologists to adapt this model to their working practices are evolving (Huber, 2007; Miller & Frederickson, 2006, Stoker & Figg, 1998).

The issues with regard to working within the limits of evidence-based practice for educational psychologists are presented by Fox (2003). He discusses the government-led drive for psychologists to provide a unified practice with the understanding that if psychologists are following research evidence, everyone will work in the same way and all clients/patients will receive the same treatment recommendation, regardless of their geographical location. The NHS view is that good research means a hierarchy of evidence evaluation, with randomised controlled trials as the gold standard for evaluating treatments. However, Fox makes the case that large randomised controlled trials as a means of assessing the efficacy of interventions can have little relevance for individuals in the classroom. It is for individual children that most EPs have to provide interventions and their needs vary according to a multitude of environmental factors and within-child differences as well as their most pertinent 'diagnosis'. The complexity of children's contexts and needs perhaps contributes to the failure of so many government-led initiatives; they simply do not reflect the everyday issues that children face.

Fox also points out that EPs have access to a wide range of sources from which to create their own evidence-base. For example, access to the Internet makes it much easier for EPs to keep abreast of research evidence from a wide variety of related fields (e.g. clinical psychology and neuropsychological rehabilitation literature, all of

which may help to inform their practice) and to access information from a range of scientific search engines.

Fox then brings together ideas about how EPs operate to provide services to schools and individuals and concludes that it is the professional formulation skills of the EP for which there must be an evidence base rather than a straightforward application of a deficit-treatment model, because the individuals being assessed and treated rarely fit a prescribed pattern. The EP must know the evidence about the application of different interventions, but as their effectiveness depends on many other factors that need to be taken into account, there is rarely a right answer but rather an evolving process of management that needs continual monitoring and adjusting.

While the evidence base for interventions for managing childhood confabulation is small, e.g. from the child literature on the management of impulsivity and lying, there are pockets of evidence from the adult literature on confabulation. Any treatment of difficulties with confabulation in children must be devised and monitored with regard to this evidence base. The issues around developing an evidence base for interventions are discussed by Deegear and Lawson (2003), particularly with respect to the use of single-case intervention studies and the importance of collating data across studies to provide a meaningful evidence base.

4:2m) Relevance of the study to the field of educational psychology and other professional groups

While the decision was made to make this study the main research thesis for the doctorate, the research into confabulation had already been commenced prior to the beginning of the doctorate. It had originally been intended as a purely neuropsychological small-scale study but as the study progressed it raised a number of issues that encompassed the children's home and educational management that meant the scope of the study was broadened. A review of the normal process of the development of lying was needed to establish the context of the study and consideration was required regarding how more general advice for managing lying fitted within the confabulation frameworks outlined. Presentations of the neuropsychological aspects of the study alone to educational psychologists have shown that there is in fact a general interest in the neuropsychology of confabulation, particularly discussions of aspects of memory and attention and how these relate to interpretation, storage and recall of experiences. Therefore, in retrospect it is not clear that it was essential to broaden the focus of the study in order to have interest and relevance for EPs generally. However, it has almost certainly ensured that the thesis has been set in a more ecologically valid context than would otherwise have been achieved, i.e. to cover the circumstances in which confabulation occurs and to think about environmental adaptations that can be made to support the specific difficulties of the children affected.

Although this study focuses on a small group of children with an apparently rare difficulty, the issues dealt with in the assessment and management of confabulation

are of relevance to any professionals working with children. Social services and the police knew several of the children whose assessments triggered the study and their parents and other pupils had been under investigation. Fortunately in none of these cases was anyone found to be at fault but this may not always be the case.

The process of the development of the ability to lie is a complex, multi-faceted one. EPs will be expected to be able to give advice about when lying becomes developmentally inappropriate and how best to manage it. This thesis provides an outline of the evidence for each of these aspects and, in addition, alerts EPs to the existence of an apparently rare condition that can prevent children from being able to tell the truth. The discussion of the difficulties children with ADHD have with inhibiting false statements is also of relevance to EPs, as that aspect of that particular feature of ADHD may not be known to EPs. It is by no means unusual for children with ADHD to be in trouble for deliberately lying because after the event they can acknowledge that what they said was not true. That knowledge makes it no easier for them to tell the truth in the future and in fact the converse may be true, that becoming anxious about telling the truth when confronted makes them more impulsive and more likely to give a false answer.

One factor that has become clear during the course of the study is that the confabulating children do not have control over their confabulation and the problem seems worse when they are put under pressure to answer. These observations have enabled the researcher to recommend that children are not punished for confabulating, as it does not appear to be within their control, nor are they put under

pressure to try to tell the truth immediately as that appears to make them more likely to confabulate.

While there are no formal studies investigating the use of interventions for persistent lying in school settings, most schools include teaching of moral responsibility as part of their PSHE curriculum. The evidence that is available from research studies (e.g. Talwar, Lee, Bala and Lindsay, 2002) that teaching children about the need for honesty will make them more likely to tell the truth. Such teaching might benefit those children who have not been exposed to a clear moral framework at home. However, this study indicates that such teaching will have little effect on children who confabulate. In their case, their inability to tell the truth is not simply a matter of not knowing and believing that to tell the truth is important. Confabulators appear to want to tell the truth but cannot maintain an accurate memory of what the truth is. Their impulsive responding is reasonably easy to identify and perhaps also to treat, e.g. with medication, training to pause before replying and using multiple choice questioning rather than free-recall. However, what this study does not address or assess is the issue of memory for these children. When the children generate false responses, they seem to remember them as correct and these memories appear very credible to them. This instability of memory, whatever it is that prevents them being able to recognise that imagined events did not really happen, remains a problem for future studies. Children with ADHD who respond impulsively and say the wrong thing seem to be able to recognise their mistakes when given time to think about what really happened. The confabulating children do not.

As with many children seen at the clinic, local psychology services had little direct involvement. Children were referred to the clinic by their paediatricians but were usually on the waiting list for CAMHS support if they had been referred at all. Following the clinic assessment, the paediatricians would show interest in the conclusions but none of the local CAMHS services made any contact when they did become involved with the children. Three of the children were therefore seen at the clinic for follow-up management and one moved too far away but regular phone contact between parents and the school with the clinic proved helpful. For all four children, schools were contacted after the initial assessment and were receptive to feedback. However, local educational psychologists were not directly involved with any of the children during the period of assessment and the schools had not prioritised them for individual EP time, possibly because the children were already attending or were due to attend the neurodevelopmental clinic. Therefore, the majority of information gathering and feedback on intervention was conducted via the parents. For future research purposes, it would be important to liaise more closely with schools and local psychology services because this study does not establish exactly how these children present in school and how teachers manage their behaviour.

4:2n) Issues of confidentiality related to small sample size

Although all participants in the study have been made completely unidentifiable to the public, the small study size, and the need to have accurate assessment data and the detailed parental logs mean that the parents of the children involved will have no difficulty identifying their own children. While all the parents and the children have

given consent for their participation in this study, given that they can identify themselves and their families from the information given, it is not possible or right to discuss for example how family background might have contributed to children's confabulating behaviour. If, for example, a family was very disorganised and dishonest, perhaps in trouble with the law, it might be harder to conclude that the problem was purely within the child as it would be possible that they were being exposed to poor role modelling of honest behaviour. These issues would need to be discussed in the study but it would not be ethical to do so, given the parents' access to the information. However, since the issue of parental management remains an essential discussion point it should perhaps be raised separately from the individual case studies. It is possible that home environment could make a child a compulsive liar with poor understanding of the need for honesty. Such a child would not be considered to be a confabulator unless they could not distinguish between fantasy and reality and it is not known whether poor environment could create such a difficulty.

As part of a further study in this area, it would be useful to examine how children with persistent lying as a consequence of home environment respond to teaching about honesty and morality. As with younger children who respond to their parents' guidance, it is possible that the persistent liars have simply not had this development opportunity. On the other hand, it is important to consider that their parents' inability to help their development in this area may be a consequence of their own difficulties in this area, i.e. they might have a genetic predisposition towards confabulation themselves. Therefore this complex issue would need to be tackled very carefully

over a range of different experimental conditions to tease out the causes of persistent lying.

Fortunately, the four families in the study did not present with complex and ambiguous backgrounds. However, even to a much lesser extent, any speculation about the role of the family in the support of the child becomes difficult to discuss impartially, especially as clinical work with each of the families is on-going.

4:2o) Limitations of ethics permission

Ethical permission for the study needed to be established before the main study commenced. This meant that if amendments needed to be made during the process of the study, amendments needed to be presented to the ethics committee. The ethics directives say further permission is only needed for substantial changes but what constitutes a substantial change is not specified. During the course of the study it became apparent that some children in either the control or experimental groups might be already taking medication for their various behavioural/attention difficulties. Ideally the assessments would be conducted with all participants either taking the same medication or no medication. Since participants had different diagnoses and medication needs, they should ideally have been assessed without medication. However, ethical permission had not been sought to ask participants not to take their medication on the day of the assessment and it was considered unsafe to ask people to do so without permission. Also some medications, like Clonidine, need to be gradually withdrawn and cannot be stopped and started on a day-by-day basis.

Therefore, participants had to be assessed in their 'normal' state, i.e. taking whatever medication was routinely prescribed.

The only medication that would be likely to effect confabulation, based on the evidence thus far, would be any that reduces impulsivity as that would reduce the confabulators' tendency to respond without checking the veracity of their answers. Therefore any of the treatments for ADHD would be likely to have this effect. However, since all the confabulators scored poorly for impulsivity (as measured by the Walk, Don't Walk subtest of the TEA-Ch), impulsivity clearly remains an issue for them. It is possible that the medications being taken by the control children reduced their impulsivity but for them, confabulation had not been an issue even before they had been receiving medication. Therefore, although the medications could be affecting the neuropsychological test scores, it is unlikely that they are masking confabulatory profiles in the control children. As concluded from the empirical study, the two issues that appear to lead to confabulation are impulsivity and delusional beliefs and reducing impulsivity appears to have little effect on the delusional beliefs (false memory) problem seen in the confabulators.

4:2p) Personal reflection on the research process

This study was commenced on the basis of clinical need and the form of the study was initially a purely neuropsychological investigation. As the project progressed and was integrated with the doctorate process, it changed greatly. A much broader context for the research was required, to include the children's presentations at school and to consider their management in a variety of settings. Adding these

different parameters has helped to set the study in a more useful context. It not only makes it of interest to a broader range of people, it exposes some of the many unknowns about this condition in children. While adult studies have proved able to demonstrate the existence of confabulation in standardised experimental tasks, this study suggests that for children, confabulation is most evident in their everyday experiences and research into their confabulation will require experimental processes that can reflect their everyday lives, at least while establishing a tighter conceptualisation of the process of confabulation in children.

4:3) Summary

While there are a number of methodological challenges inherent in a study of this nature, these are not insurmountable and the process of addressing and evaluating them has been a useful and educational one. In retrospect, there are a number of things that could usefully have been done differently. For example, a more ecologically valid measure of confabulation in children could have been tried, such as using video replay of an event. In terms of assessing the effectiveness of interventions, an additional parental measure could have been used. For example, all of the parents found their children's confabulations frustrating to deal with and it would perhaps be useful to include a measure of frustration for the parents or their perception of their levels of control over their children's honesty pre- and post-intervention to determine any changes intervention brought to their quality of life.

However, upon reflection, it is unlikely that these methodological issues detract significantly from the usefulness of this study as an initial exploratory piece of work into confabulation in children.

APPENDIX A

REFERENCES

References

Ackil, J.K. & Zaragoza, M.S. (1998). Memorial consequences of forced confabulation: age differences in susceptibility to false memories. *Developmental Psychology*, 34, 1358-1372.

Aldrich, M. (1998) Diagnostic aspects of narcolepsy. *Neurology*, 50, 2-7.

Aloisi, B.A., McKone, E. & Heubeck, B.G. (2004) Implicit and explicit memory performance in children with attention deficit/hyperactivity disorder. *British Journal of Experimental Psychology*, 22, 275-292.

American Academy of Child and Adolescent Psychiatry (2003) Facts for Families. Internet publication – www.aacap.org/publications/factsfam/lying.htm.

Anderson, V. (1998) *Developmental Neuropsychology: A Clinical Approach*. Psychology press: Taylor & Francis.

Ardila, A. & Bernal, B. (2007) What can be localized in the brain? Toward a “factor” theory on brain organisation of cognition. *International Journal of Neuroscience*, 117, 935-969.

- Bates, E., Reilly, J., Wulfeck, B., Dronkers, N., Opie, M., Fenson, J., Kriz, S., Jeffries, R. Miller, L. & Herbst, K. (2001) Differential effects of unilateral lesions on language production in children and adults. *Brain and Language*, 79, 223-265.
- Beardon, L., Parsons, S. & Neale, H. (2001) An inter-disciplinary approach to investigating the use of virtual reality environments for people with Asperger Syndrome. *Educational and Child Psychology*, 18, 53-62.
- Benson, D.F., Djenderedjian, A. Miller, B.L., Pachana, N.A., Chang, L., Itti, L., Eng, G.E. & Mena, I. (1996) Neural basis of confabulation. *Neurology*. 46, 1239-1243.
- Bijou, S., Peterson, R.F. & Ault, M.H. (1968) A method to integrate description and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavioural Analysis*, 1, 175-191.
- Blatt, M. & Kohlberg, L. (1975). The effect of classroom moral discussion upon children's level of moral judgment. *Journal of Moral Education*, 4, 129-161.
- Bowler, D.M., Gardiner, J.M., Grice, S. & Saavalainen, P. (2000) Memory illusions: False recall and recognition in adults with Asperger's syndrome. *Journal of Abnormal Psychology*, 109, 663-672.

Brebion, G., Gorman, J.M., Amador, X., Malaspina, D. & Sharif, Z. (2002) Source monitoring impairments in schizophrenia: characterisation and associations with positive and negative symptomatology. *Psychiatry Research*, 112, 27-39.

Bussey, K. & Grimbeek, E. J. (2000) Children's conceptions of lying and truth telling: Implications for child witnesses. *Legal and Criminological Psychology*, 5, 187-199.

Bussey, K. (1999). Children's categorisation and evaluation of different types of lies and truths. *Child Development*, 70, 1338-1347.

Bussey, K. (1992) Lying and truthfulness: Children's definitions, standards and evaluative reactions. *Child Development*, 63, 1338-1347.

Cabeza, R., Locantore, J.K. & Anderson, N.D. (2003) Lateralisation of prefrontal activity during episodic memory retrieval: Evidence for the production monitoring hypothesis. *Journal of Cognitive Neuroscience*, 15, 249-259.

Cansino, S., Maquet, P., Dolan, R.J. & Rugg, M.D. (2002) Brain activity underlying encoding and retrieval of source memory. *Cerebral Cortex*, 12, 1048-1056.

Ceci, S.J., Loftus, E.F., Leichtman, M.D. & Bruck, M. (1994) The possible role of source misattributions in the creation of false beliefs among preschoolers. *International Journal of Clinical and Experimental Hypnosis*, 62, 304-320.

Chahal, K. & Cassidy, T. (1995) Deception and its detection in children: A study of adult accuracy. *Psychology, Crime & Law*, 1, 237-245.

Cohen, M. (1997) *Children's Memory Scale*. San Antonio, Texas: Harcourt Assessment Inc.

Corrie, S. & Callahan, M.M. (2000) A review of the scientist-practitioner model: Reflections on its potential contribution to counselling psychology within the context of current health care trends. *British Journal of Medical Psychology*, 73, 413-427.

Craig, R.A. & Molder, C. (2003) The use of law enforcement polygraph tests with juveniles. *Journal of Credibility Assessment and Witness Psychology*, 4, 63-74.

Crawford, J. R., Garthwaite, P. H. & Gray, C. D. (2003). Wanted: Fully operational definitions of dissociations in single-case studies. *Cortex*, 39, 357-370.

Crossman, A.M. & Lewis, M. (2006) Adults' ability to detect children's lying. *Behavioural Sciences and the Law*, 24, 703-715.

Cunningham, J.M., Pliskin, N.H., Cassisi, J.E., Tsang, B. & Rao, S.M. (1997) Relationship between confabulation and measures of memory and executive function. *Journal of Clinical and Experimental Neuropsychology*, 19, 867-877.

Czernochowski, D., Mecklinger, A., Johansson, M. & Brinkmann, M. (2005). Age-related differences in familiarity and recollection: ERP evidence from a

recognition memory study in children and young adults.

Cognitive, Affective and Behavioral Neuroscience, 5, 417-433.

Dalla Barba, G. (1993) Different patterns of confabulation. *Cortex*, 29, 567-581.

Dalla Barba, G., Boisse, M-F, Bartolomeo, P. & Bachoud-Levi, A-C. (1997a)

Confabulation following rupture of posterior communicating artery. *Cortex*, 33, 563-570.

Dalla Barba, G., Cappalietti, J.Y., Signorini, M. & Denes, G. (1997b) Confabulation:

Remembering 'another' past, planning 'another' future. *Neurocase*, 3, 425-435.

Dalla Barba, G., Mantovan, M.C., Cappalietti, J.Y. & Denes, G. (1998) Temporal

gradient in confabulation. *Cortex*, 34, 417-426.

Damasio, H., Grabowski, T., Frank, R., Galaburda, A.M. & Damasio, A.R. (1994).

"The return of Phineas Gage: clues about the brain from the skull of a famous patient." *Science*, 264, 1102-5.

Dawson, P. & Guare, R. (2004) *Executive Skills in Children and Adolescents*. New

York: Guilford Press.

Dayus, B. & van den Broek, M.D. (2000) Treatment of stable delusional

confabulations using self-monitoring training. *Neuropsychological Rehabilitation*, 10, 415-427.

Deegear, J. & Lawson, D.M. (2003) The utility of empirically supported treatments.

Professional Psychology: Research and Practice, 34, 271-277.

Delis, D. C., Kaplan, E. & Kramer, J. H. (2001). *Delis-Kaplan Executive Function*

System (D-KEFS). San Antonio, TX: Harcourt.

DeLuca, J. (2000) A cognitive perspective on confabulation. *Neuropsychanalysis*.

2, 119-132.

Demery, J.A., Hanlon, R.E. & Bauer, R.M. (2001) Profound amnesia and

confabulation following traumatic brain injury. *Neurocase*, 7, 295–302.

Duff, K., Schoenberg, M.R., Scott, J.G. & Adams, R.L. (2005) The relationship

between executive functioning and verbal and visual learning and memory. *Archives*

of Clinical Neuropsychology, 20, 111-122.

Dunn, J. C., & Kirsner, K. (2003). What can we infer from double dissociations?

Cortex, 39, 1-7.

Edelstyn NMJ, Drakeford JL, Oyebode F & Findlay CD (2003) An investigation of

conscious recollection, false recognition and delusional misidentification in patients

with schizophrenia. *Psychopathology*, 36, 312-319.

Farrant, A., Blades, M. & Boucher, J. (1998) Source monitoring by children with autism. *Journal of Autism & Developmental Disorders*, 28, 43-50.

Fischer, R.S., Alexander, M.P., D'Esposito, M. & Otto, R. (1995) Neuropsychological and neuroanatomical correlates of confabulation. *Journal of Clinical and Experimental Neuropsychology*, 17, 20-28.

Fisher, R. (1920) A mathematical examination of the methods of determining the accuracy of observation by the mean error and the mean square error. *Monthly Notes of the Royal Astronomical Society*, 80, 758-770.

Fotopoulou, A. Solms, M. & Turnbull, O. (2004) Wishful reality distortions in confabulation: a case report. *Neuropsychologia*, 42, 726-744.

Fox, M. (2003) Opening Pandora's Box: evidence-based practice for educational psychologists. *Educational Psychology in Practice*, 19, 91-102.

Garven, S., Wood, J.M. & Malpass, R.S. (2000) Allegations of wrongdoing: The effects of reinforcement on children's mundane and fantastic claims. *Journal of Applied Psychology*, 85, 38-49.

Geiselman, R.E., Fisher, R.P., Firstenberg, I., Hutton, L.A., Sullivan, S.J., Avetissian, I.V. & Prosk, A.L. (1984) Enhancement of eyewitness memory: an

empirical evaluation of the cognitive interview. *Journal of Police Science and Administration*, 12, 74-79.

Gervais, J., Tremblay, R.E., Desmarais-Gervais, L. & Vitaro, F. (2000) Children's persistent lying, gender differences, and disruptive behaviours: A longitudinal perspective. *International Journal of Behavioral Development*, 24, 213-221.

Gibbs, J.C. (2006). Should Kohlberg's cognitive-developmental approach to morality be replaced with a more pragmatic approach? Comment on Krebs and Denton (2005). *Psychological Review*, 111, 666-671.

Gilboa, A. & Moscovitch, M. (2002). The cognitive neuroscience of confabulation: A review and a model. In: A.D. Baddeley M.D. Kopelman, and B.A. Wilson (Eds.) *Handbook of Memory Disorders, 2nd Edition*. London: Wiley. Pp. 315-342.

Gilboa, A., Alain, C., Stuss, D.T., Melo, B., Miller, S. & Moscovitch, M. (2006) Mechanisms of spontaneous confabulations: a strategic retrieval account. *Brain*, 10. 295-307.

Gilligan, C. (1982) *In a Different Voice. Psychological Theory and Women's Development*. Cambridge and London: Harvard University Press.

Gioia, G.A., Isquith, P.K., Guy, S.C. & Kenworthy, L. (2000) *Behaviour rating Inventory of Executive Function*. San Antonio, Texas: Harcourt Assessment Inc.

Goodman, R. (1999) The extended version of the Strengths and Difficulties Questionnaire as a guide to child psychiatric caseness and consequent burden.

Journal of Child Psychology and Psychiatry, 40,791-801.

Hagstrom, R.P. (2007) Educational psychologists as scientist-practitioners. *American Behavioral Scientist*, 50, 797-807.

Hashimoto, R., Tanaka, Y. & Nakano, I. (2000) Amnesic confabulatory syndrome after focal basal forebrain damage. *Neurology*, 54, 978-983.

Himelstein, J., Newcorn, J.H. & Halperin, J.M. (2000) The neurobiology of attention-deficit hyperactivity disorder. *Frontiers in Bioscience*, 5, 461-478.

Hood, J., Baird, G., Rankin, P. M. & Isaacs, E. (2005) Immediate effects of methylphenidate medication on cognitive attention skills of children with Attention Deficit Hyperactivity Disorder. *Developmental Medicine and Child Neurology*, 47, 408-414.

Huber, D.R. (2007) Is the scientist-practitioner model viable for school psychology practice? *American Behavioural Scientist*, 50, 778-788.

Isaacs, E.B., Vargha-Khadem, F., Watkins, K.E., Lucas, A., Mishkin, M. & Gadian, D.G. (2003) Developmental amnesia and its relationship to degree of hippocampal atrophy. *Proceedings of the National Academy of Sciences*, 100, 13060-13063.

Johns, L.C., Rossell, S., Frith, C., Ahmad, F., Hemsley, D., Kuipers, E. & McGuire, P.K. (2001) Verbal self-monitoring and auditory verbal hallucinations in patients with schizophrenia. *Psychological Medicine*, 31, 705-715.

Joseph, R., Gallagher, R.E. Holloway, W. & Kahn, J. (1984) Two brains, one child: interhemispheric information transfer deficits and confabulatory responding in children aged 4, 7, 10. *Cortex*, 20, 317-331.

Klein, S.B., Loftus, J. & Kihlstrom, J.F. (2002) Memory and temporal experience: The effects of episodic memory loss on an amnesic patient's ability to remember the past and imagine the future. *Social Cognition*, 20, 353-380.

Kohlberg, L. (1958). "*The Development of Modes of Thinking and Choices in Years 10 to 16*". Ph. D. dissertation, University of Chicago.

Kolak, D. (1993) Finding ourselves: identification, identity and multiple personality. *Philosophical Psychology*, 6, 363-386.

Kopelman, M.D. (1987) Two types of confabulation. *Journal of Neurology, Neurosurgery & Psychiatry*, 50, 482-487.

Koriat, A., Goldsmith, M., Schneider, W., & Nakash-Dura, M. (2001). The credibility of children's testimony: Can children control the accuracy of their memory reports? *Journal of Experimental Child Psychology*, 79, 405-437.

Krebs, D.L. & Denton, K. (2006). Explanatory limitations of cognitive-developmental approaches to morality. *Psychological Review*, 113, 672-675.

Langdon, R. & Coltheart, M. (2000). The cognitive neuropsychology of delusions. *Mind & Language*, 15, 184-218.

Larsson, A. S., Granhag, P. A., & Spjut, E. (2003). Children's recall and the Cognitive Interview: Do the positive effects hold over time? *Applied Cognitive Psychology*, 17, 203-214.

Larsson, A. S., & Granhag, P. A. (2005). Interviewing children with the cognitive interview: Assessing the reliability of statements based on observed and imagined events. *Journal of Scandinavian Psychology*, 46, 49-57.

LaVoie, D., Willoughby, J. & Faulkner, L.K. (2006) Frontal lobe dysfunction and false memory susceptibility in older adults. *Experimental Aging Research*, 32, 1-21.

Leung, A.K., Robson, W.L. & Lim, S.H. (1992) Lying in children. *Journal of the Royal Society of Health*, 112, 221-224.

Liégeois, F., Connelly, A., Cross, J.H., Boyd, S., Gadian, D.G., Vargha-Khadem, F. & Baldeweg, T. (2004). Language reorganization in children with early onset lesions of the left hemisphere: an fMRI study. *Brain*. 127, 1229-1236.

Loftus, E. F. & Zanni, G. (1975). Eyewitness testimony: The influence of the wording of a question. *Bulletin of Psychonomic Society*, 5, 19-31.

Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P. & Robertson, I.H. (2001) The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative samples and ADHD performance. *Journal of Child Psychology and Psychiatry*, 42, 1065-1081.

Manly, T., Robertson, I. H., Anderson, V. & Nimmo-Smith, I. (1998). *Test of Everyday Attention for Children (TEA-Ch)*. London: Harcourt

McGaughran, L.S. & Wylie, A.A, (1969) Continuity in the development of conceptual behaviour in preschool children. *Developmental Psychology*, 1, 181-192.

Meguro, Y., Suzuki, K., Tsukiura, T., Fujii, T., Yamadori, A. & Kudoh, M. (1999) Episodic and semantic memory after traumatic brain injury in a child. *Brain and Nerve*, 51, 985-990.

Mellor, D. (2004) Furthering the Use of the Strengths and Difficulties Questionnaire: Reliability With Younger Child Respondents. *Psychological Assessment*, 16, 396-401.

Meltzer, L. (2007) *Executive Functions in Education: From Theory to Practice*. Guilford Press: NY.

Memon, A. & Stevenage, S.V. (1996) Interviewing Witnesses: What Works and What Doesn't? *Psychology*: 7(6), witness-memory.1.memon.

Metcalf, K., Langdon, R. & Coltheart, M. (2007) Models of Confabulation: A critical review and a new framework. *Cognitive Neuropsychology*, 24, 23-47.

Miller & Frederickson, N. (2006) Generalizable findings and idiographic problems: Struggles and successes for educational psychologists as scientist practitioners. In D.A. Lane & S. Corrie (eds.) *The modern scientist-practitioner: A guide to practice in psychology*. Routledge.

Mohamed, F.B., Faro, S.H., Gordon, N.J., Platek, S.M. Ahmad, H. & Williams, J.M. (2006) Brain Mapping of Deception and Truth Telling about an Ecologically Valid Situation: Functional MR Imaging and Polygraph Investigation—Initial Experience1 *Radiology*, 238, 679-688.

Moritz, S., Woodward, T.S. & Ruff, C.C. (2003) Source monitoring and memory confidence in schizophrenia. *Psychological Medicine*, 33, 131-139.

Muller, R.-A., Rothermel, R.D., Behen, M.E., Muzik, O., Chakraborty, P.K. & Chugani, H.T. (1999). Language organization in patients with early and late left-hemisphere lesion: a PET Study. *Neuropsychologia*. 37, 545-557.

Mycroft, R., Mitchell, D.C. & Kay, J. (2002) An evaluation of statistical procedures for comparing an individual's performance with that of a group of controls. *Cognitive Neuropsychology*, 19, 291-299.

Myslobodsky, M.S. & Hicks, L.H. (1994) The rationale for confabulation: What does it take to fabricate a story? *Neurology Psychiatry & Brain Research*, 2, 221-228.

Nathaniel-James, D.A. & Frith, C.D. (1996) Confabulation in schizophrenia: evidence of a new form? *Psychological Medicine*, 26, 391-399.

National Institute for Clinical Excellence (2000) Guidance on Methylphenidate for ADHD.

Nedjam, Z., Devouche, E. & Dalla Barba, G. (2004) Confabulation, but not executive dysfunction discriminate AD from frontotemporal dementia. *European Journal of Neurology*, 11, 728-733.

Neville, H.J. & Bavelier, D. (2000). Specificity and plasticity in neurocognitive development in humans. In Gazzaniga, M.S. (Ed). *The New Cognitive Neurosciences*. (2nd ed.) pp83-99, Cambridge, MA: The MIT Press.

Nourbakhsh, M. R., & Ottenbacher, K. J. (1994). The statistical analysis of single-subject data: A comparative examination. *Physical Therapy*, 74, 768-776.

Nys, G.M.S., van Zandvoort, M.J.E., Roks, G., Kappelle, L.J., de Kort, P.L.M. & de Haan, E.H.F. (2004) The role of executive functioning in spontaneous confabulation. *Cognitive and Behavioural Neurology*, 17, 213-218.

Ozonoff, S. & Jensen, J. (1999) Brief report: Specific executive function profiles in three neurodevelopmental disorders. *Journal of Autism and Developmental Disorders*, 29, 171-177.

Papagno, C. & Baddeley, A. (1997) Confabulation in a Dysexecutive patient: implication for models of retrieval. *Cortex*, 33, 743-752.

Parker, R.I., Brossart, D.F., Vannest, K.J., Long, J.R., De-Alba, R.G., Baugh, F.G., & Sullivan, J.R. (2005). Effect sizes in single case research: How large is large? *School Psychology Review*, 34, 116-132.

Pennington, B.F. (1997) Dimensions of executive functions in normal and abnormal development. In N.A. Krasnegor, G.R. Lyon, & P.S. Goldman-Rakic (eds.) *Development of the Prefrontal Cortex: Evolution, Neurobiology and Behaviour*. Baltimore: Paul Brooks Publishing.

Petersen, C.A. (2007) A historical look at psychology and the scientist-practitioner model. *American Behavioral Scientist*, 50, 758-765.

Piaget, J. (1932) *The Moral Judgment of the Child*. Routledge and Kegan Paul.

Posner, M.I. & Peterson, S.E. (1990) The attention system of the human brain.

Annual Review of Neuroscience, 13, 25-42.

Quine, L. (2001) Sleep problems in primary school children: comparison between mainstream and special school children. *Child: Care, Health and Development*, 27, 201-221.

Ramayya, A. & Jauhur, P. (1997) Increasing incidence of Korsakoff's psychosis in the East End of Glasgow. *Alcohol & Alcoholism*, 32, 281-285.

Rankin, P.M., O'Carroll, P.J. (1995) Reality discrimination, reality monitoring and disposition towards hallucinations. *British Journal of Clinical Psychology*, 34, 517-528.

Rankin, P.M. & Hood, J. (2005) Designing clinical interventions for children with specific memory disorders. *Pediatric Rehabilitation*, 8, 283-297.

Raybould, E.C. & Solity, J.E. (1988) More questions on precision teaching. *British Journal of Special Education*, 15, 59-61.

Reason, R. & Morfidi, E. Literacy difficulties and single-case experimental design. *Educational Psychology in Practice*, 17, 227-244.

Reichle, J. & Johnston, S.J. (1993) Replacing challenging behaviour: The role of communication intervention. *Topics in Language Disorders*, 13, 61-76.

Sadeh, A., Pergamin, L. & Bar, H.Y. (2006) Sleep in children with attention-deficit hyperactivity disorder: a meta-analysis of polysomnographic studies. *Sleep Medicine Reviews*, 10, 381-398.

Sattler, J.M. (2001) *Assessment of children: Cognitive applications*. (4th edn.). San Diego, CA: Sattler.

Schacter, D.L., Kagan, J. & Leichtman, M.D. (1995) True and False Memories in Children and Adults: A Cognitive Neuroscience Perspective. *Psychology, Public Policy & Law*, 1, 411-428.

Schacter, D.L., & Tulving, E. (1994). *Memory systems*. Cambridge, MA: MIT Press.

Schnider, A., Treyer, V. & Buck, A. (2000) Selection of currently relevant memories by the human posterior medial orbitofrontal cortex. *The Journal of Neuroscience*. 20, 5880-5884.

Schnider, A. (2001) Spontaneous confabulation, reality monitoring, and the limbic system – a review. *Brain Research*, 36, 150-160.

Schnider, A., Valenza, N., Morand, S. & Michel, C.M. (2002) Early cortical distinction between memories that pertain to ongoing reality and memories that don't. *Cerebral Cortex*, 12, 54-61.

Schnider, A. (2003) Spontaneous confabulation and the adaptation of thought to ongoing reality. *Nature*, 4, 662-671.

Schnider, A. (2004) Commentary on "The Pleasantness of False Beliefs". *Neuro-Psychoanalysis*, 6, 37-39.

Schnider, A., Bonvallant, J. Emond, H. & Leeman, B. (2005) Reality confusion in spontaneous confabulation. *American Academy of Neurology*, 65, 1117-1119.

Schwartz, B.L., Parker, E.S., Deutsch, S.I., Rosse, R.B., Kaushik, M. & Isaac, A. (2002) Source monitoring in alcoholism. *Journal of Clinical and Experimental Neuropsychology*, 24, 806-817.

Scoville, W.B. & Milner, B. (1957). Loss of recent memory after bilateral hippocampal lesions. *Journal of Neurology, Neurosurgery and Psychiatry*, 20, 11–21.

Sharon, T. & Woolley, J. D. (2004) Do monsters dream? Young children's understanding of the fantasy/reality distinction. *British Journal of Developmental Psychology*, 22, 293–310.

Simons, J.S. & Spiers, H.J. (2003) Pre-frontal and medial temporal interactions in long-term memory. *Nature Reviews: Neuroscience*, 4, 637-648.

Simons, J.S., Verfaellie, M., Galton, C.J., Miller, B.L., Hodges, J.R. & Graham, K.S. (2002) Recollection-based memory in frontotemporal dementia: Implications for theories of long-term memory. *Brain*, 125, 2523-2536.

Skeel, R.L., Sitzer, D., Fogal, T., Wells, J. & Johnstone, B. (2003) Comparison of Predicted-difference, Simple-difference, and Premorbid-estimation methodologies for evaluating IQ and memory score discrepancies. *Archives of Clinical Neuropsychology*, 19, 363-374.

Solity, J. (1991). An overview of behavioural approaches to teaching children with learning difficulties and the national curriculum. *Educational Psychology*, 11, 151-166.

Spence, S. (2004) The deceptive brain. *Journal of the Royal Society of Medicine*, 97, 6-9.

Stirling, J., Hellewell, J. & Ndlovu, D. (2001) Self-monitoring dysfunction and the positive symptoms of schizophrenia. *Psychopathology*, 34, 198-202.

Stoker, R. & Figg, J. (1998) Action research: Redefining the term “scientist practitioner”. *Educational and Child Psychology*, 15, 55-64.

Stone, K. (2006) Recent insights and better tools for understanding and diagnosing narcolepsy. *Neuropsychiatry Review*, 7,

Stouthamer-Loeber, M. (1986) Lying as a problem behaviour in children: a review. *Clinical Psychology Review*. 6, 267-289.

Sunderland, A., Harris, J.E. & Baddeley, A.D. (1984) Assessing everyday memory after severe head injury. In: Harris JE, Morris PE, ed. *Everyday Memory, Actions and Absentmindedness*. London: Academic Press.

Sussman, A. L. (2001). Reality monitoring of performed and imagined interactive events: Developmental and contextual effects. *Journal of Experimental Child Psychology*, 79, 115-138.

Takahashi, Y., Ohki, K. & Miyashita, Y.C.A. (2002) The role of the parahippocampal gyrus in source memory for external and internal events. *Neuroreport*, 13, 1951-1956.

Talwar, V., Lee, K., Bala, N., & Lindsay, R.C. (2002) Children's' conceptual knowledge of lying and its relation to their actual behaviour: implications for court competence examinations. *Law and Human Behaviour*, 26, 395-415.

Teaford, T., Shaw, R.J., Reiss, A. & Lotspeich, L. (2002) Pseudologia fantastica associated with pervasive developmental disorder. *Psychiatry*, 65, 165-172.

Tulving, E. (1985) Memory and consciousness. *Canadian Psychology*, 26, 1-12.

Turner, M.S., Cipolotti, L., Yousry, T.A. & Shallice, T. (in press) Confabulation: Damage to a specific inferior medial prefrontal system. *Brain*.

Vargha-Khadem, F., Gadian, D.C., Watkins, K.E., Connelly, A., Van Paesschen, W. and Mishkin, M. (1997) Differential effects of early hippocampal pathology on episodic and semantic memory. *Science*, 277, 376-380.

Vargha-Khadem, F., Isaacs, E. & Muter, V. (1994). A review of cognitive outcome after unilateral lesions sustained during childhood. *Journal of Child Neurology*. 9, 67-73.

Viding, E., Frick, P. J. & Plomin, R. (2007). Aetiology of the relationship between callous-unemotional traits and conduct problems in 7-year-old twins. *British Journal of Psychiatry*, 190, 33-38.

Wells, R.D., Bruns, B., Wender, E.H., Stein, M.T. (2005) Scott: An 11-Year-Old Boy with Repetitive Lying. *Journal of Developmental & Behavioral Pediatrics*, 26, 423-426.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children- 3rd Edition (WISC-III)*. San Antonio, Texas: Psychological Corporation.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI)*. San Antonio, Texas: Harcourt Assessment Inc.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children- 4th Edition (WISC-IV)*. San Antonio, Texas: Harcourt Assessment Inc.

Wechsler, D. & Stone, C. P. (1945) *Wechsler Memory Scale*. Psychological Corp., San Antonio, Texas.

Wheeler, M.A., Stuss, D.T. & Tulving, E. (1997) Towards a theory of episodic memory: the frontal lobes and autonoetic consciousness. *Psychological Bulletin*, 121, 331-354.

Wilson, B., Cockburn, J. & Baddeley, A. (1991) *The Rivermead Behavioural Memory Test*. Thames Valley Test Co., Bury St. Edmunds, Suffolk, U.K., 2nd Ed.

Wilson, A.E., Smith, M.D. & Ross, H.S. (2003) The nature and effects of young children's lies. *Social Development*, 12, 21-45.

Yirmiya, N., Solomonica-Levi, D., & Shulman, C. (1996). The ability to manipulate behavior and to understand manipulation of beliefs: A comparison of individuals with autism, mental retardation, and normal development. *Developmental Psychology*, 32, 62-69.

Zaragoza, M.S., Payment, K.E., Ackil, J.K., Drivdahl, S.B. & Beck, M. (2001).

Interviewing witnesses: Forced confabulation and confirmatory feedback increases false memories. *Psychological Science*, 12, 473-477.

APPENDIX B

ETHICS APPROVAL



Bromley Local Research Ethics Committee

Health Intelligence Unit
Templegate
115-123 High Street
Orpington
Kent
BR6 0LG

Telephone: 01689 865985
Facsimile: 01689 884074

Email: janine.peters@bromleyhospitals.nhs.uk

14 December 2004

Ms Jane Hood

Consultant Paediatric Neuropsychologist
Guys' and St Thomas's Hospital
The Newcomen Centre
Guys' Hospital
St Thomas's Street
London
SE1 9RT

Dear Ms Hood

Full title of study: *Confabulation in Children*
REC reference number: 04/Q0705/38
Protocol number:

Thank you for your letter of 18 November 2004, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered at the meeting of the LREC Sub-Committee held on 02 December 2004. A list of the members who were present at the meeting is attached.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

The favourable opinion applies to the research sites listed on the attached form. Confirmation of approval for other sites listed in the application will be issued as soon as local assessors have confirmed that they have no objection.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document Type:	Version:	Dated:	Date Received:
Application		19/10/2004	21/10/2004
Investigator CV		19/10/2004	21/10/2004
Letters of Invitation to Participants	1	19/10/2004	21/10/2004
Participant Information Sheet	1	19/10/2004	21/10/2004
Participant Consent Form	1	19/10/2004	21/10/2004
Response to Request for Further Information		18/11/2004	23/11/2004
Other	1	19/10/2004	21/10/2004

Management approval

The study should not commence at any NHS site until the local Principal Investigator has obtained final management approval from the R&D Department for the relevant NHS care organisation.

Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

Notification of other bodies

The Committee Administrator will notify the research sponsor that the study has a favourable ethical opinion.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

04/Q0705/38

Please quote this number on all correspondence

With the Committee's best wishes for the success of this project,

Yours sincerely,

 Chair

E-mail: janine.peters@bromleyhospitals.nhs.uk

Enclosures *List of names and professions of members who were present at the meeting and those who submitted written comments*

Standard approval conditions

Site approval form (SF1)

List of names and professions of members who were present at the meeting and those who submitted written comments

Dr Ian Jessiman,
Vice Chair

Mr Niall McCrae
Expert Member

Lay Member

Bromley Local Research Ethics Committee

LIST OF SITES WITH A FAVOURABLE ETHICAL OPINION

For all studies requiring site-specific assessment, this form is issued by the main REC to the Chief Investigator and sponsor with the favourable opinion letter and following subsequent notifications from site assessors. For issue 2 onwards, all sites with a favourable opinion are listed, adding the new sites approved.

REC reference number:	04/Q0705/38	Issue number:	1	Date of issue:	14 December 2004
Chief Investigator:	Ms Jane Hood				
Full title of study:	Confabulation in Children				

This study was given a favourable ethical opinion by Bromley Local Research Ethics Committee on ¹⁴~~02~~ December 2004. The favourable opinion is extended to each of the sites listed below. The research may commence at each NHS site when management approval from the relevant NHS care organisation has been confirmed.

Principal Investigator	Post	Research site	Site assessor	Date of favourable opinion for this site	Notes ⁽¹⁾
Ms J Hood	Consultant Paediatric Neuropsychologist	(GSTT) The Guy's & St Thomas' NHS Foundation Trust St Thomas' Street London SE1 9RT	Guy's	14/12/2004	
<p>Approved by the Chair on behalf of the REC:</p> <p>..... (Signature of Chair/Administrator*)</p> <p>(*delete as applicable)</p> <p><i>JANINE PETERS</i> (Name)</p>					

⁽¹⁾ The notes column may be used by the main REC to record the early closure or withdrawal of a site (where notified by the Chief Investigator or sponsor), the suspension or termination of the favourable opinion for an individual site, or any other relevant development. The date should be recorded.

APPENDIX C

SAMPLE LETTER/INFORMATION SHEET AND CONSENT FORM

NEWCOMEN CENTRE

Tel No: 0207-188 9502

Guy's & St Thomas' Hospital Trust

Guy's
HOSPITAL

Tel: 0207 188 7188

St Thomas Street
London SE1 9RT

Study title

Confabulation in children (version 2, November 2004)- experimental group- -LREC ref: 04/Q0705/38

Dear Parent,

Your child is being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends or relatives if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Purpose of the study

I am conducting a study into the assessment of children who confabulate. Confabulation occurs when people are unable to distinguish between fantasy and reality and so make claims that are untrue. 'Lying' is a normal developmental process and all children tell lies at some point. It becomes a problem if it persists and there are a group of children who genuinely seem to have difficulty with knowing the difference between what really happened and what they thought about happening. As you can imagine, this can have distressing implications for the child and their families, teachers etc. because they often make troubling or frightening claims. It is important to be able to understand why this happens and whether it is attributable to a specific pattern of learning difficulties.

As part of this study I am using a series of tests to look at children's memory for events and the accuracy with which they distinguish between their thoughts and what really happened. These tests are simple memory tests using everyday words and pictures. In addition I shall be using some tests of attention to see how good children are at controlling their own thoughts and actions. These are mostly tests of response speed in different situations. I shall also be doing a brief IQ test with each child, as I shall only be studying children who do not have general learning difficulties.

Your child's participation

I am requesting your child's participation as they have shown evidence of confabulation over an extended period of time. The assessments I would like to administer would be in addition to those tests they would normally complete as part of their routine neuropsychological assessment. The additional tests should only add around 10 minutes to the total assessment time, which is normally two sessions of three hours each. Your child's neuropsychological assessment results and the results of the extra tests would be used to analyse possible reasons for their confabulation. I would also be asking you to complete a log for two months that documents any incidents of confabulation that your child shows. This would take the form of a simple diary of events.

Participation is entirely voluntary. It is up to you and your child to decide whether or not they are to take part. If you do decide to include your child in this research, you will be given this information sheet to keep and be asked to sign a consent form. If you do decide to take part, you are free still to withdraw at any time and without giving a reason.

Your child will be at no risk from the assessment. These tests are used regularly for assessing children and the tasks are designed to be enjoyable for children. Following the assessment, I would provide you with a full clinical report and advice regarding their educational and behavioural management. If you do not wish to participate in the research part of the assessment, this would in no way affect the assessment for which your child was originally referred.

Confidentiality

All information which is collected about your child during the course of the research will be kept strictly confidential. Any information about your child will have your name and address removed so that you cannot be recognised from it.

General information

The results of the study will be written up for publication and a copy of the research will be made available to you. This research is part of departmental research and it is not being externally funded. The Guy's Hospital Research Ethics Committee has reviewed the study.

Contact for Further Information

Jane Hood –

Finally

You will be asked to sign the information sheet and consent form and you will be given a copy of each to keep for your records.

Jane Hood
**Consultant Paediatric Neuropsychologist/
Educational Psychologist**

Consumers for Ethics in Research (CERES) publish a leaflet entitled 'Medical Research and You'. This leaflet gives more information about medical research and looks at some questions you may want to ask. A copy may be obtained from CERES, PO Box 1365, London N16 0BW.

NEWCOMEN CENTRE

Tel No: 0207-188 9502

Guy's & St Thomas' Hospital Trust

Guy's
HOSPITAL

Tel: 0207 188 7188

O

St Thomas Street
London SE1 9RT

LREC Study Number: 04/Q0705/03. Patient Identification Number for this trial:
(Version 2, November 2004)

CONSENT FORM

Title of Project: Confabulation in Children

Name of Researcher: Jane Hood
Consultant Paediatric Neuropsychologist / Educational Psychologist

Please initial box

1. I confirm that I have read and understand the information sheet dated November 2004 (version 2) for the above study and have had the opportunity to ask questions.
2. I understand that my child's participation is voluntary and that I am free to withdraw them at any time, without giving any reason, without my medical care or legal rights being affected.
3. I understand that sections of any of my medical notes may be looked at by responsible individuals from Guy's Hospital or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records.
4. I agree to take part in the above study.

Name of Child

Date

Signature

Name of Person taking consent
(Parent / Guardian)

Date

Signature

Researcher – Jane Hood

Date

Signature

1 for patient; 1 for researcher; 1 to be kept with hospital notes

APPENDIX D

SOURCE MONITORING 1 PROTOCOL

Confabulation Source Memory Test (adapted from Brebion et al. 2000)

5 categories: Animals
Food
Clothes
Furniture
Vehicles/transport

I give verbal and pictorial example then ask child to give third example of own.

Read list of 15 with 5 distractors. Child is asked whether example was previously produced or not.

If example was previously produced, who produced it and in what form.

Animals: Cow
Frog – picture
Child -

Food: Apple
Bread – picture
Child -

Clothes: Coat
Socks – picture
Child -

Furniture: Table
Chair – picture
Child -

Vehicles: Bicycle
Plane – picture
Child -

List:

Was one of the words?

horse

plane

child's animal

coat

bicycle

child's clothing

apple

child's vehicle

chocolate

frog

bed

shoe

child's furniture

lorry

table

socks

child's food

cow

chair

bread

Distractors:

Animals: Horse
Chicken
Elephant
(Cat)

Food: Banana
Chocolate
Pizza
(Carrot)

Clothes: Trouser
Shoe
Shirt

(Skirt)

Furniture: Table
Bed
Cupboard
(Cooker)

Vehicles: Train
Lorry
Car
(Bus)

APPENDIX E

SOURCE MONITORING 2 PROTOCOL

Source Monitoring Task

I am going to say some word-pairs that I want you to remember, for example, Father-Christmas, ice-cream. Afterwards I will say one of the words and I want you to tell me the one that went with it. So if I say Father-Christmas, and afterwards I say Father, you would say? -Christmas, and if I say ice-cream, and afterwards I say ice, you would say? cream.

Listen carefully to these word pairs

Practice 1

- 1 (Harry) – 2 (Potter)
- 3 (Tooth) – 4 (Brush)
- 5 (Sea) – 6 (Sand)
- 7 (Skipping) – 8 (Rope)
- 9 (School) – 10 (Teacher)
- 11 (Apple) – 12 (Pear)
- 13 (Sweet) – 14 (Shop)

What word went with Harry? - if incorrect give correct answer

What word went with Tooth? -

What word went with Sea? -

What word went with Skipping? -

What word went with School? -

What word went with Apple? -

What word went with Sweet? -

Practice 2

- 1 (Harry) – 2 (Potter)
- 3 (Tooth) – 4 (Brush)
- 5 (Sea) – 6 (Sand)
- 7 (Skipping) – 8 (Rope)
- 9 (School) – 10 (Teacher)
- 11 (Apple) – 12 (Pear)
- 13 (Sweet) – 14 (Shop)

What word went with Harry? - if incorrect give correct answer

What word went with Tooth? -

What word went with Sea? -

What word went with Skipping? -

What word went with School? -

What word went with Apple? -

What word went with Sweet? -

Trial 1

- 1 Can you remember what word went with Harry?
- 2 Can you remember what word went with Tooth?

- 3 Can you remember what word went with Sea?
- 4 Can you remember what word went with Skipping?
- 5 Can you remember what word went with School?
- 6 Can you remember what word went with Apple?
- 7 Can you remember what word went with Sweet?
- 8 Can you remember what word went with Tooth?
- 9 Can you remember what word went with Sea?
- 10 Can you remember what word went with School?
- 11 Can you remember what word went with Brush?

Trial 2

- 1 Can you remember what word went with Harry?
- 2 Can you remember what word went with Tooth?
- 3 Can you remember what word went with Sea?
- 4 Can you remember what word went with Skipping?
- 5 Can you remember what word went with School?
- 6 Can you remember what word went with Apple?
- 7 Can you remember what word went with Sweet?
- 8 Can you remember what word went with Harry?
- 9 Can you remember what word went with Apple?
- 10 Can you remember what word went with Sweet?
- 11 Can you remember what word went with Brush?

Trial 3

- 1 Can you remember what word went with Harry?
- 2 Can you remember what word went with Tooth?
- 3 Can you remember what word went with Sea?
- 4 Can you remember what word went with Skipping?
- 5 Can you remember what word went with School?
- 6 Can you remember what word went with Apple?
- 7 Can you remember what word went with Sweet?
- 8 Can you remember what word went with Harry?
- 9 Can you remember what word went with Sea?
- 10 Can you remember what word went with Skipping?
- 11 Can you remember what word went with Sand?

Trial 4

- 1 Can you remember what word went with Harry?
- 2 Can you remember what word went with Tooth?
- 3 Can you remember what word went with Sea?
- 4 Can you remember what word went with Skipping?
- 5 Can you remember what word went with School?
- 6 Can you remember what word went with Apple?
- 7 Can you remember what word went with Sweet?
- 8 Can you remember what word went with Tooth?

- 9 Can you remember what word went with Sea?
- 10 Can you remember what word went with School?
- 11 Can you remember what word went with Rope?

Trial 5

- 1 Can you remember what word went with Harry?
- 2 Can you remember what word went with Tooth?
- 3 Can you remember what word went with Sea?
- 4 Can you remember what word went with Skipping?
- 5 Can you remember what word went with School?
- 6 Can you remember what word went with Apple?
- 7 Can you remember what word went with Sweet?
- 8 Can you remember what word went with Harry?
- 9 Can you remember what word went with Tooth?
- 10 Can you remember what word went with Skipping?
- 11 Can you remember what word went with Teacher?

Recall to check that subjects could remember each word

- What word went with Harry?
What word went with Tooth?
What word went with Sea?
What word went with Skipping?
What word went with School?
What word went with Apple?
What word went with Sweet?

Recognition

- How many times did you hear the word Harry?
How many times did you hear the word Potter?
How many times did you hear the word Tooth?
How many times did you hear the word Brush?
How many times did you hear the word Sea?
How many times did you hear the word Sand?
How many times did you hear the word Skipping?
How many times did you hear the word Rope?
How many times did you hear the word School?
How many times did you hear the word Teacher?
How many times did you hear the word Apple?
How many times did you hear the word Pear?
How many times did you hear the word Sweet?
How many times did you hear the word Shop?

Index scores

Estimated total number of times odd words spoken / actual number of times words spoken X 100

Estimated total number of times even words spoken / actual number of times words spoken X 100

Number of times odd words spoken

Word 1-	13
Word 3-	13
Word 5-	13
Word 7-	12
Word 9-	12
Word 11-	11
Word 13-	11

Total for odd words = 85

Number of times even words spoken

Word 2-	$2 + 0 = 2$
Word 4-	$2 + 2 = 4$
Word 6-	$2 + 1 = 3$
Word 8-	$2 + 1 = 3$
Word 10-	$2 + 1 = 3$
Word 12-	$2 + 0 = 2$
Word 14-	$2 + 0 = 2$

Total for even words = 19

APPENDIX F

SUNDERLAND EVERYDAY MEMORY QUESTIONNAIRE RESULTS TABLE

Memory Questionnaire

(to be completed by Relative or Friend)

Please indicate your relationship to _____

His Mother.....	<input type="checkbox"/>
His Father.....	<input type="checkbox"/>
His Brother.....	<input type="checkbox"/>
His Sister.....	<input type="checkbox"/>
Other* (please described below).....	<input type="checkbox"/>

— If you have ticked “His Friend” or “Other”, please indicate whether you are male or female

Male Female

Today's Date: _____

Instructions

On the following pages are examples of things that happen in normal everyday life. Some of them may happen frequently and some may happen very rarely. We would like to know how often on average each one has happened to your friend/relative over the past three months. Write the appropriate letter from the list below in the box beside each item.

- A. Not at all in the last three months
- B. About once in the last three months
- C. More than once in the last three months but less than once a month
- D. About once a month
- E. More than once a month but less than once a week
- F. About once a week
- G. More than once a week but less than once a day
- H. About once a day
- I. More than once a day

We realise that people vary from day to day depending on their mood and the exact circumstances they are in. However, we would like you to try to give us an overall impression of how often these things happen to your friend/relative. Put a single letter in every box and leave no blanks. If you are really stuck on any item, just make the best guess you can.

Please do not consult him about how often these things happen. It is your estimate we want even if you think it is less accurate.

Using the scale on the previous page, put the appropriate letter in the box beside each item to indicate how often on average each one has happened to your friend/relative over the past three months.

- | | | |
|-----|---|--------------------------|
| 1. | Forgetting where he has put something. Losing things around the house. | <input type="checkbox"/> |
| 2. | Failing to recognise places that he has often been to before. | <input type="checkbox"/> |
| 3. | Finding a television show difficult to follow. | <input type="checkbox"/> |
| 4. | Not remembering a change in his daily routine, such as a change in place where something is kept or a change in the time something happens. Following his old routine by mistake. | <input type="checkbox"/> |
| 5. | Having to go back to check whether he has done something that he meant to do. | <input type="checkbox"/> |
| 6. | Forgetting when it was that something happened; for example, whether it was yesterday or last week. | <input type="checkbox"/> |
| 7. | Completely forgetting to take things with him, or leaving things behind and having to go back and fetch them. | <input type="checkbox"/> |
| 8. | Forgetting he was told something yesterday or a few days ago, and maybe having to be reminded about it. | <input type="checkbox"/> |
| 9. | Starting to read something (a book or an article in a newspaper or magazine) without realizing he has already seen it before. | <input type="checkbox"/> |
| 10. | Letting himself ramble on to speak about unimportant or irrelevant things. | <input type="checkbox"/> |
| 11. | Failing to recognise, by sight, close relatives or friends that he meets frequently. | <input type="checkbox"/> |

-
- A. Not at all in the last three months. B. About once in the last three months.
C. More than once in the last three months but less than once a month.
D. About once a month. E. More than once a month but less than once a week.
F. About once a week. G. More than once a week but less than once a day.
H. About once a day. I. More than once a day.

- | | | |
|-----|--|--------------------------|
| 12. | Having difficulty picking up a new skill. For example, finding it hard to learn a new game or to work some new gadget after he has practised once or twice. | <input type="checkbox"/> |
| 13. | Finding that a word is 'on the tip of his tongue'. He knows what it is but cannot quite find it. | <input type="checkbox"/> |
| 14. | Completely forgetting to do things he said he would do, and things he planned to do. | <input type="checkbox"/> |
| 15. | Forgetting important details of what he did or what happened to him the day before. | <input type="checkbox"/> |
| 16. | When talking to someone, forgetting what he has just said. Maybe saying, 'What was I talking about?' | <input type="checkbox"/> |
| 17. | When reading a newspaper or magazine being unable to follow the thread of the story; losing track of what it is about. | <input type="checkbox"/> |
| 18. | Forgetting to tell somebody something important. Perhaps forgetting to pass on a message or remind someone of something. | <input type="checkbox"/> |
| 19. | Forgetting important details about himself, e.g., his birthday or where he lives. | <input type="checkbox"/> |
| 20. | Getting the details of what someone has told him mixed up and confused. | <input type="checkbox"/> |
| 21. | Telling someone a story or joke that he has told them once already. | <input type="checkbox"/> |
| 22. | Forgetting details of things he does regularly, whether at home or work/school. For example, forgetting details of what to do, or forgetting what time to do it. | <input type="checkbox"/> |
| 23. | Finding that the faces of famous people seen on television or in photographs look unfamiliar. | <input type="checkbox"/> |

- A.** Not at all in the last three months. **B.** About once in the last three months.
C. More than once in the last three months but less than once a month.
D. About once a month. **E.** More than once a month but less than once a week.
F. About once a week. **G.** More than once a week but less than once a day.
H. About once a day. **I.** More than once a day.

24. Forgetting where things are normally kept or looking for them in the wrong place.
25. (a) Getting lost or turning in the wrong direction on a journey, on a walk, or in a building where he has often been before.
- (b) Getting lost or turning in the wrong direction on a journey, on a walk, or in a building where he has only been once or twice before.
26. Doing some routine thing twice by mistake. For example, putting two lots of tea in the pot, or going to brush/comb his hair when he has just done so.
27. Repeating to someone what he has just told them or asking the same question twice.

Please check that you have put a letter in EVERY box.

If you have put a letter in every box, the form is now complete.

-
- A. Not at all in the last three months. B. About once in the last three months.
C. More than once in the last three months but less than once a month.
D. About once a month. E. More than once a month but less than once a week.
F. About once a week. G. More than once a week but less than once a day.
H. About once a day. I. More than once a day.

APPENDIX G

PARENTAL LOG SHEET

Date	Time	Brief description of incident	Consequence	Possible Trigger

VOLUME 2

Professional Practice Assignments

Jane Hood

University College London

Continuing Professional Development

Doctorate in Educational Psychology

1) Cognitive attention in ADHD: Educational psychology and the application of neuropsychological assessments. Page 1

2) Specific memory deficits and their implications for learning and behaviour in the classroom. Page 42

3) Educational Neuropsychology: Contributing to the evidence base for interventions. Page 91

4) The author as professional supervisor: A review. Page 133

**Cognitive attention in ADHD: Educational psychology and
the application of neuropsychological assessments.**

INDEX

Abstract	2
1) Section 1: Aims and Scope of the Assignment	5
2) Section 2: Practice and Context	8
<i>a) Diagnosing ADHD</i>	8
<i>b) Interventions for ADHD</i>	12
<i>c) ADHD and Academic Attainment</i>	13
<i>d) Behavioural management of ADHD in schools</i>	14
3) Section 3: A Review of the Psychological Literature	16
<i>e) Cognitive Attention Models</i>	16
<i>f) Neuropsychological Assessment of Attention</i>	17
<i>g) Neuroscientific Views of ADHD and its Treatment</i>	19
4) Section 4: Integration of Theory, Research and Practice Issues	22
<i>h) Research Report</i>	23
<i>i) Discussion of Results</i>	27
<i>j) Linking Findings to EP Practice</i>	28
<i>k) Future Directions for the Development of Services</i>	29
5) Section 5: Concluding Comments	32
6) References	34
7) Appendix 1: Attention Management Principles	40

**Cognitive attention in ADHD:
Educational psychology and the application of
neuropsychological assessments.**

Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder estimated to affect approximately 5 percent of the population, although prevalence studies can vary between 3 to 12 percent of the paediatric population. There is a significant literature reporting that ADHD has significant implications for children, their families, and health and education systems. Difficulties with challenging behaviour, learning, academic achievement and psychosocial functioning are commonly reported in children who have a diagnosis of ADHD and stimulant medication is the routinely recommended treatment. However, despite the documented behavioural and learning difficulties reported in this population, there has been little attempt to examine these children from a neuropsychological perspective in which detailed objective cognitive assessments are performed and with confounding variables controlled for by assessing children from similar social backgrounds, with comparable levels of intellectual functioning, comparable ages and gender, but without ADHD diagnoses. Such a perspective would significantly inform our understanding of the underlying cognitive attention deficits associated with children who have ADHD and provide a means of reliably measuring the effectiveness of stimulant medication.

This assignment describes ADHD in terms of the criteria and process by which the diagnosis is made. The behavioural and educational challenges that children with ADHD commonly present to educational and health professionals are discussed. Psychological models of cognitive attention are outlined in order to consider specific attention deficits that might underlie the behavioural and attentional problems shown in children who have a diagnosis of ADHD. Neuropsychological methods of assessing cognitive attention are illustrated with particular reference to the Test of Everyday Attention for Children (TEA-Ch – Manly et al., 2001) and the application of such measures with this group of children are discussed.

The use of stimulant medication for the treatment of ADHD is discussed in terms of its effectiveness in the management of behavioural difficulties. A controlled trial is described to evaluate the effectiveness of stimulant medication on cognitive attention in which 15 children with a diagnosis of ADHD performed a neuropsychological assessment before and after they were administered stimulant medication. To control for possible confounding variables, 16 children without diagnoses of ADHD were matched on age, gender, social background and intellectual functioning and were administered the neuropsychological assessments at similar time points to the ADHD group to control for possible practice effects of same day testing. This investigation reports significant improvement in many aspects of cognitive attention for children with ADHD compared to controls when stimulant medication was administered. The implications for diagnosis, management and educational support of children who may have ADHD are discussed, particularly in terms of the possible role for

educational psychologists when working with this significant percentage of the paediatric population.

Section 1: Aims and Scope of the Assignment

Attention Deficit Hyperactivity Disorder (ADHD) is a medical diagnosis that is normally made by GPs, Paediatricians and Psychiatrists. Within educational psychology and more broadly in the field of psychology, there is much scepticism about the existence of ADHD as an identifiable disorder that is somehow different from a behavioural difficulty. In neuropsychological terms there is no clear neuropsychological profile that relates to the group of children with ADHD. However, neuropsychological models and assessments have shown that children with ADHD experience a range of problems relating to poor attention and disinhibition (Anderson et al., 2001; Pliszka et al., 1996).

Current and relevant research into the development of attention and proposed models of cognitive attention will be reviewed from a neuropsychological perspective. This is necessary to provide an understanding of why ADHD is such a multi-faceted diagnosis and why there is such variation within the group of children receiving the diagnosis. Current problems with constructing a neuroanatomical model for attention control and ADHD will be discussed.

Currently, the main medical treatment for ADHD is stimulant medication and the effect of that medication will be described in neurobiological as well as behavioural terms. Despite the widespread use of stimulant medication for the treatment of children with ADHD, few studies have been undertaken to quantify the effects of medication on cognitive attention. Therefore, a small-scale study

into the immediate effects of methylphenidate, one of the most commonly prescribed treatments for ADHD, was conducted and the results of that study will be presented. The results will also be examined to determine whether children with ADHD differ from children without ADHD sufficiently on their performance on cognitive tests of attention for those tests to be used reliably for diagnostic purposes.

Although there is now a large body of evidence pointing towards a genetic cause for a neurological dysfunction in ADHD, there are many researchers and clinicians who have sought and published other explanations for the behavioural irregularities. Those who reject the existence of ADHD as having a neurological basis may adopt more psychosocial or psychodynamic explanations for children's behaviour and focus their interventions on changing family systems. However, studies of cognitive-behavioural and family therapy approaches have found little evidence for their effectiveness as stand-alone treatments (Brown & Ievers, 1999; MTA, 1999).

This assignment will be used to draw together information from observations of children's behaviour and that gleaned from formal testing of attention profiles in order to inform the development of a holistic picture of the child's strengths and weaknesses, with the aim of defining the cognitive attention deficits experienced by children with ADHD more tightly.

The conclusion of this assignment will present suggestions for conducting a more multi-disciplinary approach to the assessment and management of ADHD in

schools, to include neuropsychological assessments of attention used in conjunction with behavioural observations, for the purposes of developing a range of cognitive as well as behavioural interventions for the management and teaching of these children in school. Recent National Institute of Clinical Excellence (NICE, 2000) guidelines describe best practice for the treatment of ADHD with the stimulant medication, methylphenidate (Ritalin). These guidelines suggest that it would be preferable, but not essential, for a psychologist to be involved in the diagnosis and on-going management of the child. Implications of these guidelines for the future roles of educational psychologists will be suggested.

To summarise, the key aims of this assignment are to review and discuss:

- 1) The diagnosis of ADHD
- 2) The behavioural and educational challenges children with ADHD present to professionals
- 3) Psychological models of cognitive attention
- 4) Neuroanatomical and neuropsychological factors in ADHD
- 5) A small scale study into the effect of medical treatment of ADHD
- 6) Implications and suggestions regarding future developments for educational psychologists and other professionals working with children with ADHD

Section 2: Practice and context

a) Diagnosing ADHD

ADHD is a medical/psychiatric diagnosis made on the basis of observable behaviours. DSM-IV diagnostic criteria specify problems with attention, hyperactivity and impulsivity, using the International Classification of Diseases-10 (ICD-10) or the Diagnostic and Statistical Manual of Mental Disorders - 4 (DSM-IV (American Psychiatric Association, 1994)) criteria. Increasing numbers of children are being diagnosed with ADHD. Current estimates indicate that 3-5 % of the American population have ADHD (Goldman et al., 1998; Shaffer et al., 1996), although estimates vary according to diagnostic criteria applied. The extent of these problems is normally determined through the use of parental interview and the completion of questionnaires, such as the Conners' Rating scale (CRS-Revised, 1997). There is no need for an assessment of cognitive attention skills to be administered before the diagnosis is made. Nor is there any need for behavioural observations beyond those described by the parents during the diagnostic interview.

When a child attends a psychiatric or paediatric assessment for consideration of neurodevelopmental disorders, liaison with schools and educational psychologists is often very limited. Therefore, someone who actually sees the child in school does not usually give the description of classroom behaviours required for diagnostic purposes. This means that if formal assessments of attention are carried out in the clinic, these are not necessarily considered in the

light of the behavioural difficulties exhibited in class. However, there is, as yet, insufficient evidence to assume that the hyperactivity and attention difficulties observed in children by teachers and parents can be reliably quantified on formal assessment measures. Moreover, in clinical use, the effects of medication are not monitored in terms of their effect on cognitive attention but rather by their effects on observed behaviour.

Although most LEA educational psychologists will be working with children with a diagnosis of ADHD, their involvement is not necessary in terms of the medical diagnosis and management of these children. While the medical profession appears comfortable with the use of ADHD as a diagnosis, there is currently little agreement amongst educational and clinical psychologists over whether ADHD exists as a discrete disorder. This debate may exist, in part, because such a wide variety of behaviours are subsumed under the category ADHD and there is no definitive test for its presence.

In order to diagnose a child with ADHD, there must be reported evidence of a range of behavioural difficulties. These are listed in DSM-IV and must include evidence of problems of inattention, impulsivity and hyperactivity. Typical behavioural difficulties that might be seen within class can be grouped according to these DSM-IV criteria: -

Inattention: e.g. the child frequently daydreams, loses possessions, misses instructions, loses their place within a piece of work.

Impulsivity: e.g. the child reacts without thinking, hits out if knocked in the corridor, calls out in class, will run across a road without looking.

Hyperactivity: the child is constantly fidgeting, the child is physically restless even when fully engaged, the child cannot maintain a good sitting posture at their desk and fiddles with anything on the desk.

These diagnostic categories are clearly subjective and examples of each of these types of behaviour need to be considered in the light of what is currently known about the normal development of attention in children. ADHD is considered to be a neurodevelopmental disorder and the specific attentional difficulties defined within it are usually thought of as immaturities of development of aspects of attention. For example, the impulsivity that is considered to be a problem in an 8 year old who runs across the road without looking would not be considered abnormal behaviour in a two year old who sees an ice cream van across the road. Similarly one would not expect a two year old to sit on the floor and listen to a story being read without fidgeting, although by 5 years of age, there is an expectation that children will be able to sit still for brief periods of time when asked. When a child shows normal intellectual development but has reduced control over their behavioural responses, this tends to be interpreted as a behavioural problem.

The contribution of neuropsychological assessments to the assessment of individual children with ADHD is to create a profile of the developmental stages of these component skills in a more objective way. If, on standardised testing, a

child is found to have average intellectual ability but the impulse control of a much younger child, it makes it simpler for those working with the child to consider the real needs of the child when planning interventions. In thinking about appropriate teaching methods for children with attention problems, teachers need to devise ways of presenting materials to the child that are sufficiently structured and organised to be appropriate for their attentional level whilst be sufficiently challenging to meet their academic needs. In rehabilitation studies with adults with attention impairments, it is acknowledged that the outward expression of their attentional impairments is highly dependent on their environment (Bracy, 1994).

Different professional bodies take very different roles in the assessment and management of ADHD and, as identified by a number of recent studies within local educational psychology services, access to multi-professional services for assessment and support varies widely between authorities (Cains, 2000; Connor et al., 1997; Keen et al., 1997). Recent educational psychology literature gives the impression that in those authorities where ADHD is acknowledged, research is focussed on collecting demographic and systems information (Holowenko & Pashute, 2000) or on an individual service's response to the behavioural and learning issues for the children with this diagnosis as a group (Cains, 2000; Connor et al., 1997). A review of educational psychology literature did not provide evidence of educational psychologists investigating the cognitive attention skills of this group of children, or considering how neuropsychological variables might affect their learning and behaviour.

The use of medication and how its effect is monitored, in behavioural and cognitive terms, is not generally considered within a multi-professional framework, as the responsibility for on-going management lies with the prescribing medic, in accordance with NICE guidelines (2000). Recent studies by Educational Psychology Services suggest that multi-professional liaison is increasingly recognised as important within Local Education Authorities. However, the role of the educational psychologist within multi-disciplinary teams appears to be one of behavioural management of the child and school liaison, rather than becoming specifically involved in diagnostic issues and the monitoring of the effect of medication on cognitive attention, i.e. they are not necessarily taking an active role in liaising with or being consulted by the medical professionals.

b) Interventions for ADHD

Perhaps as a consequence of this lack of psychological involvement, there remains a real dearth of community-based or multi-centre studies into the real cognitive issues for children with attention difficulties. The absence of a role for educational psychologists also means there is a lack of research into the development of effective, evidence-based behavioural and neurocognitive interventions for children with ADHD. The effectiveness of different medical treatment approaches on the behaviour of children with ADHD was conducted by the MTA Co-operative Group (1999) in a randomised clinical trial, the NIMH Collaborative Multisite Multimodal Treatment Study of Children with ADHD. They found that well managed, clinic-based treatment with medication was more

effective than a behavioural management approach or a combined community-based medication and behavioural management approach.

Currently interventions led by psychological services, whether at school or at home, tend to be based on managing and improving behaviour, for which there is little research evidence in terms of strategy effectiveness (Brown & Ievers, 1999). These findings need to be considered by educational psychologists to ensure that their practice is research-led. They also need to consider their role in the assessment of attention difficulties, to ensure they are using contemporary measures to conduct reliable assessments of individual children's skills.

There are few studies into the effectiveness of direct training of cognitive attention in children. Kerns et al. (1999) investigated the effect of a system, called 'Pay Attention', on the behavioural and cognitive attention skills of a small group of children with ADHD. They found some cognitive benefits even in the absence of behavioural benefits, although where there were behavioural benefits, these were observed within school only. However, this trial was conducted with a small group of children and would need to be replicated with a larger sample size, with the longer-term effects of the training on cognitive attention and academic learning evaluated.

c) ADHD and academic attainment

Children with ADHD are more likely than children without ADHD to become disaffected from their work and school and to underperform at school when their

academic attainments are compared to their intellectual ability (Zentall, 1993). Specific literacy difficulties are commonly recognised in association with ADHD and, to a lesser extent, problems with numeracy (Bull, 2001). A study was conducted in which stimulant medication was used with children with ADHD and poor numeracy (Lindsay et al., 1999). It was shown that the medication has beneficial effects on mathematical performance and this was linked to improvements in aspects of cognitive attention. Therefore, there may be an additional benefit from the medication leading to improved academic performance as a consequence of improved cognitive attention that is not directly as a consequence of reduced behavioural difficulties.

d) Behavioural management of ADHD in schools

Many LEAs have created Behaviour Support Teams, which may not be part of the Educational Psychology Service, who take a lead role in the on-going support of individual children with ADHD and providing advice to teachers. A review of the literature does not provide any evidence of evaluation studies of the model upon which such services might be constructed or of the effectiveness of their services. Anecdotal evidence suggests that these teams have been set up as a consequence of LEAs developing behaviour policies that address their management of children with challenging behaviour. These teams are often working with advice from educational psychology but are not necessarily using specific research-led models of working. They are normally comprised of experienced teachers who have an interest in behavioural difficulties and special educational needs, who provide a consultancy service to teachers and carry out

Section 3: A Review of the Psychological Literature

e) Cognitive attention models

It is useful to have an overview of the theoretical framework within which disorders of attention can be considered. The term 'attention' refers to a range of skills that can be thought of as a hierarchy of functions, from the most basic skills of alerting and orienting, to the higher order skills of the executive attention system, which have a role in the control of attention and response (Posner & Peterson, 1990). The attention system operates within a complex network of interrelated skills and systems, and it is not possible truly to consider each area in isolation.

There are a number of cognitive attention models that further subdivide these factors. Contemporary neuropsychological batteries are based on models such as those proposed by Whyte (1992 a&b), Barkley (1997) and Mirsky et al. (1999). The following domains are proposed: arousal, focussed attention, divided attention, sustained attention and response inhibition. While these proposed subcomponents of attention can be measured under laboratory conditions, there are many limitations to the measurement of attention and executive impairments within standardised assessments because the presence of the tester and the test structure eliminates or alters the situations in which functional impairments have greatest impact (Lezak, 1995).

The examples below include studies and proposed models that outline some of the concepts within attention models and brief definitions of these subcomponents of attention (Levitt & Johnstone, 2001): -

Attention component	Research studies	Definition
Arousal	Posner 1995	Levels of alertness and differential responsiveness to surroundings
Focussed attention	Barkley 1997 Sohlberg & Mateer 1987	The ability to focus on a chosen stimulus and ignore distractions
Divided attention	Sohlberg & Mateer 1987 van Zomeren & Brouwer 1994	The ability to attend to more than one stimulus at once
Sustained attention	Sohlberg & Mateer 1987 van Zomeren & Brouwer 1994 Cohen et al 1998	The ability to maintain attention over extended periods
Response inhibition	Barkley 1997 Cohen et al 1993	Ability to inhibit automatic response

See Appendix 1 for examples of how this model might inform the development of intervention strategies based on observable behaviours.

f) Neuropsychological assessment of attention

Within the paediatric population, severe attention disorders can occur as a consequence of many acquired disorders, such as traumatic brain injury or encephalitis, emotional disturbances, such as post-traumatic stress disorder, and developmental disorders, such as autism and ADHD.

ADHD is not defined by any precise pattern of cognitive attention difficulties and, until recently, there have been few standardised measures available for the

assessment of attention in children. Even using the measures currently available, it has proved very difficult to describe ADHD in terms of specific weaknesses in cognitive attention. This may have been for a number of reasons. Children receiving a diagnosis of ADHD tend to be a very heterogeneous group and, in neuropsychological terms, no reliable correlation between the diagnosis and any specific cognitive profile using contemporary test batteries has been found that would be adequate for diagnostic purposes.

There is the additional problem that children's attention skills are developing throughout childhood and attempts to identify discrete dissociations within the component skills, as in adult populations, have proved difficult (Manly et al., 2001; Shapiro et al., 1998). Children also behave very differently in formal test situations than they do within less structured environments, such as the classroom, and the very nature of using a standardised test imposes some external structure on the child's behaviour.

However, despite these concerns about the ecological validity of testing attention, formal measures of cognitive attention have been developed for research and clinical purposes. Batteries such as the TEA-Ch (the Test of Everyday Attention for Children; Manly et al., 1999) and the NEPSY (a developmental neuropsychological assessment battery which includes a number of tests to assess attention/executive skills; Korkman et al., 1998) are based on multi-component models (e.g. Mirsky et al., 1999) as described above. They tend to be downward extensions of adult models of attention and assume linear development. Although there are considerable limitations to the use of these tests

for diagnostic purposes, they can highlight specific cognitive strengths and weaknesses and provide useful tools for investigating the development of attention processes in children.

g) Neuroscientific views of ADHD and its treatment

Despite much on-going debate about the mechanisms of attention control within the brain, there is general agreement that the frontal regions of the cerebral cortex are strongly involved (Barkley, 1992; 1997). The frontal lobes are considered to have an essential role in attention, memory and executive functioning skills (the organisation of purposeful, goal-directed activity). This includes the ability to manage attention by shifting from one concept to another, to combine details to form a coherent whole, to manage multiple sources of information simultaneously and apply acquired knowledge to novel situations. Shallice and Burgess (1991) suggested that the role of the frontal lobes is to act as a supervisory attentional system (SAS), which activates a finite set of actions and schema according to certain triggers. The chosen behaviour may not be the most immediate but rather the most appropriate according to past learning. This facility may enable a coherence to be formed between events.

Recent imaging studies have enabled neuroscientists to begin to build up a picture of which brain regions might be involved in attention tasks (Mefford & Potter, 1989; Aston-Jones et al., 1999; Posner, 1995). Using MRI techniques with children with ADHD, researchers (Lou et al., 1989; Semrud-Clikeman et al., 1994) have identified a number of different brain regions that are implicated in

different types of cognitive attention task. Suggestions regarding why it has proved so challenging to find agreement about localisation of function in imaging studies of ADHD are put forward in a review article by Baumeister and Hawkins (2001). This paper is important because psychologists and health professionals may over-interpret imaging studies as objective measures and the authors outline why conclusions drawn from even these apparently reliable methods need to be integrated with an evaluation of research methodology and knowledge about the effect of the children's context on their performance and behaviour.

The role of neurotransmitters in ADHD has proved a useful area of investigation, particularly in terms of their sites of action, triggers and pathways, and this research informs neuropharmacological treatment of disorders of attention. The systems most commonly implicated are the Catecholamines, Dopamine and Noradrenaline (Norepinephrine). The action of Noradrenaline on the locus coeruleus, reticular formation and thalamus and the action of Dopamine on the basal ganglia and frontal lobes are considered key areas for investigation. These neurotransmitters are important because knowledge about their triggers, pathways and sites of action inform neuropharmacological treatment of disorders of attention. Medications that are effective in the treatment of ADHD are those that affect the transmission of the relevant neurotransmitters (Zametkin & Rapoport, 1987). Most researchers now agree that ADHD is a consequence of dysfunction in multiple neurotransmitter systems, as proposed by Pliszka et al. (1996).

Traditionally, treatment for children with ADHD involves a combination of behavioural management strategies and drug therapy, such as Ritalin (Methylphenidate). (See Coghill 2002, for a review of the psychopharmacological treatment for children). Ritalin is a stimulant medication that acts on and improves functioning in the frontal regions of the brain. It is believed to affect neurotransmitters in the brain, in particular, the uptake and release of dopamine (Himmelstein et al., 2000; Volkow et al., 2001). It is a short-acting medication with 1-4 hours duration of action and a half-life of 2-3 hours. When it is prescribed to a child, and the optimum dose is titrated over time and its effectiveness is then determined in terms of its effect on behaviour.

Despite the fact that Ritalin is widely used for the treatment of ADHD, it is only recently that studies have been conducted to examine the effects of Ritalin on different cognitive components of attention. These studies tend to be based on experimental tests and the findings are not necessarily easily transferable to real-life situations for the child. However, these studies do show some clear improvements in attention in children treated with stimulant medication (Aman et al., 1998; Kempton et al., 1999; Tannock et al., 1995; Mehta et al., 2000).

Section 4: Integration of theory, research and practice issues

The review of the research literature highlights some of the issues facing those working with children with ADHD. Each professional specialism appears to take a rather polarised view of what ADHD is and the important areas for study. This has led to very detailed knowledge about the different aspects of ADHD but provides little practical information for those working with the children themselves. For example, there appears to be very little information about how the various different components of attention might impact upon children's academic, social or behavioural learning and there have been no published studies into how the classroom curriculum can be adapted to support the learning of children with attentional difficulties. These issues are left very much up to the efforts of individual teachers and staff providing support and advice to those teachers.

Until a few years ago little consideration has been given to the effects of particular cognitive attention difficulties on learning and the effect of medication on specific areas of weakness. However, with the recent development of tests of attention for children, such as the TEA-Ch, it has been possible to administer formal assessments of their cognitive attention skills, and to consider those in the light of their intellectual ability and academic achievement. The TEA-Ch provides a battery of tests that measure different aspects of cognitive attention, based primarily on Mirsky et al.'s (1999) model of attention and adapted from the Test of Everyday Attention (TEA, Robertson et al., 1994), an adult attention

battery. Educational psychologists do not generally use this type of psychometric assessment, nor have clinical psychologists working within neurodevelopmental teams to examine the attention skills of children with ADHD routinely used it. Therefore, in order to demonstrate the applicability of this type of assessment within this population, the results of a clinic-based study using a formal assessment of cognitive attention are presented below.

h) Research Report

In order to provide evidence for the effect of stimulant medication on cognitive attention in children with ADHD, a small-scale study was undertaken (Hood et al., 2005). This study involved assessing the attention skills of a small clinic population of children with ADHD (13 boys, 2 girls, mean age: 9 years 5 months), using the TEA-Ch, and comparing their results to a control group (14 boys, 2 girls, mean age: 9 years 8 months). It was then also considered useful to assess children's cognitive attention when they are medicated appropriately in order to monitor the effect of the medication and compare their attention skills when medicated to the skills of the control group (unmedicated). The rationale for the study, the results and the implications for practice are briefly summarised here to provide an example of how this type of testing can provide evidence for the need to assess skills that might not be quantifiable by observation alone.

The children in the clinic study were children who were initially referred to the neurodisability clinic at Guy's Hospital by their local paediatricians for a second opinion regarding whether they have a specific neurodevelopmental impairment.

The intellectual ability of all children attending the clinic is routinely assessed in order to provide information about factors such as whether their behavioural difficulties might be related to more general learning difficulties. Following their initial assessment, each child in the study was given their prescribed medication, Ritalin (methylphenidate), and re-tested using a parallel version of the same tests on the same day. A group of control children, matched for age, gender and IQ were assessed similarly although they did not have a diagnosis of ADHD and were not given any medication. The control group was included to control for possible confounding variables of age, gender, intellectual ability and practice effects from same day re-testing.

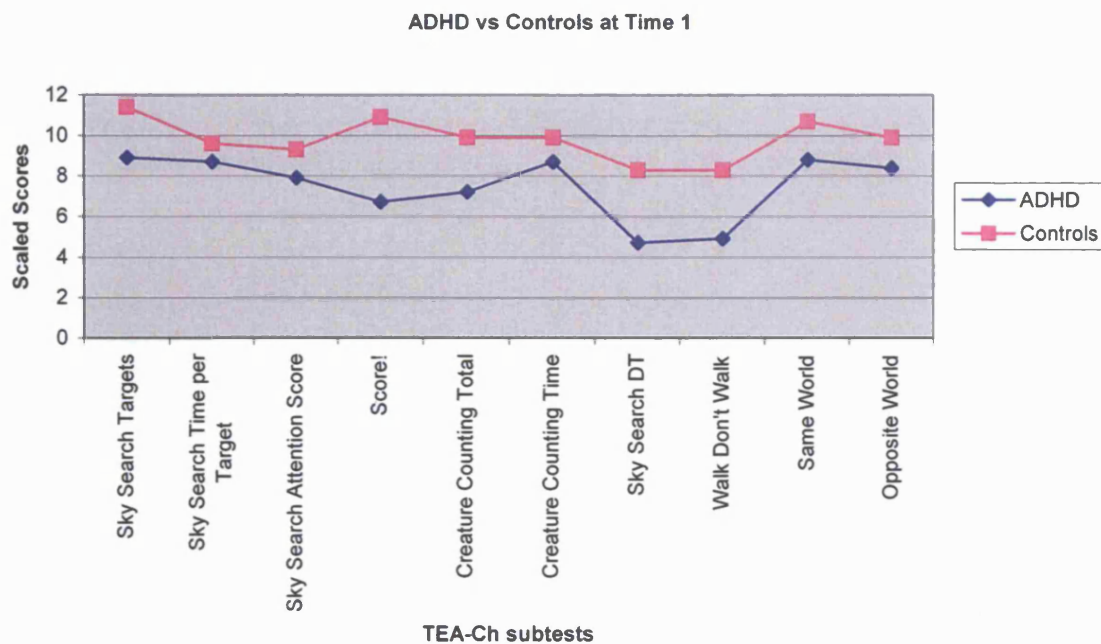
The hypotheses being considered were: -

1) Prior to taking their medication, the group of children with a diagnosis of ADHD would perform significantly worse on the TEA-Ch compared to the control group.

2) After taking their medication, there would be no difference between the two groups on the TEA-Ch.

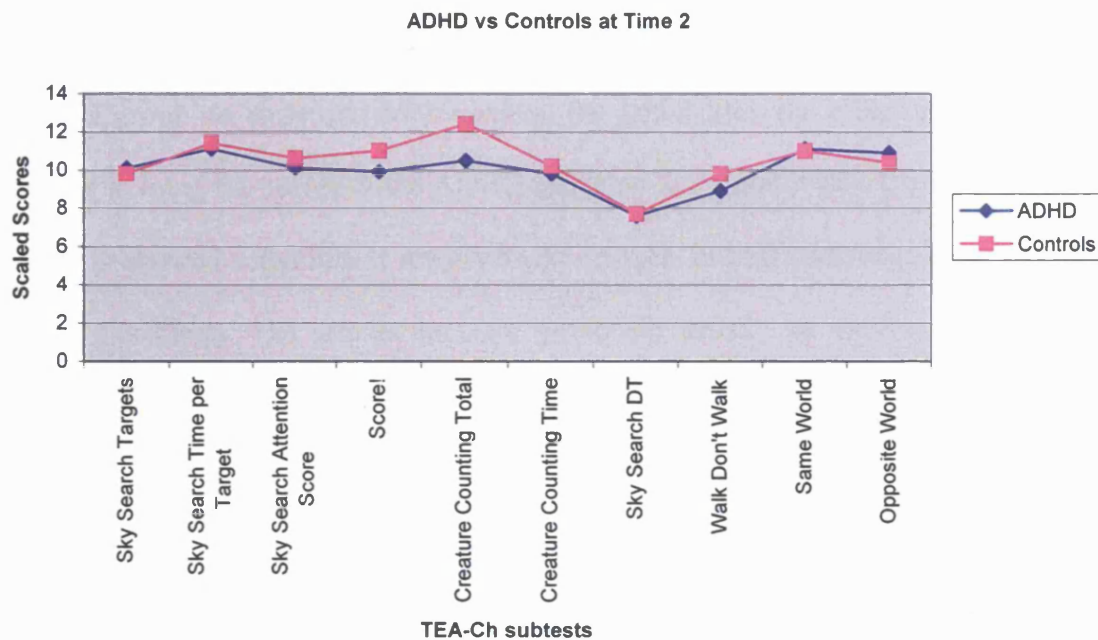
The results of the two test administrations are shown in the following graphs.

Comparison of TEA-Ch subtest scores – Time 1



As the graph shows, the ADHD group performed at a lower level than the control group on most subtests. The results were analysed using an independent measures t-test and the scores for the tests of sustained attention, attention control and inhibition (subtests Score!, Creature Counting Total, Sky Search DT and Walk, Don't Walk) were found to be significantly lower in the ADHD group. This supports the first hypothesis, that the ADHD group performs at a lower level than the control group on initial administration of the TEA-Ch.

Comparison of TEA-Ch subtest scores – Trial 2



Following medication, at time 2, there was only one remaining difference between the two groups on the individual measures: Creature Counting Total.

From Time 1 to Time 2, the Control group only showed a significant improvement on one subtest, a measure of attentional control and switching. There was no significant practice effect with same-day administration on any of the other test items.

For all but one subtest, these results support the second hypothesis, that following treatment with stimulant medication, there is no significant difference between the two groups on the TEA-Ch.

i) Discussion of Results

Treatment for ADHD

This study finds that although the ADHD group performed significantly below the Control group on most measures used on the initial trial, the effect of the Ritalin was to bring the scores of the ADHD group up to normal levels. Children with ADHD showed a significant improvement on their overall performance on most of the subtests. The size of increase could not usually be attributed to practice alone.

Therefore, formal measures of cognitive attention skills, repeated with and without medication, can provide evidence of the effects of medication on children's cognitive attention.

Suggestions for further studies

Ideally, another Control group would have been included, composed of children with a diagnosis of ADHD who repeated the test twice without Ritalin, but with a placebo on second administration, i.e. a randomised, double-blind control trial. However, this was not ethical in this study as the experimental group were all part of a clinical population attending for treatment.

Given the nature of the problems with attention and motivation within the ADHD group, it would seem likely that the ADHD group are more likely to experience boredom and fatigue on second administration (Konrad et al., 2001; Hoza, 2001), especially when they have struggled with the first trial. This would suggest that

the effect of the Ritalin on attention and motivation might be greater than demonstrated by this experiment. Therefore it might also be useful to have a control group of children with ADHD who repeat the test on the same day, without taking medication on either occasion.

It is important to be able to relate the findings of repeat administration to information supplied by the standard parent and teacher behavioural questionnaires. This would help to determine whether specific improvements on cognitive attention could be linked to behavioural observations. Similarly, it would also be useful to compare the children's rate of progress on academic attainments, such as literacy and numeracy, to determine whether the improvements in attention and executive functioning can be seen to have a direct effect on rate of academic learning.

j) Linking findings to EP practice

The results of the study presented above show that children with ADHD have significant cognitive attention impairments when compared to a control group of children without ADHD. These research findings also show the benefits of medication for children with ADHD. These changes may not be apparent in terms of observable behavioural changes in the children, although this aspect was not covered by this study. In 1989 a view was proposed by August & Garfinkel that there is a sub-group of children (around 20%) within the ADHD group that has 'cognitive' rather than 'behavioural' ADHD. They suggested that it is this group that has specific neuropsychological impairments leading to academic

underachievement, in addition to the other symptoms of ADHD. With the development of attention measures that assess a broader range of attention skills, it now seems probable that all children with ADHD would be expected to have some neuropsychological deficits. However, August and Garfinkel also recognised that those neuropsychological deficits affecting cognitive attention are likely to have a severe impact on learning. It would therefore also seem plausible that any medication that has a positive impact on these neuropsychological deficits will also improve learning. This has been shown to be the case in studies by Zentall (1993) and Lindsay et al. (1999) cited earlier. Educational underachievement within the ADHD population has usually been thought of as a consequence of behavioural difficulties or lower intellectual ability but these findings support the view that it may well be a consequence of specific cognitive difficulties. The effects that stimulant medication has on children's learning should therefore be carefully monitored, as well as any behavioural changes, to ensure that medication is not withdrawn simply because the more subtle benefits to academic learning have not been fully assessed or recognised.

k) Future directions for the development of services for children with ADHD

In order to meet the educational and social needs of children with specific attentional disorders, it would seem imperative to identify correctly the nature of their difficulties in order not only to ensure that appropriate interventions are put in place in school but to make certain that the child, their parents and teachers understand the likely impact of their difficulties on their behaviour, learning and social interactions. A retrospective study of young adults with ADHD (Murphy

et al. 2002) painted a rather gloomy picture of their outcome. They conducted a study comparing the educational achievements and clinical history of young adults with ADHD with normal controls. Despite the fact that the two groups were matched for IQ, the ADHD groups received fewer years of education and were less likely to have graduated from college. They were more likely to have been diagnosed with learning difficulties, dysthymia (chronic low mood) and drug/alcohol dependence/abuse. As this group of adults with ADHD were not diagnosed as children and therefore did not receive any interventions specifically targeting ADHD as they were growing up, it would be useful to repeat the study now, comparing their outcomes to a similar group who have been correctly diagnosed and treated as children. This would provide some evidence regarding whether early intervention leads to better long-term educational, social and psychiatric outcome for this group.

The diagnosis and monitoring of childhood attention problems is currently carried out by doctors and it may be that the lack of psychological involvement in the diagnosis is contributing to the heterogeneity of the group of children described as having ADHD. The use of medication and how its effect is monitored, in behavioural and cognitive terms, should be considered within a multi-professional framework. As neuropsychological measures of attention improve, it would be useful to include them in all diagnostic cases. This would help to determine whether there are more distinct subgroups within ADHD. It would also ensure that any other co-existing problems, such as with working memory, receptive language etc., are taken into account when developing an intervention programme for the individual. Psychologists should aim to develop

clearer models for implementing interventions that support both behaviour and learning, addressing the child's most salient difficulties. Intervention strategies can be external, e.g. altering the environment for the child, or internal, e.g. teaching the child compensatory strategies. Recommendations will vary according to the age, context and intellectual ability of the child.

Within the UK there is a drive to develop more multi-professional services for children with ADHD, to include Child and Adolescent Mental Health professionals and a range of educational professionals (Barrow, 1996; Burgess, 2002; Thompson et al., 2003). It is important that these agencies include Behaviour Support teams at the planning and training stage of the development of these services in order to ensure a coherent and consistent provision for children. Professionals within the Behaviour Support Teams should also be supported by colleagues with training in research methods to ensure that they are able to monitor and evaluate their service provision systematically in terms of specific cognitive, learning and social benefits to the children, rather than focussing on exclusion and statementing rates, as described by Barrow (1996).

While there are few studies demonstrating effective rehabilitation methods for specific attention problems in children, the adult literature provides some methods, based on the cognitive models described above, that have face validity and would translate quite readily to the classroom/teaching environment (Stringer, 1996; Whyte et al., 1998). Specific strategies need to be geared to the child's learning environment, their neuropsychological profile and varied according to task and environmental demands.

A review of strategies used to support pupils with ADHD in the USA (New England) indicated that a similar system to that used broadly within the UK is also used there, i.e. providing advice to schools through consultation (Mulligan, 2001), with therapists offering advice directly to the teachers. When the teachers' views regarding the effectiveness of the various strategies were surveyed, those that were found to be most effective were those which involved environmental adaptations being made for the child, e.g. the provision of in-class support, frequent breaks for motor activities and clear routines and structures. They found that the less adult-oriented strategies, such as time-out and peer tutoring were less effective. This study was published in an occupational therapy journal and reflects a growing involvement of occupational therapists in the treatment and management of children with ADHD.

Section 5: Concluding Comments

Educational psychologists, as well as health professionals, need to be more aware of the possible cognitive underpinnings to ADHD-related behavioural disorders and to consider them when evaluating a child's behavioural difficulties. There are now a number of studies that suggest that problems with attention impact on learning in a range of areas, most notably numeracy and literacy skills. It is also likely that attention difficulties are responsible for more pervasive problems of learning, such as self-organised learning and the generation, organising and presentation of ideas. These problems, in adult literature, would be considered within the realms of higher order thinking skills and, in children, may be

fundamental to many aspects of learning (Cohen et al. 1998). Educational Psychologists need to have a good understanding of the assessment and management of attention difficulties because they exist in some form in most cases of behavioural, learning and social communication difficulty. Attentional functions underlie many other cognitive processes that are essential for learning and there is a high co-morbidity with autistic spectrum disorders, dyslexia, and dyspraxia as well as conduct disorder (Biederman et al., 1991).

There is a clear role for educational psychologists to take an active part in monitoring the effect of medical and psychological treatment options on the various difficulties associated with ADHD. The diverse skills of the educational psychologist are needed to understand how the complex and often disparate research findings can inform our management of the behavioural and learning difficulties for individual children within their real-life context. This role of multi-professional facilitator is necessary in order to take our understanding of ADHD forward in a balanced, reflective way.

References

August, G.J. & Garfinkel, B.D. (1989) Behavioural and cognitive subtypes of ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry*. **28**:739-748.

Aman, C.J., Roberts, R.J. & Pennington, B.F. (1998) A Neuropsychological Examination of the Underlying Deficit in Attention Deficit Hyperactivity Disorder: Frontal Lobe Versus Right Parietal Lobe Theories. *Developmental Psychology*. **34**(5): 956-969.

American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (1994) Washington DC. American Psychiatric Association.

Anderson, J., Anderson, V., Robertson, I. & Manly, T. (2001) Sustained and selective attention in children with Attention Deficit/Hyperactivity Disorder and Specific Learning Disabilities. *Clinical Neuropsychological Assessment*. **2**:

Aston-Jones, G., Rajkowski, J. & Cohen, J. (1999) Role of locus coeruleus in attention and behavioural flexibility. *Biological Psychiatry*. **46**: 1309-1320.

Barkley, R.A. (1997) Behavioural inhibition, sustained attention and executive function: constructing a unified theory of ADHD. *Psychological Bulletin*. **121**: 65-94.

Barkley, R.A. & Grodzinsky, G.M. (1992) Are tests of frontal lobe functions useful in the diagnosis of attention deficit disorders? *Clinical Neuropsychology*. **8**: 121-139.

Barrow, G. (1996) A survey of behaviour support service. *Emotional and Behavioural Difficulties*. **1**(2): 31-34.

Baumeister, A.A. & Hawkins, M.F. (2001) Incoherence of Neuroimaging studies of Attention Deficit/Hyperactivity Disorder. *Clinical Neuropsychology*. **24**: 2-10.

Biederman, J., Newcorn, J. & Sprich, S. (1991) Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety and other disorders. *American Journal of Psychiatry*. **148**: 564-577.

Bracy, O.L. (1994) Cognitive functioning and rehabilitation. *Journal of Cognitive Rehabilitation*. **12**:10-28.

Brown, R.T. & Ievers, C.E. (1999) Psychotherapy and pharmacotherapy treatment outcome research in pediatric populations. *Journal of Clinical Psychology in Medical Settings*. **6**: 63-88.

- Bull, R. & Scerif, G. (2001) Executive functioning as a predictor of children's mathematics ability: Inhibition, switching, and working memory. *Developmental Neuropsychology*. **19**: 273-293.
- Burgess, I.C. (2002) Service Innovations: Attention-deficit hyperactivity disorder – development of a multi-professional integrated care pathway. *Psychiatric Bulletin*. **26(4)**: 148-151.
- Cains, R.A. (2000) Children diagnosed ADHD: Factors to guide intervention. *Educational Psychology in Practice*. **16(2)**: 159-180
- Coghill, D. (2002) Evidence-based psychopharmacology for children and adolescents. *Current Opinion in Psychiatry* **15(4)**: 361-368.
- Cohen, R.A., Sparling-Cohen, Y.A. & O'Donnell, B.F. (1993) *The neuropsychology of attention*. New York: Plenum Press.
- Cohen, R.A., Malloy, P.F. & Jenkins, M.A. (1998) Disorders of Attention. In P.J. Snyder & P.D. Nussbaum (Eds.) *Clinical Neuropsychology: A pocket handbook for assessment*. (541-572). Washington DC: American Psychological Association.
- Conners, C.K. (1997) *Conners' Rating Scales – Revised*. Multi-Health Systems Inc.
- Connor, M.J., Epting, C., Freeland, R., Halliwell, S., et al. (1997) Understanding and managing attention deficit hyperactivity disorder: The perspective from educational psychology. *Educational and Child Psychology*. **14 (1)**: 60-69.
- Goldman, L.S., Genel, M., Bezman, R.J., et al. (1998) Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Journal of the American Medical Association*. **279**:1100-1107.
- Himmelstein, J., Newcorn, J.H. & Halperin, J.M. (2000) The neurobiology of attention-deficit hyperactivity disorder. *Frontiers in Bioscience*. **5**: 461-478.
- Holowenko, H. & Pashute, K. (2000) ADHD in Schools: a survey of prevalence and 'coherence' across a local UK population. *Educational and Child Psychology*. **16(2)**: 181-190.
- Hood, J., Baird, G., Rankin, P. & Isaacs, E. (2005) Immediate effects of methylphenidate medication on cognitive attention skills of children with Attention Deficit Hyperactivity Disorder. *Developmental Medicine and Child Neurology*. **47**: 408-414.
- Hoza, B., Pelham, W.E., Waschbusch, D.A., Kipp, H. & Owens, J.S. (2001) Academic task persistence of normally achieving ADHD and control boys: Performance, self-evaluations and attributions. *Journal of Consulting and Clinical Psychology*. **69(2)**: 271-283.

Imich, A. & Roberts, A. (1990) Promoting positive behaviour: An evaluation of a behaviour support project. *Association of Educational Psychologists Journal*. **5(4)**: 201-209.

Keen, D.V., Olurin-Lynch, J. & Venables, K. (1997) Getting it all together: Developing a forum for a multi-agency approach to assessing and treating ADHD. *Educational and Child Psychology*. **14(1)**: 82-90.

Kempton, S., Vance, A., Maruff, P., Luk, E., Costin, J. & Pantelis, C. (1999) Executive function and attention deficit hyperactivity disorder: stimulant medication and better executive performance in children. *Psychological Medicine*. **29(3)**: 527-538.

Kerns, K.A., Eso, K. & Thomson, J. (1999) Investigation of a direct intervention for improving attention in young children with ADHD. *Developmental Neuropsychology*. **16(2)**: 273-295.

Konrad, K., Gauggel, S., Manz, A. & Scholl, M. (2001) Lack of inhibition: A motivational deficit in children with attention deficit/ hyperactivity disorder and children with traumatic brain injury. *Child Neuropsychology*. **6(4)**: 286-296.

Korkman, M, Kirk, U. & Kemp, S. (1998) NEPSY – A Developmental Neuropsychological Assessment. The Psychological Corporation. Harcourt Brace & Company. San Antonio.

Levitt, T. & Johnstone B. (2001) The Assessment and Rehabilitation of Attention Disorders. In B. Johnstone & H.H. Stonnington (Eds.), *Rehabilitation of Neuropsychological Disorders* (pp. 27-52). Psychology Press: Taylor & Francis Group.

Lezak, M.D. (1995) *Neuropsychological Assessment* (3rd ed.) New York: Oxford.

Lindsay, R.L., Tomazic, T., Levine, M.D. & Pasquale, J.A. (1999) Impact of attentional dysfunction in dyscalculia. *Developmental Medicine & Child Neurology*. **41**: 639-642.

Lou, H.C., Henriksen, L., Bruhn, P., Borner, H. & Nielsen, J.B. (1989) Striatal dysfunction in attention deficit and hyperkinetic disorder. *Archives of Neurology*, **46**, 48-52.

Manly, T., Anderson, V. Robertson, I., & Nimmo-Smith, I. (1999). *The Test of Everyday Attention for Children*. London: Thames Valley Test Company.

Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P. & Robertson, I. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and

ADHD performance. *Journal of Child Psychology & Psychiatry*. **42**:1065-1081.

Mefford, I.N. & Potter, W.Z. (1989) A neuroanatomical and biochemical basis for attention deficit disorder with hyperactivity in children: a defect in tonic adrenaline mediated inhibition of locus coeruleus stimulation. *Medical Hypotheses*. **29**: 33-42.

Mehta, M.A., Owen, A.M., Sahakian, B.J., Manaddat, N., Pickard, J.D. & Robbins, T.W. (2000) Methylphenidate Enhances Working Memory by Modulating Discrete Frontal and Parietal Lobe Regions in the Human Brain. *The Journal of Neuroscience*. **20**:RC65 (1-6)

Mirsky, A.F., Pascualvaca, D.M., Duncan, C.C. & French, L.M. (1999) A model of attention and its relation to ADHD. *Mental Retardation & Developmental Disabilities Research Reviews*. **5**(3): 169-176.

MTA Co-operative Group. (1999) A 14-month randomised clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry* **56**(12): 1073-1086.

Mulligan, S. (2001) Classroom strategies used by teachers of students with attention deficit hyperactivity disorder. *Physical and Occupational Therapy in Pediatrics*. **20**(4): 25-44.

Murphy, K.R., Barkley, R.A. & Bush, T. (2002) Young adults with attention deficit disorder: subtype differences in comorbidity, educational and clinical history. *The Journal of Nervous and Mental Disease*. **190**: 147-157.

National Institute for Clinical Excellence. (2000) Guidance on the use of methylphenidate (Ritalin, Equasym) for attention deficit/hyperactivity disorder (ADHD) in childhood. *Technology Appraisal Guidance*. **13**. London: NICE.

Pliszka, S.R., McCracken, J.T. & Maas, J.W. (1996) Catecholamines in attention-deficit hyperactivity disorder: current perspectives. *Journal of the American Academy of Child and Adolescent Psychiatry*. **35**: 264-272.

Posner, M. (1995). Attention in Cognitive Neuroscience: An Overview. In M. Gazzaniga (Ed.): *The Cognitive Neurosciences*. Cambridge, MA: MIT Press.

Posner, M.I. & Peterson, S.E. (1990) The attentional system of the human brain. *Annual Review of Neuroscience*. **13**: 25-42.

Rennie, E. (1993) Evaluating Behaviour Support: A consideration of possibilities. *Association of Educational Psychologists Journal*. **9**(1): 22-25.

Robertson, I.H., Ward, A., Ridgeway, V. & Nimmo-Smith, I. (1994) *Test of Everyday Attention*. Bury St Edmunds: Thames Valley Test Company.

Sattler, J.M. (1992) *Assessment of Children*. 3rd Edition. San Diego: JM Sattler.

Semrud-Clikeman, M., Filipek, P.A., Biederman, J., Steingard, R., Kennedy, D., Renshaw, P. & Bekken, K. (1994). Attention-deficit Hyperactivity Disorder: magnetic resonance imaging morphometric analysis of the corpus callosum. *Journal of the American Academy of Child and Adolescent Psychiatry*. **33**:875-881.

Shaffer, D., Fisher, P., Dulcan, M. et al. (1996) The NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3): description, acceptability, prevalence rates, and performance in the MECA study. *Journal of the American Academy of Child and Adolescent Psychiatry*. **35**: 865-877.

Shallice, T. & Burgess, P. Higher-order cognitive impairments and frontal lobe lesions in man. *Frontal Lobe Function and Dysfunction*, edited by Levin H, Eisenberg H, and Benton A. New York, NY: Oxford University Press; 1991.

Shapiro, M.B., Morris, R.D., Morris, M.K., Flowers, C. & Jones, R.W. (1998) A neuropsychologically based assessment model of the structure of attention in children. *Developmental Neuropsychology* **14**: 657-677.

Sohlberg, M.M. & Mateer, C.A. (1987) Effectiveness of an attention-training program. *Journal of Clinical and Experimental Neuropsychology*. **9**: 117-130.

Sproson, B. (1997) What role can be fulfilled by an external support teacher to maintain students who present mainstream schools with behaviour management difficulties? *Emotional & Behavioural Difficulties*. **2(2)**: 4-13.

Stringer, A.Y. (1996) *A guide to neuropsychological diagnosis*. Philadelphia: Davis.

Tannock, R., Ickowicz, A. & Schachar, R. (1995) Differential Effects of Methylphenidate on Working Memory in ADHD Children with and without Comorbid Anxiety. *Journal of the American Academy of Child and Adolescent Psychiatry*. **34(7)**: 886-896.

Thompson, A.E., Morgan, C. & Urquhart, I. (2003) Children with ADHD transferring to secondary schools: Potential difficulties and solutions. *Clinical Child Psychology and Psychiatry*. **8(1)**: 91-103.

van Zomeren, A.H. & Brouwer, W.H. (1994) *Clinical Neuropsychology of Attention*. New York: Oxford University Press.

Volkow, N.D., Wang, G-J., Fowler, J.S., Logan, J., Gerasimov, M., Maynard, L., Ding, Y-S., Gatley, S.J., Gifford, A. & Franceschi, D. (2001) Therapeutic Doses of Oral Methylphenidate Significantly Increase Extracellular Dopamine in the Human Brain. *Journal of Neuroscience*. **21**: 121:1-5.

World Health Organisation. (1993) The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research. WHO, Geneva.

Whyte, J. (1992a) Attention and arousal: Basic science aspects. *Archives of Physical Medicine and Rehabilitation*. **73**: 940-949.

Whyte, J. (1992b) Neurologic disorders of attention and arousal: Assessment and treatment. *Archives of Physical Medicine and Rehabilitation*. **73**: 1094-1103.

Whyte, J., Hart, T., Laborde, A. & Rosenthal, M. (1998) Rehabilitation of the patient with traumatic brain injury. In J.A. DeLisa & B.M. Gans (Eds.) *Rehabilitation Medicine: Principles and practice* (3rd ed., pp. 1191-1239). Philadelphia: Lippincott-Raven.

Zametkin, A.J., Rapoport, J.L. (1987) Neurobiology of attention deficit disorder with hyperactivity: where have we come in 50 years? *Journal of the American Academy of Child and Adolescent Psychiatry*. **26**: 676-686.

Zentall, S.S. (1993) Research on the educational implications of attention deficit hyperactivity disorder. *Exceptional Children*. **60**: 143-153.

APPENDIX 1

Attention component	Possible cognitive consequences	Management principles
Arousal	Problems with levels of arousal might lead the child to under or over react to what is happening around him. He may respond too slowly to external stimuli or become distressed when he is in a busy environment	<ul style="list-style-type: none"> -Ensure the child is always well rested when commencing work -Sequence activities so that least interesting tasks are interspersed with favoured tasks -Provide the child with a pictorial representation of the sequence of events to improve motivation
Focussed attention	The child has a very short span of attention. The child may well find that in situations where other children's attention is held naturally, e.g. when a story is being read, he requires intentional cognitive effort to remain focussed and that cannot be sustained as easily	<ul style="list-style-type: none"> -Create a non-distracting environment, e.g. remove distractors from view -Place the child in front of the teacher -Call the child by name before addressing them -Ask the child to repeat instructions to ensure they have understood -Workstations may be helpful for creating a sensory-reduced environment.
Divided attention	The child may have limited capacity to share his attention between two simultaneous events, e.g. to listen to the teacher while finishing writing a sentence	<ul style="list-style-type: none"> -Ensure the child has to only concentrate on one stimulus source at a time -Try to make sure tasks can be completed within the time-frame allowed to prevent the child having to leave tasks incomplete and switch to something else -Provide written notes and instructions so the child does not have to try to write while listening to the teacher
Sustained attention	The child may lose his place during a mental calculation or be distracted by his own ideas, the child forgets what he is doing as he proceeds through a piece of work	<ul style="list-style-type: none"> -Keep tasks brief enough to be completed within the child's span of attention. This will vary for different types of tasks and different

		<p>classroom situations</p> <ul style="list-style-type: none"> -Reward on task time and plan breaks into an activity so that the child is not always in trouble for being off-task -Structure activities so that the child does not have to hold the work plan in their head as it may be lost as soon as they are distracted
Response inhibition	<p>The child may be very distractible and not be able to ignore noises around him. Similarly, he may not be able to inhibit his own impulses and may need to vocalise an idea as soon as it occurs to him rather than delay mentioning it</p>	<ul style="list-style-type: none"> -Maintain a calm environment -Avoid multi-sensory teaching -Train the child to use alternative reactions in role-play situations i.e. to replace the impulsive response with another impulsive, but more appropriate, response

**Specific memory deficits and their implications for learning
and behaviour in the classroom**

Abstract

Until recent years there was little evidence for specific dissociations in childhood memory. It was often assumed that congenital or acquired neurological disorders early in development resulted in diffuse global learning difficulties or alternatively that immature brains had enough plasticity to compensate for areas of initial impairment. Recent studies have questioned this view with evidence of specific memory deficits in both clinical populations (Vargha-Khadem et al., 1997; Gadian et al., 2000) and mainstream school children who have no obvious neurological history (Gathercole & Pickering, 2000). This assignment describes how specific memory deficits influence children's behavioural presentation and learning capacity in the school classroom. It is intended that the description of specific memory deficits in the classroom will provide educational professionals with informed guidance on identifying and adapting supportive strategies for the individual child's needs. Whilst the systematic study of memory rehabilitation in children remains limited, practical suggestions are made based on recent findings of dissociations in children's memory and the clinical experience of the author working with these populations. It is anticipated that such suggestions may act as hypotheses for further systematic study of memory rehabilitation in children and adolescents.

INDEX

1	Abstract		43
2	Introduction	Aims and scope of assignment	45
3	Context for assignment		47
		Dissociations in explicit memory	49
4	A Review of the Psychological Literature		51
		Short term Phonological Loop	52
		Short term Visuo-spatial Sketchpad	53
		Short-term central executive	56
		Long-term memory	58
		Semantic memory	58
		Episodic memory	60
4	Integration of Theory, Research and Practice		62
		Short-term working memory deficits	63
		Short-term phonological loop deficits	64
		Short-term visuo-spatial sketchpad deficits	65
		Short-term central executive deficits	67
		Long-term semantic memory deficits	68
		Long-term episodic memory deficits	70
		Summary table	74
		Implications for EP Practice	75
5	Summary		76
7	References		78

Introduction

Aims and scope of assignment

There are numerous theoretical accounts of observable dissociations in the memory system, ranging from molecular models (e.g. Small et al., 2000) to neural systems models (e.g. Squire et al., 1993). However, knowledge about these dissociations is rarely considered when assessing and supporting children with specific learning difficulties in school. Therefore this assignment will outline some of the most commonly agreed dissociations in human memory with particular attention drawn to specific memory deficits reported in children and adolescents. However, it should be stressed that memory is not an isolated cognitive skill or domain. Ideally a full neuropsychological assessment for an individual would be completed to provide a context within which memory can be considered. For example, overall intellectual abilities would indicate the level and complexity of information that can be understood and therefore recalled. Difficulties with language comprehension or hearing/auditory processing problems would affect a child's ability to perform tasks assessing the amount of auditory information they can retain, whereas core visuo-spatial abilities would affect measures assessing visual memory. In addition attention and executive functioning skills will affect a child's ability to process, make sense of and organise information. All of these factors will impact on a child's performance on memory tasks. In addition, a complete neuropsychological assessment, incorporating a memory assessment, allows consideration of an individual's strengths and weaknesses, so that recommendations can be tailored to

suit their specific needs, in order to maximise the child's strengths and avoid overloading areas of specific weakness. For example, multi-sensory or multi-modal approaches are frequently recommended for children and yet, for those children with specific short-term memory deficits, they can be detrimental as they bombard children with distracting information they cannot use.

The behavioural and learning implications of these problems will be considered, with specific educational examples, in order to demonstrate the potentially far-reaching and pervasive effects of these particular difficulties on a broad range of learning and social areas. Finally, possible strategies for supporting children's learning and development will be described. These will be presented with an emphasis on taking the broader social and personal needs of the child into account when planning and evaluating their individual programme. The potential areas for developing rehabilitation studies for children with memory disorders will be outlined and the case for early intervention will also be made.

Therefore, the aims of this assignment are:

- 1) To describe neuropsychological and cognitive models of human memory
- 2) To relate these processes to children's learning and the implication for their classroom behaviour
- 3) To consider how these models can inform the development of specific classroom interventions
- 4) To discuss the implications of studies in this area for future educational psychology practice.

Context for assignment

A significant role for educational psychologists in their day-to-day practice is to provide advice to schools regarding children's learning difficulties. However, educational psychologists do not routinely assess children's memory skills in a formal way as part of their individual assessment of children. Therefore, by way of introduction to this subject, the various presentations of specific memory disorders within the learning environment will be described in order to put forward the possibility that a range of specific memory disorders are being over-looked.

It is important to note at the outset that the identification of a memory disorder should not be limited to an assessment of the child's performance on memory tasks alone. To identify a memory disorder reliably a neuropsychological assessment is required that utilises appropriate measures of memory, but also includes assessments of associated cognitive functions including attention, language, visual-spatial skills, executive functions, motor planning and general intelligence. A neuropsychological assessment considers how each of these domains relates to each other and to what extent they are indicative of underlying brain function. Deficits in any of these cognitive abilities may confound a child's ability to perform well on memory tests. For example, a child with an attentional processing deficit may not attend to the stimuli that are being used in a memory test. Alternatively a child with poor language comprehension may not successfully encode verbal material to be remembered while a child with poor language expression may have stored the material to a reasonable level but perform poorly when asked to recall the material verbally. Furthermore, a child with generalised low intellectual abilities is likely to perform within the low

range on any measure of cognitive function. Therefore one cannot assume that a child who performs poorly on memory tests or behaves as if they are experiencing memory difficulties necessarily has a specific memory problem. Obviously memory difficulties can coexist alongside more pervasive cognitive deficits, but in an attempt to investigate the relationship between memory deficit and the consequences for behaviour and learning, this paper considers the specific dissociations noted in childhood memory.

The research demonstrating the dissociations within human memory will be outlined here in order to demonstrate how specific memory difficulties might be expressed in the classroom. The first distinction often made between different types of memory concerns explicit (also known as declarative) versus implicit (non-declarative) memory. Explicit memory is considered to be information that a person can explicitly recall or is consciously aware of. It is also described as declarative memory because humans can usually verbally declare that they are experiencing such memories. Explicit memory will most typically affect the child's ability to learn the contents of the academic curriculum and day-to-day social functioning. Therefore this paper will predominantly consider specific deficits in explicit memory.

Briefly, implicit memory refers to acquired knowledge that we are not explicitly able to recall, such as procedural skills (Squire et al., 2001). For example when we are experienced at riding a bicycle, we will accurately perform the necessary motor sequences and adjust our balance according to a changing environment, but we are unlikely to explicitly recollect the information which informs our performance. These memories take time and practice to acquire. Obviously a child's literacy skills

may be implicit once they have become accomplished and it is suggested that impaired implicit learning may be a feature of the cognitive profile of dyslexic children (Vicari et al., 2003). Therefore deficits in implicit learning are also likely to affect a child's academic functioning. However, initially the child will have to use explicit phonic knowledge and visual interpretation to learn basic literacy and this type of learning appears more readily accessible to possible intervention. Implicit learning does not appear to vary as a function of IQ or age (Vinter & Detable, 2003).

Dissociations in Explicit Memory

Common everyday activities require us to hold information in mind for short periods of time until we have used the information to work out a problem or perform a task. Such activities might include recalling a telephone number until we have dialled it or written it down, or performing mental arithmetic on the prices of items in our shopping basket. Baddeley and Hitch (1974) described this type of memory processing as short-term 'working' memory (STWM), because it is the memory used to 'work out information there and then'. This model hypothesized that there were three aspects of STWM as described below; the phonological loop, the visuo-spatial sketchpad and the central executive. Baddeley (2000) has since added an additional aspect to the working memory model, which he terms the 'episodic buffer'. However, for the sake of developing an initial simple model for memory intervention studies, episodic memory is described only within the long-term memory system, as this is the system in which it has been more frequently investigated. It is anticipated that the model will be critically evaluated and reformulated as evidence within the field grows.

The implications for children of the existence of specific memory deficits are that they are likely to have long-term implications for their learning and social functioning and also their longer-term ability to live independently. Therefore, it is of paramount importance that those overseeing the learning of these children are aware of how specific memory deficits affect their learning and social functioning and take the necessary steps to provide appropriate advice based on current research.

Research into the development, use and efficacy of interventions for rehabilitation for children with memory disorders is conspicuously sparse. There is considerably more research into rehabilitation in the adult field and a more established history of rehabilitation with adults with acquired injuries (e.g. Kapur, 2001). Despite this, there are few studies into the efficacy of restorative and rehabilitative methods that are recommended (Wilson, 1997). The field of rehabilitation is more complex still for children because, in many cases, the aim will be to rehabilitate skills that are not yet fully developed yet. This will mean, in some cases, to help children return to their prior level of functioning, while in others to predict and limit future deficiencies. This makes the evaluation of any rehabilitation techniques extremely challenging because it is hard to be sure about which skills would or would not have improved anyway. However, given the limited amount of knowledge of rehabilitation available, the best approach would seem, instinctively, to use what is known to be effective from adult research and adapt it accordingly, to use what little is known from child research, and to incorporate that with common sense approaches built up from clinical experience integrated with a sound training in paediatric neuropsychology and cognitive development. Consequently it is important for

strategies being used with children to be evaluated regularly as their needs and circumstances are likely to change markedly as they move through school and the educational and social demands constantly evolve. Such monitoring is also important as there is, as yet, such limited evidence regarding the remediation and rehabilitation of childhood memory impairments.

Most rehabilitation recommendations for children are compiled from educational approaches used in school settings, clinical experience and theoretical models adapted from adult rehabilitation. Unfortunately, the few papers from educational psychology tend to be conducted in the absence of a model of memory and brain development, e.g. Riding et al. (2003). Or, as in the case of the Gathercole and Pickering paper (2000), draw broad conclusions about the specific effects of memory deficits without ruling out the presence of more general learning difficulties. Practical recommendations for specific learning difficulties, including aspects of memory, are described by Dr. Mel Levine in the Learning Base section of his website, www.allkindsofminds.org.

A Review of the psychological literature

This section describes neuropsychological models of memory in order to establish a framework for considering the behavioural, learning and social implications of specific memory disorders for children of school age. It is beyond the scope of this assignment to consider a range of cognitive models of memory and therefore an overview of the current neuropsychological models, upon which contemporary

paediatric assessments are based, is used. Observations made about the consequences for behaviour are drawn largely from clinical experience and related to these models.

Short term Phonological Loop

The Phonological Loop encodes phonological sound structures such as verbal information. Information gains access to the phonological store either directly via auditory presentation of speech stimuli or indirectly via internally generated phonological codes for non-auditory input such as printed words. The phonological loop is assumed to comprise two sub-components, a phonological store and an articulatory control process based on inner speech (Baddeley, 1997). Memory traces in the phonological store fade and become irretrievable after about two seconds. However, the articulatory control process can rehearse the trace. This rehearsal can prevent the decay of the memory, providing the entire contents of the memory can be practiced within two seconds (Gathercole, 1998), as would be the case when repeating a telephone number to yourself until you have dialled the number.

Children's short-term phonological memory increases dramatically over the early and middle years of childhood with a two to three-fold increase in the ability to hold two and three verbal items at 4 years of age to about six items at 12 years (Gathercole, 1998).

Children with phonological loop problems often first present with speech and language difficulties. There is now substantial evidence linking poor phonological short-term memory skills with specific difficulties in acquiring language. Young

children's scores on phonological memory tests, such as repeating a series of digits or nonsense words, are strongly correlated with vocabulary knowledge in their native language (Bowie, 2001; Gathercole and Baddeley, 1989; Gathercole et al., 1999; Michas & Henry, 1994) and in second languages (Service, 1992; Service & Kohonen, 1995). Children with phonological memory deficits also show impairments on speech production (Adams & Gathercole, 1995; Blake et al., 1994). Children with Specific Language Impairment, a disorder of language development in the absence of general intellectual or sensory problems, also have significant deficits in short-term phonological memory (Bishop et al., 1996; Montgomery, 1995). It has been hypothesised that this is because the phonological loop is necessary for learning new words (Baddeley et al., 1998). According to this view, children with inadequate short-term memory skills will experience difficulties in learning the sound structure of new words, although the non-phonological aspects of their vocabulary acquisition may be entirely normal (Gathercole et al., 1999).

Short term Visuo-spatial Sketchpad

The second major component of short-term working memory is the visuo-spatial sketchpad (Baddeley and Hitch, 1974), a system assumed to be responsible for setting up and manipulating visuo-spatial images, including shape, colour, space and movement. Like the phonological loop the visuo-spatial sketchpad appears to have two sub-components, a visual store in which the physical characteristics of objects can be represented and a spatial mechanism that can be used for planning movements (Levine et al., 1985; Logie, 1994; Pickering et al., 2001). It is well documented that

sensory visual processing involves two major neural pathways emanating from the retina. A dorsal pathway to the posterior parietal cortex, including the middle temporal area, appears mainly concerned with spatial processing, sometimes known as the 'where route' and a ventral pathway involving the inferior temporal cortex that seems more specialised for object recognition, the 'what route' (Ungerleider & Mishkin, 1982). It may be that the dissociation between the two sensory routes underlies the basis of the two cognitive components reported in visuo-spatial memory studies.

The developmental course of children's visuo-spatial sketch-pad between the ages of 7 and 15 years was investigated by Isaacs and Vargha-Khadem (1989) using a measure known as Corsi blocks in which children have to repeat a tapping sequence of blocks that are arranged across a board. Children at the age of 7 years could correctly tap a sequence of 4 blocks and by the age of 15, their span had almost doubled to 7 blocks. Studies also suggest that younger children are more dependent on using their sketchpad to remember visual material, whereas older children seem to store such information as verbal stimuli more readily. Hitch et al. (1988), reported that 5 year olds were much more impaired at recalling visual objects that shared physical features, compared to those that shared few physical features. 10-year-old children showed no such contrast, but were impaired when the objects had lengthy names. This suggests the developmental increase in the capacity of the visuo-spatial sketchpad may be partly a consequence of using a more efficient or reliable strategy.

Within the paediatric population referred to clinical neuropsychology services, it is often the case that children with specific visuo-spatial memory deficits are more

poorly understood by teachers and parents when compared to children with phonological memory deficits. Phonological memory is more frequently measured and recognised by teachers, support staff and speech and language therapists as underpinning many children's difficulties with literacy and language skills. Such phonological deficits are easily linked to difficulties with an academic curriculum largely expressed as verbal information. Also, within the developmental cognitive literature, the effects of specific visuo-spatial sketchpad deficits have been much less extensively investigated compared to language disorders, although this may not reflect the actual incidence of such deficits (Temple, 1997).

A well-studied population of children with visuo-spatial memory difficulties are referred to in the non-verbal learning difficulties literature (Rourke, 1995). Unfortunately this population is rather heterogeneous as they are described based upon their overall non-verbal intellectual skills, rather than specific visuo-spatial memory deficits. Albeit with this limitation in mind, there are good descriptions of such children performing poorly on visual memory tasks and having clear difficulties finding their way around new environments (Stiles-Davis, 1988), learning spatial groupings (Shies & Nass, 1991), learning visual symbols such as numbers and mathematical symbols and manipulating visual information (Badian, 1983; Rourke & Conway, 1997; Strang & Rourke, 1983). The subjects most dependent on spatial awareness and organisation, such as mathematics, science and geography, often appear to be most problematic (Denkla, 1991; Ozols & Rourke, 1988). Social skills are also frequently reported as impaired within this population (Worling et al., 1999; Rourke, 1988) and significant deficits in visual-spatial memory tasks have been

reported in people with prosopagnosia, the inability to recognise faces accurately (Barton, 2003).

Short term Central Executive

The working memory model includes a central executive component that acts as an attentional controller, manipulating the information stored in either of the two slave systems, the phonological loop and visuo-spatial sketchpad (Baddeley and Hitch, 1974). For example, as discussed above, if someone were trying to remember a phone-number, it would be immediately encoded in the phonological loop system. However, if they were required to reverse the sequence of numbers, the central executive would be required to manipulate the information in this way. The central executive is closely related to a broader range of neuropsychological skills known as 'executive functioning' (Pennington & Ozonoff, 1996), which involves planning, control of action and organisation of goal-directed behaviour. Children with central executive difficulties have difficulty with the on-line or dynamic processing of complex information. The ability to think flexibly and to carry out mental operations enables people to be able to apply well-learned information and skills in novel situations (Ericsson & Kintsch, 1995).

The central executive is involved when children are planning a course of action. They need to consider their objectives, draw on information from prior learning, predict the likely consequences of each option, hold that plan in mind and execute it accurately. When children have weaknesses in their central executive, that initiation

of novel tasks can become very daunting. Children often complain that other children ‘just seem to know what to do’ and they have no idea *how* they know. This can be frustrating but more often it seems to be anxiety-provoking. Children frequently then either opt out, or may do something disruptive so that they do not feel self-conscious about not knowing what to do. Particularly as central executive difficulties can exist despite average intellectual ability, children can become very despondent about their inability to perform in class. For these children it can be helpful to ensure that whenever they are asked to do something new, the route to the solution is modelled for them and they are then usually able to carry on working independently. This avoids exposing them to that feeling of anxiety from observing the other children getting on. These children are often rather impulsive and quickly associate themselves with the other members of the class who are also not working, preferring to be seen as ‘too tough to work’ rather than unable to work.

Once children with central executive deficits have commenced a course of action, in my experience they are usually able to continue to apply it to progressively harder examples. However, as soon as a slight adaptation to the task occurs, they will again need help to change what they are doing or they might well carry on applying the same procedure when it is inappropriate and make repeated mistakes without noticing. Teachers are often first to identify these subtle problems with learning and are confused by them because they occur despite the child’s ability to apply learned strategies to a high level. These children are often described as lazy or attention-seeking because they present as not being prepared to start the task without adult prompting whereas they are actually unable to do so.

Long-Term Memory

As noted above, there is now clear evidence to suggest that long-term memory is associated with different neural processes from short-term memory. The exact time when a short-term memory becomes a long-term memory in humans is unclear. However, we usually accept that once a memory has gone from immediate attention, (for example, following a short delay of minutes with the child concentrating on new information in between) then to retrieve the original information would require the support of the long-term memory system.

Within long-term memory, some theorists suggest that there is a dissociation between long-term episodic and semantic memory (Tulving, 1972; 1985; 2000; Neely, 1989). This area is not without controversy as others suggest semantic and episodic memories are essentially one form of memory (Squire, 1998). However, as there have been reports of children with impaired episodic memory but relatively preserved semantic-like memory (Vargha-Khadem et al., 1997; Vargha-Khadem, 2001; Gadian et al., 2000), this apparent dissociation will be described below.

Semantic memory

Semantic Memory is considered to be the factual retention of knowledge and information (Tulving, 2000), such as remembering the date of the battle of Hastings. Recall of this fact is not dependent on remembering when or where it was learnt and semantic memory characteristically lacks details about the specific occasions on which semantic knowledge was established.

Our long-term semantic memory store is our general knowledge of the world. Therefore children who can remember one-off everyday experiences well but are unable to extract semantic information from their experiences are likely to have quite pervasive difficulties succeeding in most aspects of the educational curriculum. As the long-term retention of facts is fundamental to most experiences of learning, one could debate the relationship between semantic memory and more generalised learning difficulties.

Younger children in general have a limited capacity to learn the information we consider to form long-term semantic memory. When children do start to build their semantic memories they learn (in lay terms) in a 'concrete way'. That is, they only tend to learn semantic information when it is very similar to their current understanding of basic concepts and categories. To teach them new, more abstract ideas, the framework for their learning needs to be established, with information clearly adapted to their current knowledge base. Within the primary school stage, teaching semantic information is largely performed through experiential learning experiences. Many primary school lessons are based on doing rather than being told. Children dress up as Romans and experience eating lying down and wearing togas because, when they recall that experience, it helps them to recall facts that were delivered at that time. They cannot access their learning as successfully if they are asked direct factual questions as when they are told to think about when they dressed as Romans, and then asked about what they remember (Bristow et al., 1999). The experience of the situation enables the child to link the semantic information given to the event. Indeed, Conway et al., (1997) have demonstrated that, even for

undergraduates, there are changes in semantic memory awareness during learning, so that initially new learning is most strongly linked to the teaching situation rather than to the network of meanings (semantic memory). As the students progress through the course, they use semantic memory more and report 'knowing things' without recalling the details of the context of their learning.

Young children who are new to a topic do not have sufficient prior knowledge to assign new semantic information into a framework. The early experiential learning helps to provide some kind of early structure for their knowledge and their reliance on the concrete experience becomes less as they acquire more semantic knowledge and experience.

Episodic memory

Episodic memory is considered to be the memory of personal events that are encoded in time and place. Episodic memory enables individuals to remember their personally experienced past in subjective time (Tulving, 1995). For example, when a child can recall what happened on their trip to school this morning (differentiating between this and previous mornings), or what they had for their lunch today, they are recalling a unique episode that would constitute an episodic memory. Most traditional clinical memory tasks are primarily designed to tap episodic memory processes (Kramer & Delis, 2000). Stimuli are presented to individuals on single trials and the child is asked to recall or recognise the appropriate stimuli after a certain time period.

Long-term episodic memory can be significantly impaired in adults who have acquired neurological injury, particularly when the hippocampal formation is impaired, for example, in cases of temporal lobe epilepsy or subsequent to hypoxic events. When such a significant impairment occurs in long-term memory (in comparison to the individual's general intelligence which can remain intact), then the syndrome is usually referred to as amnesia. The most well documented case of amnesia is HM, a male adult who had both temporal lobes removed surgically to alleviate intractable epilepsy (Scoville & Milner, 1957). HM had severe difficulties recalling events from minute to minute and was unable to live an independent life following surgery. Amnesia is well studied within the adult neuropsychological literature and therefore most attempts at memory rehabilitation have so far focussed on external memory aides as compensatory strategies for such individuals (Wilson, 1996).

There have also been cases of severe long-term memory problems reported in children (Wood et al., 1989; Ostergaard, 1987; Broman et al., 1997). Vargha-Khadem et al. (1997) coined the term Developmental Amnesia to describe a group of children who suffered neurological impairments at birth or very early in life, which resulted in severe episodic memory deficits. It appears clear within the population reported by Vargha-Khadem that children with selective impairments to the hippocampi early in life demonstrate severe deficits in remembering day-to-day episodes and in functioning independently. However, they do demonstrate some preserved ability to develop a semantic knowledge of the world and perform within average to low average range on most other intellectual tasks (Gadian et al., 2000; Vargha-Khadem et al., 2001).

Other populations of children, such as those from premature births, have been reported as having episodic memory difficulties of a moderate nature (Isaacs et al., 2000, Briscoe et al., 2001), which may be due to less severe volume reduction in hippocampal function (Isaacs et al., 2003). Such deficits are likely to have implications for children's development but could be difficult to identify without a formal assessment.

Integration of theory, research and practice

Based on the models of memory described, the following observations are made regarding the behavioural and learning consequences of specific memory deficits and principles for intervention are suggested. The absence of good controlled studies into the use of rehabilitative strategies may be partly because, until recently, specific dissociations within childhood memory had not been recognised and children with specific deficits were seen to either have general learning difficulties or behavioural difficulties, depending on their outward presentation.

One educational based study into the use of mnemonic strategies, by Dawn Male (1995) involved helping children with learning difficulties to develop and use their own strategies. This study involved working with children with learning difficulties to observe how they try to learn groups of objects and she then proposed a model of working to help children to generate their own supportive strategies. Unfortunately, the model suggested has not been evaluated in a formal trial and there is no clear

guidance as to which children it might benefit. I.e. whether it would be appropriate for use with children with normal intellectual ability but specific memory impairments. The following section illustrates the importance of identifying specific memory deficits in order to be able to evaluate the effect of interventions on learning more generally.

For each of the different types of memory difficulties, the principles of support will be outlined. As with adult rehabilitation, none of these have been proven to improve memory per se; they aim to reduce the impact of the problem and so assist the individual in being more independent. Studies looking at the effect of direct training on improving functioning in specific skill areas and their effect on academic and social learning more generally are urgently needed.

Short term Working Memory Deficits

There are three basic components to supporting children with any kind of working memory problems. These would be to: -

- 1) Reduce the load on the working memory by keeping things simple and presenting tasks in single steps. Limit the amount of information given.
- 2) Reduce distractions, e.g. external (e.g. noise) or internal (e.g. anxiety) while the task is being completed.
- 3) Teach the child to do all their working out in a concrete format, graphically if there is a verbal deficit and verbally if there is a visual deficit.

Short term Phonological Loop deficits

Weaknesses in the phonological loop system are usually readily observable in children's approach to the acquisition of early literacy skills. For example, once they have learned letter-sound correspondence, they are taught how to sound out and blend sequences of letters to form simple, regular words. Even with simple consonant-vowel-consonant words, children with phonological loop deficits can be heard to remember these basic sequences inaccurately, despite having the letters still in front of them. Once they are able to sound out the letters in the correct sequence, they may find it very hard to match that sequence to a known word and, as they repeat the letter sequence to themselves, further sequential errors often occur. This prevents them learning rapidly to match letter sequences to words and it takes a very long time for them to learn to read with any fluency. This hypothesis can be observed in other situations. For example, when children are attempting mental arithmetic and the details of the sum are embedded in language, these children frequently require additional repetitions of the question.

One of the striking features of observing children with phonological loop problems in class is the variety of behavioural presentations that are manifested by this difficulty. Children may find it so hard to keep track of what the teacher or their peers are saying that they disengage from the lesson and present as passive and inattentive or distractible (Willis and Gathercole 2001). Alternatively, they may engage in alternative activities and be seen as disruptive. These externalised behaviours then tend to become the focus of interventions without sufficient consideration being given to the cognitive difficulty underlying the behaviour.

Short term Visuo-spatial Sketchpad deficits

The observable effects of early difficulties with the visuospatial sketchpad are likely to be subtle and may only really become evident when children begin formal education. They may find it hard to learn to recognise and reproduce numbers, letters and shapes. They may also show more reversals and inversions than would be expected as they learn to write, and have particular difficulty learning to read and spell irregular words. They are likely to have particular difficulties copying from the board because this places great demands on the visual memory system and the ability to switch gaze between two points. They may frequently lose where they have got to in the text and so miss out or repeat chunks. They may also have figure ground difficulties as selecting a chosen visual image from a more complex background requires the child to maintain an accurate image of what they are looking for in their visuospatial sketchpad. Children with visuospatial sketchpad problems often find it useful to have verbal descriptions of visual information as they find these easier to understand and remember.

The social implications of deficits in the visual-spatial sketchpad are multi-faceted and variable. In order to understand complex and rapidly evolving social interactions, children need to be able to integrate information from a variety of sources and senses. For example, they need to observe the facial expressions of all involved, remember who said what and when and also interpret the tone used by each person to say things and their posture and gestures. If children have weaknesses in any of these core skills, or in the integration of information from any source, they may struggle

socially. The factors contributing to early social difficulties need to be identified at an early stage to enable the child to practice skills in the recognition of facial expressions and also to know that they can ask if they are not sure, e.g. asking if someone is cross with them. Teachers should be made aware of the impact of visuospatial difficulties on social functioning and may need to support children's social skills, e.g. through Social Stories and Comic Strip Conversations (Gray, 2000 & 1994), which aim to help children integrate the visual and verbal aspects of communication.

In curriculum terms, the visuospatial sketchpad and visual imagery/manipulation in the central executive is important for maths, e.g. mental arithmetic and shape and pattern recognition. Children often find it helpful to be able to refer to templates which provide them with a description of what the various symbols mean and how to use formal mathematical formats, e.g. for long division. They will also need additional support for all subject areas with a high visual component, e.g. using maps in geography, drawing apparatus in science etc. There are important safety considerations for these children. They will need support for the practical aspects of subjects like science, CDT etc. because mistakes could be made with setting up equipment, reading temperatures, judging distances etc. which could lead to serious injury.

Short term Central Executive deficits

Children who are identified as having poor short-term memory difficulties with the phonological loop and the visuospatial sketchpad at an early stage appear to benefit from extra support and teaching to compensate for such difficulties. However, support professionals can overlook additional central executive deficits. If further central executive deficits remain unrecognised, then the child's ability to benefit from support strategies will be limited. For example, mental arithmetic places great demands on the central executive component of the short-term memory system (Steel & Funnell, 2001). Increasing the complexity of any mental task simply introduces more opportunities for errorful learning in children with central executive deficits.

Gathercole et al. (2003) suggested that children with poor central executive abilities may experience learning difficulties of a non specific nature and that such limitations may be particularly influential in preventing children with more specific difficulties, such as dyslexia, from developing alternative strategies to support their learning (Swanson, 1993). Such children will also struggle when required to process complex verbal information or remember a list of instructions (Willis & Gathercole, 2001). A further example of a complex integrative task for the child at school is planning and writing an essay. The complexity of this type of task often leads to a deterioration of specific skills, such as the child making more spelling mistakes than they would if writing the words in a spelling test, or using significantly less mature grammatical structures than they would in their everyday speech.

Long term Semantic Memory deficits

Some theories suggest that all learning is initially episodic, e.g. when one first comes across a fact, the situation in which it was first heard is relevant (Conway et al. 1997) The second time the fact is heard, the episodic information becomes less relevant and becomes pruned away, leaving purer factual, semantic learning. Younger children are able to learn semantic information, but they need it to be presented in a concrete way, i.e. where the information already fits in with their understanding of concepts and categories. To teach them new, more abstract ideas, the framework for their learning needs to be established. Within the primary school stage, this is done through experiential learning experiences. The early experiential learning helps to provide some kind of early structure for their knowledge and their reliance on the concrete experience becomes less as they acquire more knowledge and experience. Also episodic memory may be less affected by immature attentional/rehearsal/executive skills.

At an early stage, children with semantic memory difficulties are likely to present with difficulty retaining new school rules or other pieces of basic factual information. Such children may be described as appearing to know something one day and forgetting it the next. This may be because they do not encode the fact to the long-term semantic system, but they use other short-term memory processes for the immediate recall of facts or use their episodic memory to recall the event in context. They will appear further delayed in terms of their academic learning over time, as they will not automatically learn factual information about the world, as most children do, without having to be explicitly taught (incidental learning). As the

emphasis within the academic curriculum becomes more dependent on the retention of large amounts of factual information and teaching styles change to more verbal presentations of factual information, rather than experiential learning, such children will fall further behind their peers in most academic subjects.

It is notable that in some instances children's semantic memory difficulties can be masked initially because the child acquires good early literacy and numeracy skills. This is because, during the first few years of schooling, these skills, such as learning the alphabet and number sequences, are frequently used as teaching materials to establish good learning behaviour. The first sight words are explicitly taught and numbers and the alphabet are constantly available for reference on the classroom wall. However the quantity of factual information to be learned subsequently then increases exponentially and these children can appear to be quickly overwhelmed.

Children who have semantic memory deficits find it difficult to become less reliant on their personal recall of experiences and struggle to learn more abstract factual semantic information at a pace equal to their peers. When such children are identified, it often seems intuitive for teachers and parents to bombard them with learning opportunities, such as using very stimulating teaching methods and multi-sensory approaches, in the hope that something will 'stick', or more effort will produce results. In some circumstances this may exacerbate the problem, as these children are less able than most children to categorise and prioritise their learning. They are slower to learn in that they need more repetitions of information and they need a reduced quantity. Even when information seems to be learned, comments from teachers indicate that new learning frequently appears to occur only at the

expense of losing prior learning. This implies that these children have a reduced capacity for acquiring factual knowledge. Therefore, the adult needs to select exactly which small amount of information needs to be learned and to teach that information specifically until it is secure. This system is referred to as 'Precision Teaching' (Lindsley, 1990 & 1991) and it enables one to set precise learning objectives and reduce the curriculum/teaching quantity to ensure only that which the child has the capacity to learn is taught.

Long term Episodic Memory deficits

Within the classroom, children with episodic memory impairments may not recall what they have just been asked to do, unless there are visible cues around them that allow them to guess. This ability to 'cover up' their weaknesses appears to be a notable feature of some children with episodic memory difficulties. They rapidly adapt to observing and copying the activities of those around them and often 'get it right' i.e. the more astute children are able to develop good compensatory strategies, which help them to cope on a daily basis in familiar, routine surroundings. This ability to adapt and use environmental and social cues may make it difficult for parents, teachers and other professionals to identify why a child is having overall difficulties coping, particularly if the episodic memory impairments are moderate rather than severe in nature. However, if all available cues are removed, such children can become quite anxious and frustrated, as this coping strategy is no longer available to them. The problems tend to become more apparent as children move on to secondary school and are required to be more independent in their learning and personal organisation. At this point the child with episodic memory problems may be

referred to clinical services as someone with organisational problems, e.g. they are always in the wrong place at the wrong time and they never have the right equipment. Children may be described as being disorganised, with poor attention and concentration.

They might also be considered to be poorly motivated because they frequently make mistakes, have difficulty following instructions and tend not to generate novel activities. Teachers can sometimes find these children frustrating to work with as they have difficulty learning accurately from their experiences and tend to make the same mistakes repeatedly, i.e., such children are just as likely to learn their mistakes as their successes.

A further aspect of both long-term episodic and semantic memory is the distinction between retrieval and recognition of information. Adults with long term memory deficits are generally better at recognising aspects of their previous experiences compared to retrieving information without relevant prompts and there are reports of a similar case in a developmental amnesic (Baddeley et al., 2001). This observation can have important implications for designing interventions.

The general principle for supporting children with episodic memory difficulties is to attempt to provide an external memory framework that they are able to use and refer to in order to have a stable system of marking their place in the world that they can trust, i.e. recording and storing their history and planning a timetable for their short term future in an accessible way. Children with episodic memory impairments are likely to experience difficulties remembering things they have to do in the future as

well as things they have done (Klein et al. 2002). Consequently, the use of external memory aids e.g. lists and calendars, as suggested by Kapur (1991) might prove useful. Kerns and Thomson (1998) describe the application of such a structured system of support in a school setting with a single case-study. Such support was found to be beneficial in aiding the student's independence but did involve substantial adult input initially.

Good organisation allows the rehearsal of routines. For example, if possessions such as a P.E. kit are always left in the same place, knowing where it is and collecting it can become automatic. Any systems that help routines to be learned procedurally can prove helpful. Baddeley and Wilson (1994) described the ability to eradicate errors in the learning process as a feature of explicit memory. Errorless learning occurs without allowing the child to guess or make mistakes, so utilising relatively preserved implicit memory skills and preventing them learning their mistakes. Errorless learning strategies have been found to be helpful for adults with episodic memory deficits (Evans et al. 2000; Wilson et al. 1994), and anecdotally, have also proved useful for children with autistic spectrum disorders. Wilson et al. (2001) found that the use of the Neuropage, which prompted subjects to do things at certain times, helped memory impaired adults to learn routines more accurately and with less stress than when prompted by people. This system could potentially be adapted for use by children, particularly as so many children now use personal electronic equipment routinely.

Children with episodic memory problems have poor memory of their own life experiences. Their poor memory of the past naturally affects their expectations for

the future. It is possible that much of a person's sense of security or safety in the world comes from knowing that their past experiences will enable them to deal with or predict, to a certain extent, what is likely to happen in the future. Therefore some of our consideration of managing episodic memory problems needs to be devoted to enabling children to feel there is some sort of predictability in the environment.

Much of our knowledge about ourselves is part of our implicit memory system and we develop a sense of ourselves without necessarily recalling how or why we formed that opinion (Squire et al. 1993). However, that information is likely to need to be remembered through episodic channels initially. Episodic memory allows a person to build up a picture of the world and their place in it (Conway & Pleydell-Pearce, 2000). Children need to be able to remember people's reactions to them in order to develop a secure sense of self. When children have poor episodic memory function, their social development is affected because difficulties remembering previous interactions and developing a shared history makes it hard to build up any kind of personal relationship. This can make individuals very socially vulnerable. It can also make children seem unresponsive or uneasy in social situations and, in some clinical cases, a diagnosis of social communication disorder has been made when further assessment has revealed an episodic memory disorder.

Some autistic children often have exceptional memory for factual information (semantic memory) around their prescribed interests while having a poor memory for their own experiences. Often their inability to discuss their experiences is attributed to having poor recall, poor expressive language, poor organisation of memory in the absence of a formal framework or poor generation of ideas for responding to the

question. Some researchers have more recently considered that their poor social learning may be because of very limited episodic memory from an early developmental stage. (E.g. Bowler et al. 2000). Bowler et al. also discovered that even those who had marked deficits in episodic memory did not show impaired performance on recognition tasks. This suggests that when testing children on their learning or experiences, a multiple-choice format might be more useful than free-recall.

Summary of interventions:

	Short term memory (Baddeley & Hitch, 1974)			Long term memory (Tulving, 1972)	
Memory Deficit	Phonological Loop	Central Executive	Visuospatial Sketchpad	Episodic Memory	Semantic Memory
Behavioural phenotype	- Distractibility -Poor attention	-Distractibility - Disorganisation -Impulsivity	-Social skills	-Confusion around daily events -Social aloofness/anxiety -Forgetfulness	- Forgetfulness
Learning difficulty	-Language difficulties -Literacy difficulties	-Disorganised work -Poor mental arithmetic -Generating and sequencing ideas	- Mathematics -Spatial orientation - Handwriting	-Self-organisation -Learning from experiences -Keeping future appointments	-Factual learning
Hypotheses for intervention	-Visual support for verbal material -Brief verbal instructions	-Timetabling -Written instructions -Mind-mapping -Templates	-Verbal encoding of visual material -Social skills training	-Personal organisers -Picture timetables -Colour coding of school materials -Errorless learning	-Reference skills -Practice and repetition -Precision teaching -Reduce quantity

Implications for EP practice

Considering the rapidly expanding field of knowledge about the development of memory in children, it is important for educational psychologists to be able to assess this aspect of children's cognitive development in order to demonstrate how deficits within a child's cognitive profile contribute to their learning and behaviour. Until this is done as part of routine practice, interventions will continue to be put in place on an ad hoc basis. The subtleties of early memory deficits are likely to have a more gross impact on children's learning as they progress through school and these specific deficits may then lead to the presentation of a more global learning or behavioural difficulty as opportunities for implementing compensatory strategies have been missed. There is also early evidence to suggest that individual training strategies, targeting the use of preserved skills to compensate for areas of weakness can improve children's classroom learning in specific skill areas (Rankin & Hood, unpublished data).

As they develop, children are also likely to become more aware of, and possibly embarrassed by, their difficulties and their need for specialist intervention. The child's view is important when planning and implementing support. Many of the children within the specific memory disorders group will have subtle difficulties and they will be very aware of the social implications of needing individual support in class. They should therefore be included, as soon as they are able to contribute, in the planning of their individual education programmes and given responsibility for managing their own needs. A flexible, adaptive approach to intervention will be

required. Some of the difficulties with managing the rehabilitation of individuals in a school setting are highlighted by Brett and Laatsch (1998) and Franzen et al. (1996). In particular they note the problems their subjects experienced with generalising specific learning methods into classroom learning tasks. The involvement of EPs in this area of research would encourage the development of rehabilitative intervention strategies that are founded in good models of children's learning and integrated with current research in the field.

Summary

In summary, this assignment has described the variety of consequences that memory disorders might have for children's behaviour and learning in school. There are a number of studies that implicate academic skills affected by specific memory disorders and, in addition to these, this assignment has described some of the common clinical observations made once children have received neuropsychological assessment. If a child has more widespread cognitive difficulties, they are likely to demonstrate a mixture or wider range of behavioural outcomes within the school classroom.

Clinical descriptions of children within an educational context are extremely useful to help practitioners identify those at risk of unidentified memory disorders. Equally, it is important to be aware of the associated behavioural correlates of specific memory disorders in order to consider how rehabilitation may be most appropriately designed.

Despite the clinical descriptions provided within this paper, there continues to be a significant need for well-controlled empirical investigations to compare groups of children with different types of memory disorder on academic and behavioural measures.

References

Adams, A.M. & Gathercole, S.E. (1995) Phonological working memory and speech production in pre-school children. *Journal of Speech and Hearing Research*. **38**: 403-414.

Baddeley, A.D., Vargha-Khadem, F. & Mishkin, M. (2001) Preserved recognition in a case of developmental amnesia: implications for the acquisition of semantic memory? *Journal of Cognitive Neuroscience*. **13**: 357-369.

Baddeley, A.D. (2000) Short-term and Working Memory. In: E. Tulving and F.I.M. Craik (Eds) *The Oxford Handbook of Memory*. Oxford University Press

Baddeley, A.D. (1999) *Essentials of Human Memory*. Psychology Press: Hove, UK.

Baddeley, A.D., Gathercole, S. & Papagno, C. (1998) The phonological loop as a language learning device. *Psychological Review*. **105**: 158-173.

Baddeley, A.D. (1997) The role of memory in cognition: Working memory. In: A.D. Baddeley (Ed.), *Human Memory: Theory and Practice*. Pp: 49-69. Psychology Press: Hove.

Baddeley, A. & Wilson, B.A. (1994). When implicit learning fails: amnesia and the problem of error elimination. *Neuropsychologia*. **32**: 53-68.

Baddeley, A.D. & Hitch, G.J. (1974) Working Memory. In G.A. Bower (ed.) *The Psychology of Learning and Motivation*. **8**: 47-90. New York: Academic Press.

Badian, N. (1983) Arithmetic and nonverbal learning. *Progress in Learning Disabilities*. **5**: 235-264.

Barton, J.J. (2003) Disorders of face perception and recognition. *Neurologic Clinics*. **21**: 521-548.

Bishop, D.V., North, T. & Donlan, C. (1996) Nonword repetition as a behavioural marker for inherited language impairment: evidence from a twin study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. **37**: 391-403.

Blake, J., Austin, W., Cannon, M., Lisus, A. & Vaughan, A. (1994) The relationship between memory span and measures of imitative and spontaneous language complexity in preschool children. *International Journal of Behavioural Development*. **17**: 91-108.

Bowler, D.M., Gardiner, J.M. & Grice, S.J. (2000) Episodic Memory and Remembering in Adults with Asperger Syndrome. *Journal of Autism and Developmental Disorders*. **30**: 295-304.

Bowie, J.A. (2001) Nonword repetition and young children's receptive vocabulary: A longitudinal study. *Applied Psycholinguistics*. **22**: 441-469.

Brett, A.W. & Laatsch, L. (1998) Cognitive rehabilitation therapy of brain-injured students in a public high school setting. *Pediatric Rehabilitation*. **2**: 27-31.

Briscoe, J., Gathercole, S.E. & Marlow, N. (2001) Everyday memory and cognitive ability in children born very prematurely. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. **42**: 749-754.

Bristow, J., Cowley, P. & Daines, B. (1999) *Memory and Learning: A practical guide for teachers*. London: David Fulton Publishers.

Broman, M., Rose, A.L., Hotson, G. & Casey, C.M. (1997) Severe anterograde amnesia with onset in childhood as a result of anoxic encephalopathy. *Brain*. **120**: 417-433.

Conway, M.A. & Pleydell-Pearce, C.W. (2000) The construction of autobiographical memories in the self-memory system. *Psychology Review*. **107**: 261-288.

Conway, M.A., Gardiner, J.M. Perfect, T.J., Anderson, S.J. & Cohen G.M. (1997) Changes in memory awareness during learning: the acquisition of knowledge by psychology undergraduates. *Journal of Experimental Psychology: General*. **126**:393-413.

Denkla, M.B. (1991) Academic and extra-curricula aspects of nonverbal learning disabilities. *Psychiatric Annals*. **21**: 717-724.

Ericsson, K.A. & Kintsch, W. (1995) Long-term working memory. *Psychological Review*, **102**: 211-245.

Evans, J.J. Wilson, A., Schuri, U., Andrade, J., Baddeley, A., Bruna, O., Canavan, T., Della Sala, S., Green, R., Laaksonen, R., Lorenzi, L., & Taussik, I. (2000) A comparison of 'errorless' and 'trial-and-error' learning methods for teaching individuals with acquired memory deficits. *Neuropsychological Rehabilitation*.**10**: 67-101.

Franzen, K.M., Roberts, M.A., Schmits, D., Verduyn, W. & Manshadi, F. (1996) Cognitive Remediation in Pediatric Traumatic Brain Injury. *Child Neuropsychology*. **2**: 176-184.

Gadian, D.G., Aicardi, J., Watkins, K.E., Porter, D.A., Mishkin, M. & Vargha-Khadem, F. (2000) Developmental amnesia associated with early hypoxic-ischaemic injury. *Brain*. **123**: 499-507.

Gathercole, S.E., Brown, L. & Pickering, S.J. (2003). Working memory assessments at school entry as longitudinal predictors of National Curriculum attainment levels. *Educational and Child Psychology*. **20**: 109-122.

Gathercole, S.E. & Pickering, S.J. (2000) Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology*. **70**: 177-94.

Gathercole, S.E., Service, E. Hitch, G.J., Adams, A.M. & Martin, A.J. (1999) Phonological short term memory and vocabulary development: Further evidence on the nature of the relationship. *Applied Cognitive Psychology*. **13**: 65-77.

Gathercole, S.E. (1998) The development of memory. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. **39**: 3-27.

Gathercole, S.E. & Baddeley, A.D. (1989) Evaluation of the role of phonological short term memory in the development of vocabulary in children: A longitudinal study. *Journal of Memory and Language*. **28**: 200-213.

Gray, C. (1994) *Comic Strip Conversations*. Future Horizons.

Gray, C. (2000) *The New Social Stories Book: Illustrated Edition*. Future Horizons.

Hitch, G.J., Halliday, M.S., Schaafstal, A.M. & Schraagen, J.M. (1988) Visual working memory in young children. *Memory and Cognition*. **16**: 120-132.

Isaacs, E.B., Vargha-Khadem, F, Watkins, K.E., Lucas, A., Mishkin, M. & Gadian, D.G. (2003) Developmental amnesia and its relationship to degree of hippocampal atrophy. *Proceedings of the National Academy of Science. U.S.A.* **100**:13060-13063.

Isaacs, E.B., Lucas, A., Chong, W.K., Wood, S.J., Johnson, C.L., Marshall, C., Vargha-Khadem, F. & Gadian, D.G. (2000) Hippocampal volume and everyday memory in children of very low birth weight. *Pediatric Research*. **47**: 713-20.

Isaacs, E.B. & Vargha-Khadem, F. (1989) Differential course of development of spatial and verbal working memory span: a normative study. *British Journal of Developmental Psychology*. **7**: 377-380.

Kapur, N. (2001) *Managing Your Memory*. Wessex Neurological Centre, Southampton General Hospital.

Kapur, N. (1991) *Managing Your Memory. A Self-Help Memory Manual For Improving Everyday Memory Skills*. Wessex Neurological Centre, Southampton General Hospital.

Kerns, K.A. & Thomson, J. (1998) Implementation of a compensatory memory system in a school age child with severe memory impairment. *Paediatric Rehabilitation*, **2** (2), 77-87

Klein, S.B., Loftus, J., & Kihlstrom, J. (2002). Memory and temporal experience. The effects of episodic memory loss on an amnesic patient's ability to remember the past and imagine the future. *Social Cognition*. **20**: 353-379.

Kramer, J.H. & Delis, D.C. (1998) Neuropsychological assessment of memory. In: G. Goldstein, P.D. Nussbaum, S.R. Beers (Eds) *Neuropsychology*. Plenum Press: London

Levine, D.N., Warach, J. & Farah, M.J. (1985) Two visual systems in mental imagery: Dissociation of what and where in imagery disorders due to bilateral posterior cerebral lesions. *Neurology*. **35**: 1010-1018.

Levine, M. The Learning Base @ All Kinds of Minds. www.allkindsofminds.org.

Lindsley, O. R. (1990). Precision teaching: By teachers for children. *Teaching Exceptional Children*, *22*(3), 10-15.

Lindsley, O. R. (1991). Precision teaching's unique legacy from B. F. Skinner. *Journal of Behavioural Education*, *1*, 253-266.

Logie, R.H. (1994) *Visuospatial Working Memory*. Erlbaum, Hove.

Male, D. (1995) Helping Children with Learning Difficulties to Employ Mnemonic Strategies. *Educational Psychology in Practice*. **11**: 10-17.

Michas, I. C. & Henry, L.A. (1994) The link between phonological memory and vocabulary acquisition. *British Journal of Developmental Psychology*. **12**: 147-164.

Montgomery, J.W. (1995) Sentence comprehension in children with specific language impairment: the role of phonological working memory. *Journal of Speech and Hearing Research*. **38**: 187-199.

Neely, J.H. (1989). In H.L. Roediger & F.I.M. Craik (Eds.), *Varieties of memory and consciousness* (pp. 229-270).

Ostergaard, A.L. (1987) Episodic, semantic and procedural memory in a case of amnesia at an early age. *Neuropsychologia*. **25**: 341-357.

Ozols, E.J. & Rourke, B.P. (1988) Characteristics of young learning disabled children classified according to patterns of academic achievement: Auditory-perceptual and visual-perceptual abilities. *Journal of Clinical Child Psychology*. **17**: 44-52.

Pennington, B.F. & Ozonoff, S. (1996) Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. **37**: 51-87.

Pickering, S.J., Gathercole, S.E., Hall, M., & Lloyd, S.A. (2001). Development of memory for pattern and path: Further evidence for the fractionation of visual and spatial short-term memory. *Quarterly Journal of Experimental Psychology*, **54A**, 397-420

Riding, R.J., Grimley, M., Dahraei, H. & Banner, G. (2003) "Cognitive Style, Working Memory and Learning Behaviour and Learning Attainment in School Subjects". *British Journal of Educational Psychology*. **73**: 149-169.

Rourke, B.P. (Ed.) (1995) *Syndrome of nonverbal learning disabilities: Neurodevelopmental manifestations*. The Guilford Press: New York

Rourke, B.P. & Conway, J.A. (1997) Disabilities of arithmetic and mathematical reasoning: perspectives from neurology and neuropsychology. *Journal of Learning Disabilities*. **30**: 34-46.

Rourke, B.P. (1988) Socioemotional disturbances of learning disabled children. *Journal of Consulting Clinical Psychology*. **56**: 801-810.

Scoville, W.B. & Milner, B. (1957). Loss of recent memory after bilateral hippocampal lesions. *Journal of Neurology, Neurosurgery and Psychiatry*. **20**: 11-21.

Service, E. & Kohonen, V. (1995) Is the relationship between phonological memory and foreign-language learning accounted for by vocabulary acquisition? *Applied Psycholinguistics*. **16**: 155-172.

Service, E. (1992) Phonology, working memory and foreign language learning. *Quarterly Journal of Experimental Psychology. A, Human Experimental Psychology*. **45**: 21-50.

Shies, J. & Nass, R. Spatial grouping ability in young children with congenital right of left hemisphere brain injury. *Brain and Cognition*. **15**: 201-222.

Small S.A., Wu E.X., Bartch D., Perera G.M., Lacefield C.O., DeLaPaz R., Mayeux R., Stern Y., & Kandel E.R. (2000). Imaging physiologic dysfunction of individual hippocampal subregions in humans and genetically modified mice. *Neuron*, **28**: 653-664.

Squire, L.R., Clark, R.E. & Knowlton, B.J. (2001). Retrograde amnesia. *Hippocampus*. **11**: 50-55.

Squire, L.R. & Zola, S.M. (1998) Episodic memory, semantic memory, and amnesia. *Hippocampus*. **8**: 205-211.

Squire, L.R., Knowlton, B. & Musen, G. (1993) The structure and organisation of memory. *Annual Review of Psychology*. **44**: 453-495.

Steel, S. & Funnell, E. (2001) Learning multiplication facts: a study of children taught by discovery methods in England. *Journal of Experimental Child Psychology*. **79**: 37-55.

Stiles-Davis, J. (1988) Spatial dysfunctions in young children with right hemisphere injury. In: J. Stiles-Davis and M. Kritchevsky (Eds.) *Spatial cognition brain bases and development*. Pp. 251-272. Lawrence Erlbaum, NJ.

Strang, J.D. & Rourke, B.P. (1983) Concept-formation/non-verbal reasoning abilities of children who exhibit specific academic problems with arithmetic. *Journal of Clinical Child Psychology*. **12**: 33-39.

Swanson, H.L. (1993) Working memory in learning disability subgroups. *Journal of Experimental Child Psychology*. **56**:87–114

Temple, C. (1997) Memory Disorders. In: C. Temple (Ed.) *Developmental Cognitive Neuropsychology*. Pp 83-110. Psychology Press: Hove.

Tulving, E. (2000). Concepts of memory. In E. Tulving & F.I.M. Craik (Eds.), *The Oxford Handbook of Memory*. Pp. 33-43. New York: Oxford University Press.

Tulving, E. (1995) Organisation of memory. Quo Vadis? In: M.S. Gazzaniga (ed.) *The Cognitive Neurosciences*. MIT Press, Cambridge, MA. Pp 839-847.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology* **26**: 1-12.

Tulving, E. (1972) Episodic and semantic memory. In E. Tulving & W. Donaldson (Eds.), *Organization of memory*. New York: Academic Press.

Ungerleider, L.G. & Mishkin, M. (1982) Two cortical visual systems. In: D.J. Ingle, M.A. Goodale, R.J.W. Mansfield (Eds.): *Analysis of visual behaviour*. Pp 549-586. MIT Press, Cambridge, MA.

Vargha-Khadem, F., Gadian, D.G., Watkins, K.E., Connelly, A., Van Paesschen, W. & Mishkin, M. (1997) Differential effects of early hippocampal pathology on episodic and semantic memory. *Science*. **277**: 376-380

Vargha-Khadem, F., Gadian, D.G. & Mishkin, M. (2001) Dissociations in cognitive memory: the syndrome of developmental amnesia. *Philosophical Transaction of the Royal Society of London. Series B: Biological Sciences*. **356**: 1435-40.

Vargha-Khadem, F. (2001) Generalised versus selective cognitive impairments resulting from damage sustained in childhood. *Epilepsia*. **42**: 37-40.

Vicari, S. Marotta, L., Menghini, D., Molinari, M. & Petrosini, L. (2003) Implicit learning deficit in children with developmental dyslexia. *Neuropsychologia*. **41**: 108-114.

Vintner, A. & Detable, C. (2003) Implicit learning in children and adolescents with mental retardation. *American Journal of Mental Retardation*. **108**: 94-107.

Willis, C.S. & Gathercole, S.E. (2001) Phonological short-term memory contributions to sentence processing in young children. *Memory*. **9**: 349-363.

Wilson, B.A., Baddeley, AD. & Evans, J. (1994) Errorless learning in the rehabilitation of memory impaired people. *Neuropsychological Rehabilitation*, **4** (3), 307-326

Wilson, B.A. (1996) Management and rehabilitation of memory problems. In D.J. Hermann, C. McEvoy, C. Hertzog, P. Hertel & M.K. Johnson (Eds.) *Basic and*

Applied Memory Research: Theory in Context. Volume 1, pp 277-293. Mahwah, NJ: Erlbaum.

Wilson, B.A. (1997) Cognitive Rehabilitation: How it is and how it might be. *Journal of International Neuropsychological Society*. **3**: 487-496.

Wilson, B.A., Emslie, H.C., Quirk, K. & Evans, J.J. (2001) Reducing everyday memory and planning problems by means of a paging system: a randomised control crossover study. *Journal of Neurology, Neurosurgery and Psychiatry*. **70**: 477-482.

Worling, D.E., Humphries, T. & Tannock, R. (1999) Spatial and emotional aspects of language inferencing in nonverbal learning disabilities. *Brain and Language*. **70**: 220-239.

Wood, F.B., Brown, I.S. & Felton, R.H. (1989) Long-term follow-up of a childhood amnesic syndrome. *Brain Cognition*. **10**: 76-86.

**Educational Neuropsychology: Contributing to the
evidence-base for interventions.**

Index

	Page
Section 1: Aims and scope of assignment	93
Section 2: Practice and context	95
Introduction	95
Methodology	97
Summary of results	98
Feedback from schools	98
Feedback from parents	99
Recommendations	99
Section 3: Psychological theory and research	101
Observation of the child	104
Psychometric tests of intelligence	105
Consultation	107
Dynamic assessment	108
The use of neuropsychological assessments in education	109
Section 4: Integration of theory, research and practice	114
Applying neuropsychological assessments within schools	114
Moving from assessments to neuropsychological intervention	119
Section 5: Concluding comments	121
References	124

Section 1: Aims and scope of assignment

While the debate about the pros and cons of the various forms of educational assessment of children rages on, there continues to be much less interest in debating and researching the relative merits of intervention strategies. This assignment will be used, in part, to examine whether a more holistic view of assessment and intervention could be developed such that the process of assessment leads naturally on to inform intervention in a way that can be demonstrated to be effective.

The aim of this assignment is to explore some of the different assessment methods currently being used as part of the regular practice of educational psychology. It will include an overview of the methods available, including psychometric measures of intelligence and neuropsychological tests, and less standardised methods, such as dynamic assessment.

The assignment will also be used to examine whether carrying out more comprehensive neuropsychological assessments, which are not routinely conducted by educational psychologists, provides sufficient additional information about children to warrant the extra time and expense incurred. Neuropsychological assessments are generally only carried out in hospital settings for children with known or suspected neurological conditions. They are increasingly being used to assess children with neurodevelopmental disorders (Temple, 2003) and children with complex learning or behavioural difficulties. This assignment will discuss what the unique contribution of a neuropsychological assessment to the understanding of children's complex learning difficulties might be and whether their individual

profiles of strengths and weaknesses can contribute to the development of evidence-based interventions. An audit of one neuropsychological service will be presented and discussed, in which the views of parents and teachers were gathered in order to examine how they thought the assessment process affected intervention recommendations when compared to more generic services.

The conclusions of the assignment will include a discussion of how current methods of assessment and intervention could be amalgamated in order to provide a scientifically rigorous approach to developing interventions for children using an individually-tailored but evidence-based system. Proposals will then be made regarding how educational psychological and paediatric neuropsychological services might be able to integrate their services and the implications for EP practice and LEA policy of EPs having access to the tools and principles of neuropsychological assessments.

Section 2: **Practice and context**

Introduction

This assignment came about following an audit of the neuropsychological services of a large central London teaching hospital. The paediatric neuropsychology department is unique in that it employs both clinical and educational psychologists and it is the educational psychologist that now leads the neuropsychological specialism of the team, known as the Educational Neuropsychology Service (ENS). The service was audited in order to determine whether this educational emphasis might carry any additional value for children and their families.

Since the ENS team provides a distinctive position from which the EP is able to combine the two disciplines of educational psychology and paediatric neuropsychology, the audit provided a perfect opportunity to measure the perceived utility of a neuropsychological assessment for families and schools compared to any other psychological assessments they had received previously. While traditional clinical neuropsychology teams, comprised of clinical rather than educational psychologists, have provided a clinical assessment service in order to assist the neurologists with diagnosis, prognosis and providing an evaluation of the children's difficulties, the ENS team additionally aims to use the process of the neuropsychological assessment to provide specific advice for educational and behavioural management and, where appropriate, rehabilitation. In order to consider whether combining the disciplines of educational psychology and paediatric

neuropsychology affects the outcome for the child, the results of the audit of the ENS will be examined here.

The audit was initiated following a request from the hospital's audit office for bids for service audits. It was proposed that there would be some merit in trying to measure the added value of a neuropsychological assessment over-and-above the traditional psychometric assessments normally used to determine children's overall level of intellectual functioning. It takes around one to two hours to carry out a psychometric assessment of intellectual ability and academic attainments, using such instruments as the Wechsler Intelligence Scale for Children (WISC-IV, 2003) and the Wechsler Individual Achievement Test (WIAT-II, 2001). It takes from six to nine hours to carry out a full neuropsychological assessment. With additional time for feedback, report-writing and any subsequent school or home visits, these assessments are extremely time-consuming and therefore expensive to provide. In order to justify the extra costs incurred by an assessment of this length in terms of material costs, professional costs and costs to the child and family in terms of their time, it is essential that there is a measurable benefit to the commissioner of the service and the recipient of the service, both the referrer and the family in question.

There are currently no guidelines regarding the quality or delivery of paediatric services in terms of monitoring/assuring any direct benefits to the families or schools. It is therefore important to be able to quantify the value that these assessments add that would be in addition to a basic psychological/psychometric assessment.

Therefore the aim of the audit was primarily to evaluate the effectiveness of the neuropsychological service in terms of whether it brings about real changes for the recipients, i.e. children, parents and schools, as well as answering the questions of the referrers.

Methodology

The audit was carried out from 1.4.04 to 31.3.05. The audit was conducted after a pilot study of the questionnaires had been carried out within the educational neuropsychology team.

Following all neuropsychological assessments carried out within the ENS, each parent and school was sent a questionnaire about their experiences during the assessment and their views on the subsequent usefulness of the assessment. All questionnaires were sent out with stamp addressed envelopes to maximise the return rate.

In addition to sending questionnaires to parents and schools, the referrers were also asked for their views on the quality and usefulness of neuropsychological assessments received, the extent to which the reports contributed to diagnostic and treatment issues and to make comments about how the service might be improved.

35 sets were sent out by the Educational Neuropsychology service. 27 were returned by the parents (77% return rate) and 9 by schools (26% return rate).

The results of the questionnaires were considered in order to evaluate the level of satisfaction expressed by parents and schools.

Summary of results

Feedback from schools

The results for the ENS show that 23/27 of the children seen had already received psychological assessments at their schools. When teachers were asked to comment whether the report added to their understanding of their child, the main comments from the 9 returns were regarding the level of detail of the assessments and how the summary provided an explanation of how the child's difficulties led to the behaviour or learning problems that they were demonstrating. One teacher commented that it helped her to understand why the specific recommendations were being made. When asked how the service could be improved, the teachers made comments about wanting the psychologist to contact the school before making recommendations. There appeared to be some antagonism from some of the schools on receipt of the reports from the ENS as there were some comments about not taking the schools views into account and seeing what was feasible from their perspective.

There was also a relatively poor response to the questionnaires from schools and often those that did respond said that they would have welcomed direct contact from the psychologists. Despite being invited to contact the psychologist on receipt of the report, few did.

Feedback from parents

Parents using the services were generally very satisfied with the service received from both teams. They felt their views were listened to and they were treated respectfully. Parents were asked to comment on the ease with which they could understand the main findings of the reports. This was done to ensure that technical terms were adequately explained. Several parents commented that the reports were hard to understand.

Parents welcomed recommendations for educational and behavioural management, with 100% of parents saying they found the ENS recommendations for educational and behavioural management practical and useful. Specific comments regarding how the ENS assessment added to the parents' understanding of their children included: providing a more accurate description, explaining about their child's thought processes, that solutions were given that were practically applicable and that areas of difficulty are set against good intellectual ability. One set of parents commented that understanding the cause of the problem had allowed them to take off some of the pressure they had put themselves under because of their child's behaviour. The parents clearly felt they had benefited from the service provided by both services.

Recommendations

Parents evidently valued the educational and behavioural advice provided via the reports and discussions with the psychologists. Where parents found individual reports hard to understand, on further investigation, these reports were written using a similar language to all the other reports but they were written by trainees. Within the ENS it is

normal practice for the neuropsychologists to feed back the overall findings at the end of the second assessment session. This enables the parents to ask any questions and discuss recommendations. When trainees assess children, they require time to score their assessments and so the parents do not receive feedback immediately. When a child has been assessed by a trainee, parents receive the report and are invited to phone or arrange another appointment to discuss the findings. None of the parents who found the reports hard to understand chose to make further direct contact. It is therefore suggested that it is the direct discussion of the assessment that facilitates understanding of the report and that this should be done following all assessments. When this is not possible, parents should be offered an additional appointment following the assessment to go through the main conclusions. This change has already been put in place.

The feedback from schools was less positive and some teachers expressed unhappiness about being directed to manage the children in a certain way without being consulted for their views. Teachers clearly would have preferred to have been given the opportunity to give their views about the child before they were seen. It might therefore be useful for schools to be sent a comments form before the child is seen and for the psychologist to phone a contact at the school to discuss their assessment findings after the child is seen. However, direct contact by telephone with teachers has always proved hard as teachers are in class for most of their time in school. Where there are complex issues to discuss, school visits have been made in the past but this is very time-consuming for all concerned, especially considering the distances that have to be travelled. It is hoped that an increase in the use of e-mail will allow the psychologists to work more collaboratively with teachers and classroom assistants in the future.

The ENS aims to give specific and detailed advice to schools but it may be that there is something in the prescriptive nature of this advice that induced hostility in the school staff. One of the arguments for psychologists using a consultation model (as will be discussed in Section 3) in their work with schools is that the consultation model seeks to avoid presenting the psychologist as the expert who must be obeyed but proposes the development of a collaborative working relationship between the relevant parties for problem-solving purposes.

The findings of this audit indicate that parents and schools feel that neuropsychological assessments have something to offer in addition to the previous assessments that some of the children had already had. Given the small sample size, it is not possible to be precise about what exactly was different although comments referred to the detail of the assessment aiding parents' and teachers' understanding of children's profiles of difficulties. As will be discussed later in the section on consultation, this may be key to empowering service recipients to find their own solutions to the children's difficulties in terms of managing their education and behaviour.

Section 3: Psychological theory and research

In considering the findings of the audit and the difficulties of evaluating the success or otherwise of assessment and intervention methods, it was considered useful to take a broader look at the most common methods being used in schools currently. As a result of reviewing these methods, it became apparent that one of the most challenging issues psychologists seem to be grappling with is how to devise interventions on the basis of their assessments and how to 'prove' that these are

effective on an individual or group basis. In order to prove that an intervention has worked for an individual, the individual will need to make measurable progress through the course of the intervention, there must be evidence that the change is sustained and there must be evidence that the change was not due to chance alone, i.e. there must be a control situation. For practical purposes, it is desirable to be able to prove that the same intervention would work for another child with a similar difficulty and that the intervention could be applied by another person following a similar method.

The modern practice of educational psychology is far broader than that of providing assessments of intellectual assessment. In terms of assessing a child's learning needs, there is a greater emphasis on assessing the environment in which the child is growing and learning as well as within-child factors. Psychologists are trained to work as 'scientist-practitioners' (Drabick & Goldfried, 2000; Miller & Frederickson, 2006), a term that refers to the psychologist's ability to work as both a practitioner and an investigator, i.e. that they are able to integrate scientific and professional knowledge in their work. At all times they must ensure that there is a reliable evidence base for decision-making and interventions.

The scientist-practitioner model requires psychologists to implement 'best practice' in their work but unfortunately there remain many areas where there simply is not an agreed best practice. For example, the debate over both the assessment and treatment of dyslexia, and even over its mere existence as an entity, are far from resolved and yet psychologists are still required to apply best practice to their assessment and management of this 'disorder' on a regular basis. The problems with maintaining a

scientist-practitioner model within clinical psychology are discussed by Cook & Coyne (2005) and the issues raised are pertinent for educational psychologists. The everyday reality of educational psychology practice does not factor in the required time and academic study to enable this kind of work. For example, recently psychologists have been involved in the implementation of Every Child Matters, Children's Workforce Strategy, and other new initiatives, leaving little time for specific enhancement of psychological skills.

Over the past few years, many EP services have expressed a tentative interest in developing neuropsychological services within their own teams as they have felt that their current assessment methods do not provide sufficient information about children's complex learning difficulties and that they have been unable to bring about real change to the outcomes for individual children. Several central London services have been able to follow up this interest because of their ease of access to local supervision and have now purchased a small battery of neuropsychological tests, learned to administer them and received some supervision on individual cases. Through these case discussions it has become very clear that there are cases where neuropsychological assessments can be invaluable. In reviewing the success of these projects it has been found that while managers have been supportive, attempts to introduce a neuropsychological provision have proved difficult as managers have underestimated the on-costs and the time needed for these assessments. If LEA's are to invest considerable time and money in introducing neuropsychological assessments into their authorities, there must be a clear rationale regarding when they would be useful, how they can be used in conjunction with other current assessment

methods and whether they offer any additional utility in terms of informing intervention.

The next section of the assignment will be used to summarise the main assessment methods at the disposal of EPs in order to consider the extent to which they naturally lend themselves to being used in conjunction with neuropsychological tests.

Observation of the child

Assessment of the child during formal assessment, in class and amongst their peers, is a major part of an educational psychologist's work. This provides the psychologist with an opportunity to see how the child functions in their everyday environment rather than in an unnatural one-to-one assessment with a stranger. Data can be collected a number of ways, including time-sampling, latency recording, duration recording, event recording and ABC (Antecedent-Behaviour-Consequence) analysis. The psychologist seeks to assess the individual's strengths and difficulties according to what is known about normal development through a process of observation of the child's skills in a variety of settings. This includes looking at how the child approaches normal, everyday activities and school learning tasks, rather than 'intelligence' tests which are intended to evaluate their approach to novel, structured tasks. The purpose of this process is purported to be determining how the child learns and what is going wrong for that child, i.e. enables the psychologist to generate hypotheses about the child's strengths and difficulties which they can then test through a variety of means, including those discussed below. There are several formal systems available for observing children which enables the observer to

monitor change over time and evaluate the effect of interventions on observable behaviour, e.g. the Early Childhood Observation System (ECHOS, 2006) and the Behavioural Observation of Students in Schools (BOSS), (Shapiro, 1996).

Psychometric tests of intelligence

Psychometric assessments are generally used by educational psychologists to identify a child's individual cognitive strengths and weaknesses in order to evaluate why they might be exhibiting certain types of behaviour or learning difficulty and to plan a programme of support. Psychometric assessments are normally used as part of a broader psychological assessment, which in schools might include observing the child in class or on the playground and interviewing the parents and teacher. This allows the psychologist to include environmental considerations in an analysis of the child's difficulties. These various methods are used to test hypotheses regarding the difficulties a child may be experiencing in terms of their development, learning and behaviour. Psychometric assessments aim to do this by applying models of performance based on the normal population and assessing the individual's ability relative to the norm.

Intelligence tests were first introduced at the turn of the nineteenth century (Galton, 1888; Cattell, 1890; Binet & Simon, 1916). The basic structure of these tests has changed remarkably little, following Binet's approach to the assessment of higher cognitive abilities, and they still involve presenting the child with a series of items of increasing difficulty using standardised instructions. They aim to test the child's ability to reason with novel information, i.e. to assess thinking rather than learning.

An IQ is obtained by comparing the individual child's score with the normative data for their age. The tests also provide an age equivalent for the child, their 'mental age'. In 1904, Spearman introduced the concept of 'g' or general factor, referring to his theory that all tasks requiring intellectual ability share a common factor. He believed intelligence to be innate and constant.

Since intelligence tests were first introduced, the issue of 'intelligence' and what intelligence tests actually measure has been fiercely debated. It is beyond the scope of this assignment (and the author) to attempt to resolve that debate. However, providing an understanding of the issues and debates within intelligence testing, including the historical development of tests, should be a requirement of professional training to enable psychologists to understand how to make decisions about when their use is appropriate and also to understand the statistics behind the constructs they purport to measure. Psychologists using intelligence tests need to ensure that they are reliable, valid, user-friendly for the child and of relevance according to the child's cultural and environmental experience (Sattler, 2001).

Psychometric assessments provide a static measure of a child's functioning on a particular test at a particular moment in time. Unfortunately, on their own, they provide little information about remediation of any difficulties or how much variability there is in the child's performance, e.g. how the child might respond to different types of intervention.

Consultation

Consultation and problem solving approaches became popular following the work of Caplan (1970) and have become an increasingly important part of educational psychology practice (Wagner, 2000; Lambert, Hylander & Sandoval, 2004). The primary aim of the consultation model is to bring about change by addressing the needs of those in the best position to affect change (Barrett, Streeter, Lawson, Zraly, Longhofer et al., 2005). In schools this means the psychologist works most closely with the teachers rather than the children. If feedback from individual child assessments is given to staff via a report or presented as a 'fait accompli', teachers at the various levels, from classroom assistant to headteacher, may disagree with the recommendations, may feel powerless to carry them out and may even resent the interference and imposition of the psychologist, the 'expert', whom they may not even have met face-to-face. The effectiveness of the consultation model depends on the psychologist gaining the cooperation and commitment of everyone involved with the child as it is they who interact with and manage the children on a daily basis. Consultation can take many forms but includes the following aims (Barrett et al., 2005):

- To understand the child's behaviour and what they are communicating through their behaviour.
- Establishing relationships with the people that have the most direct influence on the child, such as teachers, parents and peers.
- Promoting feelings of competence in those with responsibility for the child.

Hylander (2003) found that the way caregivers interacted with children was

effectively changed by addressing their understanding of the child's problems rather than by telling them what to do.

Therefore the consultation model (Sandoval, 2004) seeks to gain the confidence and collaboration of the staff and parents so that everyone has an active rather than passive role in making any interventions work and to introduce problem-solving skills that will prepare and empower them for when future difficulties arise.

The consultation model lends itself to being incorporated with other tools, such as Circle of Friends, Personal Construct Psychology (Ravenette, 1996) and Solution Focussed Brief Therapy (Rothwell, 2005). While consultation as a model of service delivery has been embraced by EP services across the country, there do not appear to be any published studies providing evidence of its efficacy in terms of its benefits for children or schools.

Dynamic Assessment

Dynamic assessment is based on the idea that intelligence is dynamic rather than static, i.e. that intelligence is constantly influenced by on-going activity. Dynamic assessment refers to the process of providing teaching within the testing situation and assessing the child's learning potential. Proponents argue that 'learning tests' provide a fairer and more valid assessment than static intelligence tests (Guthke & Stein, 1996; Fabio, 2005) and that they provide effective interventions (Tzuriel, 2000).

Dynamic assessment, based largely on Vygotskian theory (1978) and Feuerstein's Instrumental Enrichment Programme of Cognitive Modifiability (Feuerstein, Rand, Hoffman & Miller, 1980), represents an alternative approach to traditional cognitive assessments and interventions. In dynamic assessment, the psychologist attempts to assess the child's learning potential or the modifiability of their learning style. The method involves a process of testing, intervening and retesting. The process includes an analysis of qualitative changes in the child's responses, a record of the mediated learning experiences, measures of test score gains and ratings of modifiability and learning strategies. Such an approach, though having many advocates, has remained rather marginalised (Kozulin, 2005). This may be, in part, because it relies on individual practitioners developing specific interventions for individual children and the consequent problems of interpreting results.

A similar alternative to classifying learning difficulties in terms of an IQ-achievement discrepancy is provided by the Response to Instruction model, first proposed by Gresham (2002). This model aims to provide early intervention, to avoid discrimination against minority students and to provide a link between the assessment and intervention process (Vaughn & Fuchs, 2003; Fuchs, Mock, Morgan, & Young, 2003).

The use of neuropsychological assessments in education

Neuropsychological assessments take the process of psychometric assessment a step further and allow the psychologist to formulate hypotheses about the structural integrity and/or neurophysiological status of the individual's brain in order to inform

medical diagnosis. A neuropsychological assessment uses formal tests of an individual's performance to determine cognitive strengths and weaknesses and the patterns elicited are used to form hypotheses about which areas and structures within the brain are performing and at what level. For the purposes of this discussion, it is not proposed that educational psychologists need to start trying to determine the details of individual children's brain pathology, but rather that they use what is known about cognitive dissociations and plasticity/rehabilitation to inform their interventions and also to make their own contributions to the field of neuropsychology and neurorehabilitation.

Paediatric neuropsychology is a young science compared to the adult field (See Frampton, 2004, for a review of historical developments). In 1989, Peter Griffiths presented a series of neuropsychological case studies of children proposing that adult assessment methods could be of use in the assessment of children and, to date, paediatric neuropsychology still relies heavily on using adult models of lesion identification (Moses & Stiles, 2002), brain dissociations (Temple, 1997) and forms of adult tests. Progress in the development of imaging, especially functional imaging, and EEGs have, to some extent, changed the role of the neuropsychologist. Neuropsychologists are part of a multi-disciplinary team that combines different sources of information to make judgements about the structural and functional integrity of the child's brain and the consequences of any damage or changes for the child's immediate and future learning and behaviour (e.g. Anderson, Northam, Hendy & Wrennall, 2001).

Neuropsychological tests are being increasingly used with children to identify specific acquired deficits in discrete cognitive areas that significantly impact upon their learning and behaviour in ways that were thought only to exist in adults, such as developmental amnesia (Vargha-Khadem et al., 1997). Neuropsychological deficits have also been found in groups of children previously thought to be unaffected by perinatal experiences. For example, children who experience neonatal encephalopathy without motor impairment were thought to have been spared any lasting effects. However they have recently been found to have significant neuropsychological deficits (Marlow, Rose, Rands & Draper, 2005). Since neuropsychological tests are not routinely used in community settings, it is not clear how many other groups of children experience subtle but pervasive specific difficulties affecting their academic, behavioural and social progress.

Neuropsychological assessment methods are not currently a regular part of educational psychology practice, although several local authorities are introducing neuropsychological assessments for some children, with supervision from qualified neuropsychologists. Since this is not common practice, there are no data as to the pros and cons of using such methods within an EPS. Therefore this section will be brief and speculative regarding the populations of children for whom such assessments might be useful. These include:

- Children who would normally be seen by tertiary services for a neuropsychological assessment. Being assessed by an EP would mean that they can be seen locally, by someone who knows about local provision. That EP would be able to monitor the child over time and integrate their

assessment findings with other, more system-oriented approaches, such as consultation with the school, to problem-solve around meeting the child's needs.

- Children with complex learning difficulties that may be developmental in nature but whose presentation suggests specific rather than global learning difficulties.
- Children with behavioural difficulties who might have undiagnosed attention or impulsivity problems for whom behavioural techniques alone are unlikely to be successful.

All these groups of children would benefit from having specific support strategies designed around their individual needs but these populations of children would also benefit from their results being combined to provide research data into the way neuropsychological assessments can be used to design and monitor interventions in a way that is not currently possible.

Although there has not yet been any formal evaluation of attempts in the UK to integrate educational and neuropsychological services, in the United States more progress is being made to this end. There are a number of papers by D'Amato (e.g. D'Amato, Crepeau-Hobson, Huang & Geil, 2005) advocating what he calls 'Ecological Neuropsychology'. He has expressed concern that the traditional models of neuropsychology do not make any attempt to measure a child's potential for change. Ecological neuropsychology is based on the Response to Instruction (RTI) model (Fuchs, Mock, Morgan & Young, 2003; Vaughn & Fuchs, 2003), which is similar to dynamic assessment in that it looks at children's potential to change.

D'Amato aims to use the information from traditional neuropsychological assessments to see how children learn and for rehabilitative purposes, rather than simply for identifying pathology. As neuropsychologists are becoming more aware of how the brain interacts with environmental factors, ecological neuropsychology aims to take a more dynamic approach (Work & Hee-Sook, 2005) and propose interventions within the context of the whole child. The ecological neuropsychological model integrates multiple sources of information, such as information about psychosocial systems with information from interview, observation and objective measures. What is not clear from the model proposed is exactly how this information will be used to generate interventions and how the psychologist will avoid becoming overwhelmed with information, much of which may not be directly relevant to the specific learning difficulty being addressed, in order to develop testable hypotheses. Therefore, the principles of the model seem plausible but not yet entirely manageable.

While the main methods used for assessing children in schools at the moment (psychometric assessment, consultation and dynamic assessment) seem somewhat polarised and neuropsychology has yet to make any quantifiable impact, the power of the combination of these methods would perhaps be greater than the sum of their parts.

Section 4: Integration of theory, research and practice

Applying neuropsychological assessment within schools

This assignment was originally conceived in order to make a case for the widespread use of neuropsychological services within educational psychology and to demonstrate how less structured or standardised assessment methods do not provide useful or reliable information about children's individual learning needs. However, the process of examining the broad range of assessment and intervention methods in use today has led to a change of emphasis in the assignment. Researching each of these methods in more detail has shown that each brings something unique and valuable to an evaluation of the child. The limitations of each method on its own appear to be removed by using them together in a more integrated way. The remainder of the assignment will therefore be used to attempt to draw together these potentially disparate methods in order to propose a more holistic model for working.

The results of the audit discussed in Section 2, although conducted on a very small scale, suggest that neuropsychological assessments provide additional information about certain children's learning needs that are not elicited as clearly by other methods currently used in schools. Therefore it is suggested that some form of detailed cognitive assessment of individual children with complex learning difficulties is useful in establishing the within-child cognitive factors that are affecting a child's learning. Within the field of adult neuropsychology, rehabilitation research is far in advance of paediatrics, but adult models of rehabilitation could be transferable to the field of paediatric neuropsychology and educational psychology.

The development of rehabilitation programmes could initially be conducted through the use of dynamic assessment principles/response to instruction on an individual basis. In those cases where the child has previously undergone a neuropsychological assessment, their specific skills profile would be known in detail and it would therefore be a relatively straightforward process to apply the same methods, if they are successful, to any other children with a similar profile of neuropsychological strengths and weaknesses.

The integration of educational and neuropsychological services is in its infancy in this country, but early studies in the US based on neuropsychological principles of assessment have elicited useful information about the learning needs of complex children who were not being adequately evaluated or managed using traditional methods.

There are some studies which are beginning to show how neuropsychological assessments of groups of children in schools can be used to obtain useful information about subtle difficulties that are preventing them learning. For example, Morgan, Singer-Harris, Bernstein & Waber (2000) studied a group of children who were shown to be of average ability on psychometric assessments but who were failing to progress at school. They hypothesised that they would show similar neuropsychological profiles to children with more global learning difficulties. They administered a number of executive and attention measures with these children and a control group of children with learning difficulties and found that the experimental group had problems dealing with complexity and had decreased automaticity (Executive Function problems) that were similar to the control group. They presented

as having problems adapting to their environment. The authors concluded that, since these measures were quick and easy to administer and provided simple examples of how to alleviate the difficulties these children were experiencing, they might provide more ecological validity than more traditional measures of ability.

Other studies have shown links between executive and attention skills and academic attainment, e.g. Commodari & Guarnera (2005) and St Clair Thompson & Gathercole (2006), rather than using IQ alone. If children with behavioural difficulties in class are assessed as having average IQ, there is a possibility that an assumption will be made that the child's behaviour is therefore a consequence of emotional disturbance, poor home circumstances, lack of discipline etc. and that either a therapeutic or behavioural regime may be offered. However, neuropsychological studies have shown that these children often show significant executive weaknesses that are likely to be having a major influence on their behaviour. For example, Mattison, Hooper, & Carlson (2006) used the NEPSY to examine the neuropsychological profiles of 35 primary school aged children (mean age: 9.8 +/- 1.7 years) with significant emotional and behavioural difficulties requiring special educational provision. They found that over half the pupils scored at least two standard deviations below the mean on at least one domain, usually language or attention/executive functions. Their scores were significantly related to their academic achievement and their teachers' ratings of their behaviour and attention. Their aggressive and externalised behaviour could often be attributed to misunderstanding of language and poor impulse control.

The presence of unidentified language problems was also a feature of a group of 19 excluded pupils (8-16 years) examined by Ripley and Yuill (2005). They found that the excluded boys had poorer expressive language and, in the case of the five younger subjects, poorer auditory working memory than controls, and found that expressive problems were linked to high levels of emotional symptoms as recorded on the Strengths and Difficulties Questionnaire. They concluded that the language skills of boys with behaviour problems should be assessed. However, they did not specifically address the link between working memory problems and no measures of attention difficulties were included. It is studies such as these that would benefit from including a broader measure of neuropsychological skills otherwise it is not possible to conclude whether one problem is being caused by another, e.g. whether attention is the primary deficit and poor language merely a consequence, whether both occur in tandem or whether pupils are inattentive/impulsive as a consequence of poor language skills.

Psychologists are aware of the benefits of early intervention for children who are seen to have difficulties that are likely to impact on their education and social development but it is important to be able to identify the specific nature of their difficulties in order to be able to target help appropriately. It is also important to determine whether early individual differences will persist to affect future learning as there is a tendency with younger children to 'wait and see' how they progress during their first few years at school, particularly where children have subtle or specific difficulties.

Neuropsychological assessments have recently been shown to help in the identification of pre-school children who are likely to go on to have academic difficulties. Espy et al. (2004) examined whether they could show a link between children's executive functioning ability and their mathematical ability, as both are related to activation within the prefrontal cortex. They found that inhibitory control accounted for variance in their emergent mathematical skills. Waber, Gerber, Turcios, Wagner & Forbes (2006) assessed 91 primary aged children from inner-city schools and low-income families and found that executive function difficulties featured highly in this group and that they accounted for a significant degree of the variance in their academic attainments. Working memory difficulties, both visuo-spatial and verbal, have a lasting impact on mathematical computational skills (Wilson & Swanson, 2001) and early identification of these difficulties would ensure interventions are instigated that support the specific areas of weakness rather than simply repeating unsuccessful teaching methods.

Despite these studies reporting specific executive difficulties affecting the learning abilities of young children, there are significant problems with finding reliable measures of attention and executive function in pre-school and primary aged children. While executive and attention tests have been very useful in adult populations for demonstrating significant executive difficulties, they should be used with caution with children whose executive skills are still developing and in whom such differentiation between executive skills may not be as clearly representative of the developmental nature of such processes (Hughes, 2002; Wright, Waterman, Prescott, & Murdoch-Eaton, 2003; McCrea, Mueller & Parrila, 1999). However, a review of the use of such tests in children of 6 and under concluded that attention

measures can be used successfully, with an awareness of their limitations (Mahone, 2005).

Moving from assessment to neuropsychological intervention

In terms of using neuropsychological measures to inform intervention, a few studies have emerged. For example, in the treatment of dyslexia, a study by Goldstein and Obrzut (2001) (based on Bakker's paper of 1992 into the neuropsychological classification and treatment of dyslexia) split a group of dyslexic pupils into groups according to the presentation of their difficulties. The L-type dyslexics were those who read fast but inaccurately and the P-type dyslexics who read slowly and laboriously. M-type readers showed a combination of these two styles. Bakker proposed that L-type readers relied on left-hemisphere strategies and P-type readers relied on the right hemisphere, and were unable to combine strategies (a view not supported by functional neuroimaging studies). The intervention used here involved processes called hemispheric specific stimulation (HSS) and hemispheric alluding stimulation (HAS). HSS involved presenting words to only one visual field or presenting tactile exercises to only the right or left side. HAS was a word-related task. Goldstein and Obrzut's findings did not entirely replicate Bakker's, nor have other attempts, e.g. Dryer, Beale & Lambert (1999), but they did find significant improvements in reading accuracy and comprehension, although in both cases the M-type dyslexics made the least progress. The authors commented on some of the difficulties inherent in working in a school setting, such as school holidays, pupils missing lessons etc. but concluded that neuropsychological interventions can be usefully conducted within school settings.

Attempts have been made to link specific approaches, e.g. behavioural approaches, with assessments of their effect on neuropsychological processes. For example, the PATHS Curriculum (Promoting Alternative Thinking Skills) (Kusche & Greenberg, 1994) has been well validated as an effective means of reducing aggression and promoting social competence in children with significant behavioural difficulties (Greenberg et al. 1995). Riggs, Greenberg, Kusche & Pentz (2006) examined the role of neuropsychology in the children's social functioning. They found that the PATHS programme was effective in improving inhibitory control and verbal fluency (executive functions) and helped children to use inhibitory control to affect their behaviour. They urged the developers of social-emotional programmes to ensure they support the development of children's executive skills, verbal processing skills and emotional awareness. They argued that such programmes should be delivered to coincide with known periods of neurocognitive development to maximise their impact and permanence.

While the studies described above indicate that there might be a useful role for conducting neuropsychological assessments on children with complex, albeit subtle learning difficulties, it is the link between assessment and intervention that crucially needs to be established at the outset. Both the Response to Instruction and the Dynamic Assessment models are based on similar principles in terms generating interventions on an individual basis and the introduction of a detailed neuropsychological profile to that process would introduce a completely different element. The majority of interventions are task specific, e.g. poor readers are taught better ways of breaking down words, children with poor sustained attention are

provided with environmental/material changes that help reduce distractions. However, there have yet to be convincing group studies to determine whether areas of specific deficit can be improved upon by direct teaching and, more importantly, whether these improvements are generalisable; for example, whether children with verbal working memory problems can train specifically to improve their working memory such that it affects their mental arithmetic performance (Rankin & Hood, 2005). The next useful step would be to follow up neuropsychological assessments with specific programmes of evidence-based remediation that could be carried out in school.

Section 5: Concluding comments

This assignment was initiated, however surreptitiously, in order to make a case for using psychometric assessment methods over dynamic assessments when assessing children's learning needs in schools and to dismiss consultation as a means of service delivery because it has yet to be evaluated. However, by holding in mind the notion that one of the key purposes of assessment is to inform intervention, a much more balanced stance has been achieved. Whilst it is clear there are relative merits to each of the assessment methods, psychometric assessments contribute little to intervention and, while dynamic assessments may provide improvement anecdotally for individuals, it can be hard to conduct reliable group studies without having psychometric data on the experimental groups to provide a degree of homogeneity. Consultation as a method of service delivery in schools remains unproven.

However, the unique contribution of each system discussed above can be described as:

- The psychometric data establishes the child's intellectual ability level and provides an indication of their learning ability.
- The neuropsychological profile allows the psychologist to tease out the child's cognitive strengths and weaknesses and enables the psychologist to generate hypotheses about areas for remediation and compensation with reference to adult and child rehabilitation literature.
- Dynamic assessment (Response to Instruction) enables the psychologist to evaluate how receptive the child is to a variety of intervention strategies and the extent to which they need either compensatory or remedial/retraining interventions. Applying the scientist-practitioner model enables the psychologist to develop and monitor individual interventions in a flexible but scientifically justified way (Stoner & Green, 1992).
- The consultation process allows the psychologist to take into account without-child factors and ensure that all the relevant parties are able to contribute to the intervention process in an empowered way.

If this is the ideal provision then it is an expensive one, particularly in terms of psychologist time. However, it is likely to be a valuable approach both for individual children and for groups of children as it will provide data that is transferable to other children with similar difficulties. Unfortunately, at present it appears that many UK LEAs have introduced the consultation model because it is the only way they can provide a service to a large number of schools with very limited EP time. This model would require a much higher level of funding and more intensive EP input and

therefore would need to be rigorously tested before introduction. Given the paucity of the current evidence-base for interventions, this approach would seem to provide a way to develop interventions that work, at least for individuals. If the interventions developed can be shown to be effective for matched groups of children to the extent that they can positively affect the trajectory of children through the education system and beyond, then the cost must surely be justifiable.

REFERENCES

- Anastasi, A. & Urbina, S. (1997). *Psychological Testing*. New Jersey: Prentice Hall.
- Anderson, V., Northam, E., Hendy, J. & Wrennall, J. (2001). *Pediatric neuropsychology: A Clinical Approach*. London: Psychology Press.
- Bakker, D.J. (1992). Neuropsychological classification and treatment of dyslexia. *Journal of Learning Disabilities*. 25, 102-109.
- Barrett, T., Street, B., Lawson, P., Zraly, M., Longhofer, J. & Buchbinder, M. (2005) *The Hanna Perkins Center Model for Consultation in Childcare: Meeting the Needs of Children and Their Caregivers*. Retrieved April 23, 2006, from http://www.hannaperkins.org/consultation_paper.
- Binet, A. & Simon, T. (1916). *The Development of Intelligence in Children* (E. S. Kit, trans). Baltimore: Williams & Wilkins.
- Caplan, G. (1970). *The theory and practice of mental health consultation*. New York: Basic Books.
- Cattell, J. McK. (1890). Mental tests and measurements. *Mind*. 15: 373-380.

Commodari, E. & Guarnera, M. (2005). Attention and reading skills. *Perceptual and Motor Skills*, 100, 375-386.

Cook, J.M. & Coyne, J.C. (2005). Re-envisioning the training and practice of clinical psychologists: preserving science and research orientation in the face of change. *Journal of Clinical Psychology*, 61, 1191-1196.

D'Amato, R.C., Crepeau-Hobson, F., Huang, L.V. & Geil, M. (2005). Ecological Neuropsychology: An alternative to the deficit model for conceptualizing and serving students with learning disabilities. *Neuropsychology Review*, 15, 97-103.

Drabick, D. A. & Goldfried, M. R. (2000). Training the scientist-practitioner for the 21st century: putting the bloom back on the rose. *Journal of Clinical Psychology*, 56, 327-340.

Dryer, R., Beale, I.L. & Lambert, A.J. (1999). The balance model of dyslexia and remedial training: An evaluative study. *Journal of Learning Disabilities*, 32, 174-186.

Early Childhood Observation System. (2006). Harcourt Assessment, Inc. Oxford, UK.

Espy, K.A., McDiarmid, M.M., Cwik, M.F., Stalets, M.M., Hamby, A. & Senn, T.E. (2004) The contribution of executive functions to emergent maths skills in preschool children. *Developmental Neuropsychology*, 26, 465-486.

Fabio, R.A. (2005). Dynamic assessment of intelligence is a better reply to adaptive behavior and cognitive plasticity. *Journal of General Psychology*, 132, 41-64.

Feuerstein, R. Rand, Y. & Hoffman, M. & Miller, R. (1980). *Instrumental Enrichment: An intervention program for cognitive modifiability*. Baltimore, MD: University Park Press.

Frampton, I. (2004) Research in paediatric neuropsychology – past, present and future. *Paediatric Rehabilitation*, 7, 31-36.

Fuchs, D., Mock, D., Morgan, P.L. & Young, C.L. (2003) Responsiveness-to-intervention: Definitions, evidence and implications for the learning disabilities construct. *Learning Disabilities Research and Practice*, 18, 157-171.

Galton, F. (1883). *Inquiries into Human Faculty and its Development*. AMS Press, New York.

Goldstein, B.H. & Obrzut, J.E. (2001). Neuropsychological treatment of dyslexia in the classroom setting. *Journal of Learning Disabilities*, 34, 276-285.

Greenberg, M.T., Kusche, C.A., Cook, E.T., & Quamma, J.P. (1995). Promoting emotional competence in school-aged children: The effects of the PATHS Curriculum. *Development and Psychopathology*, 7, 117-136.

Gresham, F.M. (2002) Responsiveness to intervention: An alternative approach to the identification of learning disabilities. In R. Bradley, L. Danielson & D.P. Hallahan (Eds.) *Identification of learning disabilities: Response to treatment*. Pp467-519. Mahwah, NJ: Erlbaum.

Griffiths, P. (1989) Investigative methods in paediatric neuropsychology. In John R. Crawford & Denis M. Parker (Eds.) *Developments in Clinical and Experimental Neuropsychology*. Pp 247-258. Plenum Press: New York US.

Guthke, J. & Stein, H. (1996) Are learning tests the better version of intelligence tests? *European Journal of Psychological Assessment*, 12, 1-13.

Hughes, C. (2002) Executive functions and development: Emerging themes. *Infant and Child Development*, 11, 201-210.

Hylander, I. (2003) Toward a grounded theory of conceptual change process in consultee-centered consultation. *Journal of Educational and Psychological Consultation*, 14, 263-281.

Kozulin, A. (2005) Learning Potential Assessment: Where Is the Paradigm Shift? In D.B. Pillemer & S.H. White-Sheldon (Eds.) *Developmental psychology and social change: Research, history and policy*. p. 352-367. Cambridge University Press, New York, NY, US.

Kusche, C.A. & Greenberg, M.T. (1994) *The PATHS Curriculum*. Seattle: Developmental Research and Programs.

Lambert, N.M., Hylander, I. & Sandoval, J.H., *Consultee-centered consultation: Improving the quality of professional services in schools and community organizations*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Mahone, E.M. (2005). Measurement of attention and related functions in the preschool child. *Mental Retardation and Developmental Disabilities Research Reviews*, 11, 216-225.

Marlow, N., Rose, A.S., Rands, C.E. & Draper, E.S. (2005) Neuropsychological and educational problems at school age associated with neonatal encephalopathy. *Archives of Disease in Childhood. Fetal Neonatal Edition*, 90, 380-387.

Mattison, R.E., Hooper, S.R. & Carlson, G.A. (2006) Neuropsychological characteristics of special education students with serious emotional/behavioural disorders. *Behavioural Disorders*, 31, 176-188.

McCrea, S.M., Mueller, J.H. & Parrila, R.K. (1999). Quantitative analyses of schooling effects on executive functions in young children. *Child Neuropsychology*, 5, 242-250.

Miller & Frederickson, N. (2006) Generalisable findings and idiographic problems: Struggles and successes for educational psychologists as scientist practitioners. In

D.A. Lane & S. Corrie (eds.) *The modern scientist-practitioner: A guide to practice in psychology*. Routledge.

Morgan, A.E., Singer-Harris, N., Bernstein, J.H. & Waber, D.P. (2000). Characteristics of children referred for evaluation of school difficulties who have adequate academic achievement scores. *Journal of Learning Disabilities*, 33, 489-501.

Moses, P. & Stiles, J. (2002). The lesion methodology: Contrasting views from adult and child studies. *Developmental Psychobiology*, 40, 266-277.

Rankin, P.M. & Hood, J. (2005) Designing clinical interventions for children with specific memory disorders. *Pediatric Rehabilitation*, 8, 283-297.

Ravenette, T. (1996). What would happen if? Personal construct psychology and psychological intervention. *Educational and Child Psychology*, 13, 13-20.

Riggs, N.R., Greenberg, M.T., Kusche, C.A. & Pentz, M.A. (2006). The mediational role of neurocognition in the behavioural outcomes of a socio-emotional prevention program in elementary school students: Effects of the PATHS curriculum. *Prevention Science*, 7, 91-102.

Ripley, K. & Yuill, N. (2005). Patterns of language impairment and behaviour in boys excluded from school. *British Journal of Educational Psychology*, 75, 37-50.

Rothwell, N. (2005). How brief is solution focussed brief therapy? A comparative study. *Clinical Psychology and Psychotherapy*, 12, 402-405.

Sandoval, J. H. (2004). Evaluation issues and strategies in consultee-centered consultation. In N. M. Lambert, I. Hylander & J. H. Sandoval (Eds.), *Consultee-centered consultation: Improving the quality of professional services in schools and community organizations* (pp. 391-400). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Sattler, J. M. (2001). *Assessment of Children: Cognitive Applications* (4th Edn.). La Mesa, CA: Jerome M Sattler.

Shapiro, E.S. (1996). *Academic Skills Problems Workbook*. Routledge: Taylor and Francis Group, Oxford. UK.

StClair-Thompson, H.L. & Gathercole, S.E. (2006). Executive functions and achievements in school: Shifting, updating, inhibition and working memory. *Quarterly Journal of Experimental Psychology*, 59, 745-759.

Stoner, G. & Green, S.K. (1992). Reconsidering the Scientist-Practitioner Model of School Psychology Practice. *School Psychology Review*, 21, 155-166.

Temple, C.M. (2003). Neuropsychological assessment of developmental disorders. In P. Halligan, U. Kischka & G. Beaumont (Eds.) *Oxford Handbook of Clinical Neuropsychology* (pp. 401-425). Oxford. OUP.

Temple, C. (1997). *Developmental cognitive neuropsychology*. London: psychology Press.

Tzuriel, D. (2000). Dynamic assessment of young children: Educational and intervention perspectives. *Educational Psychology Review*, 12, 385-435.

Vargha-Khadem, F., Gadian, D. G., Watkins, K. E., Connelly, A., Van Paesschen, W. & Mishkin, M. (1997). Differential effects of early hippocampal pathology on episodic and semantic memory. *Science*, 277, 376-380.

Vaughn, S. & Fuchs, L.S. (2003). Redefining learning disabilities as inadequate response to instruction: The promise and potential problems. *Learning Disabilities Research and Practice*, 18, 137-146.

Vygotsky, L. (1978). *Mind in society. The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Waber, D.P., Gerber, E.B., Turcios, V.Y., Wagner, E.R. & Forbes, P.W. (2006). Executive functions and performance in high-stakes testing in children from urban schools. *Developmental Neuropsychology*, 29, 459-477.

Wagner, P. (2000). Consultation: developing a comprehensive approach to service delivery. *Educational Psychology in Practice*, 16, 9-18.

Wechsler, D. (2001). *Wechsler Individual Achievement Test – 2nd Edition (WIAT-II)*. San Antonio, TX: Harcourt.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children- 4th Edition (WISC-IV)*. San Antonio, Texas: Psychological Corporation.

Wilson, K.M. & Lee Swanson, H. (2001). Are mathematics disabilities due to a domain-general or a domain-specific working memory deficit? *Journal of Learning Disabilities*, 34, 237-249.

Work, L.P. & Hee-Sook, C. (2005). Developing classroom and group intervention programs based on neuropsychological principles. In D'Amato, R.C., Fletcher-Janzen, E. and Reynolds, C.R. (Eds.) *The Handbook of School Neuropsychology*. Pp 663-683. Wiley, New York.

Wright, I., Waterman, M., Prescott, H. & Murdoch-Eaton, D. (2003). A new Stroop-Like measure of inhibitory function development: typical developmental trends. *Journal of Child Psychology and Psychiatry*, 44, 561-575.

The author as professional supervisor: A review

INDEX

Section 1: Aims and scope of assignment	135
Section 2: Practice and context	136
1) Supervision of undergraduate students	137
2) Supervision of trainee clinical psychologists	139
3) Supervision of qualified clinical psychologists	140
4) Supervision of qualified educational psychologists	141
Section 3: Psychological theory and research	142
The availability of supervision	142
The need for supervision	144
Models of supervision	146
The effect on supervision of the supervisory relationship	150
Section 4: Integration of theory, research and practice	152
Review of the author's provision of supervision	152
Reflections on the author's experience of being supervised	157
Section 5: Concluding comments	159
References	162

Section 1: Aims and scope of assignment

One of the key roles of experienced psychologists is that of providing supervision for junior staff and psychologists in training. The issue of supervision is particularly pertinent with the current change in training for educational psychologists, which now involves three years of training, to doctoral level, with two years of that training taking place in educational psychology services (EPSs) under the supervision of practicing educational psychologists (EPs). Supervisors are potentially in a powerful position to shape the psychologists of the future, e.g. by influencing their research ideas, shaping their future practice and inspiring them to follow certain career paths. They can also influence their self-confidence, their self-belief and their style as psychologists.

This assignment will be used to explore the professional roles and responsibilities of the author as supervisor of psychologists at three different stages of training for four different purposes; undergraduate students, clinical psychology trainees, qualified clinical psychologists and educational psychologists. Each of these stages of training presented the author with different challenges as a supervisor and the supervisees came to their placements/secondments with different expectations and support structures that influenced their learning during supervision. The author is a qualified educational psychologist (with eleven years of experience) and a clinical paediatric neuropsychologist (with eight years experience, six at consultant level) who has experience of supervising staff since she was one year post-qualification as an EP, but who has no formal training in supervision. The assignment will be used to reflect on the effectiveness of the author as a supervisor, with reference to models of

supervision that exist to support the work of a range of applied psychologists. Whether formal training in supervision would have been useful in helping to avoid or manage the issues that arose through the course of her supervisory experiences will be discussed and an action plan for future personal development work outlined.

Section 2: Practice and context

Once psychologists are professionally qualified, they can be expected to take on many different roles with respect to supervision and continuing professional development. Practising psychologists play an essential part in the development of the profession, both with respect to supporting trainees on placements and supervising qualified psychologists on professional issues in the workplace (Haynes, Corey and Moulton, 2006). This assignment will be used to explore the complex interrelationship of these roles with respect to one particular psychologist, the author, during the period 2004-2005, and her experience will be used to explore her personal effectiveness in these various roles. The psychologist, in a full time post, was responsible for the simultaneous supervision of: -

- 1) Two psychology undergraduates in their third year of a four-year psychology degree course.
- 2) One clinical psychologist in training during the third year of her doctorate course, on a third year specialist neuropsychology placement.
- 3) Three qualified clinical psychologists in the multi-disciplinary team in which the author was based, receiving clinical supervision for assessment, intervention and neuropsychological aspects of their work.

- 4) One qualified educational psychologist developing skills in neuropsychology with the intention of providing a neuropsychological service in her LEA.

Each of these supervision arrangements will be discussed in turn.

- 1) Supervision of undergraduate students

In the year preceding Year 2004-2005, the author had accepted a student from Y University. The student had assisted in clinics, e.g. keeping small children occupied whilst parents were being interviewed, making cups of tea, sorting out assessment materials, booking and preparing rooms, assisting with some assessments, etc. She had also assisted with various research projects, e.g. with data entry and contacting research families. She had proved herself to be professional in her manner, independent (e.g. if there were no tasks for her, she would make use of the professional journal collections and read) and able to act upon her own initiative. Therefore, when Y University asked whether it might be possible to take two students, it was thought likely that this would be beneficial to the team. It was agreed that the team would take on one student full time and the other part-time, shared with another department.

However, despite professing in interview to be keen to work in child psychology, the two new students immediately appeared much less motivated and self-sufficient than the previous student and they requested almost constant direction. It may have been that because there were two of them, they naturally integrated less with other team members, but they seemed very

reluctant to take advantage of the wealth of opportunities on offer to them in such a busy paediatrics department, e.g. to observe feeding clinics and movement disorder clinics, to attend ward rounds, etc. In addition to helping in clinics, each was given a specific project to work on. They were each assigned a child with whom they were to work in school for a morning on a weekly basis. The children in question were identified as having specific mathematical difficulties (as a consequence of complex neuropsychological impairments) and a programme of intervention was outlined for the students to deliver. Their brief was to obtain baseline measures for each child, deliver the programme over the course of a term, reassess using the original measures and determine whether the intervention had been effective for each child. A number of related measures were also administered to see whether any new skills had generalised to other contexts. While the programme given was broadly structured, the intention had been that the students would do some research of their own into mathematical difficulties and broaden their knowledge in this area (e.g. Butterworth, 2000; Butterworth & Yeo, 2004; Dehaene, 1999; Temple & Sherwood, 2002). Before the study they were told that they would be asked to write up what they had done in such a way that their programme could be replicated, i.e. to provide a step-by-step guide to their intervention.

During the course of the intervention, it became clear that the students were not doing any research at all into the subject and they required specific guidance for each session. This degree of difficulty or reluctance had simply not been anticipated or prepared for and there were insufficient sessions

available to provide the level of direct supervision required. This resulted in a certain amount of dissatisfaction on both sides, with the students claiming that they received insufficient support and the supervisor feeling frustrated that they had not made any apparent effort to make the project a success.

2) Supervision of trainee clinical psychologists

The clinical psychology trainee was the third consecutive trainee from a specific training course and the previous two had been of an exceptionally high calibre; both having subsequently taken posts within the Trust. The third trainee was certain that she wanted to work in paediatric neuropsychology and her performance was flawless throughout the placement. She had mastered the skill of always appearing busy, she was always prepared and she managed to pick up the hospital's systems effortlessly. Therefore, her supervision requirements were purely related to clinical teaching, i.e. teaching her how to conduct a neuropsychological interview, teaching her how to select tests according to various hypotheses, how to conduct neuropsychological formulations and feedback to parents and schools, etc. This whole process was enjoyable, professionally rewarding and good for the team. Her competence enabled the author to oversee a larger number of cases than she would have been able to see on her own, thus improving the turnover of the team and reducing the waiting times. She also brought enthusiasm and academic curiosity to the process and researched children's illnesses thoroughly, which meant that they may even have got a better service than if they had been seen by established staff members. The information that she

brought to each assessment also meant that through the supervision process, the author was maintaining her own knowledge of complex and often obscure neuropsychological presentations. The only weakness in the supervision arrangement arose when issues relating to clinical psychology were presented. For example, the trainee felt that one child had serious OCD (Obsessive Compulsive Disorder) problems and wanted to offer some treatment sessions. This was a correct diagnosis and an appropriate treatment course for a team member. However, as the author was not clinically trained, the author needed to approach a clinical psychologist to offer supervision for that aspect of the trainee's work. This was easily arranged and did not in any way weaken the supervision relationship. In fact, all trainees are encouraged to see some cases with other psychologists to ensure a breadth of experience both for the trainees and the other psychologists.

3) Supervision of qualified clinical psychologists

The three clinical psychologists supervised within the multi-disciplinary team were established members of the team but employed on honorary contracts from another trust, from which they received clinical and professional supervision via a senior team member in a different department. However, given that the author was a senior neuropsychologist in the team, she provided ad hoc supervision for complex assessment and intervention cases as they arose. Whilst this arrangement worked well because the team was fully integrated, relationships were good and offices were all on the same corridor, the supervision itself did not have an established pattern. There were

no regular sessions and the supervisor was not involved in any developmental process with the psychologists.

4) Supervision of qualified educational psychologists

The final supervisory arrangement came about following a discussion after a conference. The author has presented at many conferences and conducted training sessions for Local Education Authorities (LEAs) in order to encourage educational psychologists with an interest in neuropsychology to extend their expertise in this area. Following one such conference, an EP (CA) approached the author and suggested that her whole EPS should be trained in the application of neuropsychological principles in their everyday practice, with CA as the lead psychologist for neuropsychology. The author attended set-up meetings with the Principal EP and Senior EP of the LEA to devise a programme structure and to allocate a budget for test purchasing and fees. Over the course of a year the author provided three whole EPS training sessions to explore neuropsychological models of assessment and intervention, to discuss case studies and to discuss further development opportunities at the end of the project. CA's role was to attend the hospital clinics to observe assessments and practice administering test batteries, to conduct assessments herself within her own authority and to feed back her assessment findings to her team to ensure the cascading of knowledge and skills.

Whilst CA's LEA were very supportive of this project in principle and provided the funding for test purchasing and supervision, they did not provide

CA with any additional time to conduct the assessments, i.e. she was expected to fit them into her time allocation to schools. Therefore, if she was allocated six sessions to a primary school in one term, she would need to take three of those to conduct one assessment (two sessions for the assessment and at least another one for report-writing that would be in addition to the normal administration time required for two school visits). This meant that although the material resources were available, the time was not and so the project never really progressed. The whole EPS training sessions were well received and enjoyable to deliver but disappointing in that the reality was, the EPs were not going to be given the time to conduct neuropsychological assessments in any systematic way, however useful they found them.

Section 3: Psychological theory and research

Reviewing the literature on supervision has proved to be an interesting endeavour, particularly as the author began the process assuming that all educational psychologists were entitled to professional supervision and therefore would be receiving it. However, this is by no means the case.

The availability of supervision

The literature discussed below shows that supervision of EPs in practice is not routinely provided. This may be because traditionally EPs have become used to working autonomously, have had few expectations of receiving regular supervision post-qualification and do not have their work formally assessed on any level, e.g.

through appraisal, after qualification. When Webster (2001) examined the appraisal and supervision process in UK LEAs, he found that only 79% of educational psychology services had appraisal schemes and that in only 25% of cases those schemes were specific to the EPS, rather than to the LEA more broadly. A small number of authorities reported having no clear means of evaluating the skills and continuing professional development of their EPs. Although this study is not directly related to supervision, it does suggest that until quite recently, some EPs were working without clear supervision structures and that there was not necessarily anyone available to them for professional support and guidance. Similarly, a small survey of the supervision arrangements provided by ten local education authorities (Phelan, 2007) reported that in two of the authorities no supervision was provided. Only six provided individual support while two provided group support.

In a larger survey study of over 100 supervisors in the London area, Robinson (2007) also discovered significant proportions (roughly 2/3rds) of EPs were without regular supervision and that many providing supervision were relatively inexperienced. When she looked at the models of supervision being employed, she found that only around a fifth were using a specific model, predominantly one described as 'developmental' and some specifically identified Stoltenberg's model (the Integrated Developmental Model, 2005). Her respondents confirmed that they would like to be trained in the use of models as part of their training so that they have experience of selecting and applying a variety of models. Her respondents gave a list of the things that they felt should be covered in supervision and while they all seem very sensible, the time needed to provide such supervision would be likely to be more than the minimum stipulated by the BPS. Given that supervision is time-consuming and

therefore potentially expensive, it would be useful to determine the effects of good supervision on the quality of practice and to monitor its effect on outcome measures, such as quality of service delivery, to be able to justify the additional time required.

The need for supervision

In educational psychology, as in all applied psychologies, there is an expectation that an individual's practice will be evidence-based. However, many psychologists see their special contribution as being their individualised and reflective approach to problem-solving within their casework. Fox (2003) discussed the difficulties with the evidence base for educational psychologists and the limits to what is known about the link between assessment and intervention. While he does not discuss issues of supervision in his article, his ideas have relevance for this discussion as perhaps one role of supervision is to enable psychologists to calibrate their work in the absence of a clear evidence base. The process of supervision allows psychologists to check that their subjective decisions, albeit based on sound professional training, would be considered appropriate within the broader educational psychology community (as set in law by the Bolam vs. Friern Barnet Hospital Management Committee (1957) case which is now routinely used in court. It concluded that the actions of an individual must not fall below the professionally recognised standards at the time, and that standard can exist even if only a minority of competent professionals would have acted in the same way). As long as psychologists have regular supervision and cases that are not readily managed in an evidence-based way are discussed and discussions are recorded, individuals are likely to be considered to be acting in a professionally

competent way. Therefore it appears supervision is particularly important in a field where the evidence base is constantly evolving.

During her professional training as an EP, the author became aware of just how readily people in receipt of psychological services accepted being seen by a trainee, and, as the study discussed below indicates, the treatment provided by trainees can be as effective as that from qualified psychologists. Buckley, Newman, Kellett and Beil (2006) looked at the effect on patient outcome according to whether patients were treated by qualified or trainee clinical psychologists. They examined a group of 120 adults being treated for mental health problems through a clinical psychology department and in a variety of community settings. The supervisors matched trainees to clients whom they considered would readily engage with therapy and whose problems were appropriate for a short-term piece of work. They also ensured that the trainees received the recommended level of supervision. They measured outcome through the use of mental health questionnaires and found that in both the trainee and qualified psychologist groups, patients showed appreciable improvement and they did not find that one group outperformed the other. They expressed caution in the interpretation of the results because the trainees had been placed with clients who might have been relatively straightforward in treatment terms but it does suggest that good supervision can be an essential part of the treatment process.

This matching of trainee to client is probably always a consideration of a good supervisor, to ensure that supervisees have a positive training experience and are given clients with whom they can practice their developing skills relatively freely. The supervisees in Buckley et al.'s study were all supported by a level of supervision

that is considered at least adequate by the British Psychological Society (at least an hour per week plus access to their supervisor at other times as needs arise; CTCP, 2002).

Models of supervision:

Given the potential cost-implications to services of providing time for good supervision, it is important to determine whether any specific models of supervision assist in providing supervisees with a positive experience and whether training supervisors in the use of these models can develop their supervisory skills.

Supervision is an on-going process and continues throughout professional practice. However, within educational psychology the process of supervision and access to supervision does not yet seem to be an expected or established part of professional practice. For example, Webster, Hingley and Franey (2000) examined the expectations about supervision of newly qualified educational psychologists. They obtained data from 53 psychologists who were beginning their professional careers and just leaving their training courses (within their first 18 months of qualified practice). They asked participants about their experience of supervisory relationships and about arrangements for long-term supervision, following their initial period of induction. It was reported that many services had no formal supervision arrangements and individuals were expected to ask for supervision when needed. There were comments that, perhaps because of there not being any established supervision system, when arrangements were made they tended to focus on casework rather than reflective practice and professional issues. There were also supervisors

who were seen to be out of touch with current practices and intimidated or threatened by the process. From the responses received, Webster et al. concluded that the best supervision occurred when some sort of mutually agreed contract was drawn up that delineated their modus operandi; for example, when an agenda was negotiated and agreed, when developmental activities were included, joint activities were undertaken and the supervisor was enthusiastic about their supervisory role. Similar conclusions were reached by Benson and Holloway (2005), who found that supervision models needed to promote a reciprocal relationship where both parties were involved in the active structuring of supervision processes, and where the supervisor was responsive to their trainee's needs.

Milne and James (2002) observed the effect of training in supervision on a qualified psychologist offering supervision to six supervisees who were also qualified professionals. The supervising psychologist was already a senior practitioner who had undertaken post-graduate workshops and seminars in supervision so was aware of models of supervision but had not had any direct training in supervision. They found that an intervention that involved the supervisor receiving consultation from another psychologist with expertise in supervision, such as using negotiated learning objectives, employing evidence-based models of supervision and receiving feedback from the consultant who observed the sessions, led to improved competence and effectiveness during supervision (assessed using a formal observational rating of both supervisor and supervisee). This study suggests that training in supervision is most effectively delivered in a practical way and simply knowing about good supervisory practice may be insufficient to affect how people work. Naturally as this was a single case study, its findings may not be generalisable across other

psychologists, but it is a finding that needs to be borne in mind. It should also be noted that there were no measures of changes in the psychological effectiveness or competence of the supervisee as a consequence of the supervision they received.

Models of supervision have been developed for psychotherapists that also have relevance to psychologists. For example, Barrett and Barber (2005) argued strongly for a developmental approach in supervision for the training of psychotherapists. They said that this method provides supervisors with an approach that is individually tailored to the changing needs of their trainees. It involves establishing a baseline level for the trainee across a number of criteria, e.g. autonomy and moral insight, using a range of materials, such as the Sentence Completion Test (Hy & Loevinger, 1996), supervising their training and re-assessing where they are with respect to their initial baseline skills. This method enables the supervisor to monitor the supervisee's level of development in their thinking and to adapt their teaching accordingly.

The developmental approach, as described by Barrett and Barber (2005) in terms of its application in psychotherapy, is reported to be very influential on an individual's ability to deliver therapy, but they found that the supervisory experience is frequently a negative one and they suggested that this can have a knock-on effect on the psychotherapist's therapeutic relationships with their clients. They reviewed the literature examining the effects of supervision on trainee psychotherapists and discussed many studies describing negative supervisor/supervisee relationships. They found that this negativity was most likely to occur when supervisors were seen to be too busy to give due commitment to their supervisory role or they were simply too unapproachable. They also found that supervisors were not that good at recognising

their supervisee's training and development needs, despite professing to use a developmental model. It is interesting to note how often studies describe supervisees' negative experiences of supervision, which seems somewhat surprising given their supervisors' professional training in the promotion of good interpersonal skills. This finding might lead one to suspect that the supervisees' experiences of supervision may be more dependent on the interpersonal skills of the supervisor rather than the particular model they employ.

Morgan and Sprenkle (2007) reviewed current models of supervision to look at common factors across the models in order to attempt to take the best aspects from each to devise a new model that would avoid the pitfalls that occur in the supervisory relationship. The models they addressed were clinical, developmental and social-role models of supervision. Clinical models appear to involve the supervisor as trainer of the supervisee in a particular way of working. Developmental models recognise that the trainee needs to go through a number of stages in their development and the supervisor facilitates that process. The social-role models involve identifying the roles and functions of the supervisor and identifying how these relate to each other to contribute to successful supervision. From these they developed a three-dimensional model with four supervisory roles (Coach, Teacher, Mentor and Administrator) and three dimensions (clinical and professional issues and the supervisor/supervisee relationship). Their model demonstrates how each of these roles and responsibilities can interact and can be addressed within the supervisor/supervisee relationship.

Their analysis of the problems with these models, when considered individually, is that they do not allow flexibility across models but in reality, few supervisors seem

to use a rigid model to inform supervision (e.g. Robinson, 2007; Rowland, 2007) and good clinicians naturally use an eclectic approach and adapt according to the needs of the supervisee. Where there can be straightforward clashes in supervisory relationships, these may be largely down to personality and one or other individual failing to meet the standards required of the other party in some way. There is little in the description of these models to suggest that these situations would be avoided or resolved more easily if a specific model was being used. It seems likely that when such clashes occur, a third party could usefully be involved to act as a mediator and to provide supervision for the supervisor, however experienced they might be. Milne and James (2002) certainly found that the intervention of a third party improved the supervision experience for all concerned and this seems a sensible option to make available for all supervisors.

The effect on supervision of the supervisory relationship

As mentioned above, all practicing psychologists should be working under supervision. The relationship between the supervisor and supervisee can have a profound effect on the supervisee in terms of their experience of supervision and how they view their competence as a professional. There are a number of studies addressing this relationship. For example, Fernando and Hulse-Killacky (2005) examined the relationship between a supervisor's style and the experience of supervisees in terms of their satisfaction with the supervision experience and their perceived self-efficacy. They evaluate the experiences of supervision of 82 Masters-level counselling students and measured their perceptions of their supervision using a range of questionnaires. They found that students' perceived self-efficacy was most

influenced by supervisors who had a task-oriented style. Supervisors with an attractive or interpersonally sensitive style had the greatest influence over supervisee satisfaction with supervision. They discussed their findings in terms of a developmental model of supervision and concluded that supervisors need to be open to further learning with regard to supervision, be flexible in their approach and prepared to adapt to the needs of their students and also be able to combine their styles according to different situational demands. While this study has identified a range of styles that supervisees found helpful, the question remains as to how easy it is for supervisors to change their style and how willing would they be.

One educational psychologist, Carrington (2004), described her own experiences as a supervisor of trainee psychologists. She approached the issue of supervision as perhaps many do, that the main purpose of supervision is to train and teach less experienced staff. Carrington described her experience of supervising a trainee over a six-week period. She was able to identify a range of benefits to herself as a practitioner from her experience, such as: gaining a fresh perspective, being challenged about her views, being observed while working and receiving feedback and questions about those observations and having opportunities to reflect on her own practice. She concluded that the process of acting as a supervisor could be an enriching one for the supervisor and the psychologist's clients as well as the supervisee. This is an important observation given the professional psychologist's responsibility for recording and reflecting on their own Continuing Professional Development experiences. The British Psychological Society now requires chartered psychologists to complete at least 40 hours CPD each year and to send their recorded activities to the BPS for checking before they receive their annual practicing

certificate. It is likely that as this process becomes more formalised, and is perhaps adopted by the Health Professions Council, articles such as Carrington's will be important for ensuring that psychologists are able to count their own supervisory work as part of their CPD, as long as it is used as a self-reflective process in the way described. Carrington also comments on how few psychologists are formally trained in supervision during their own training, although she anticipated correctly that this might change with the new training process that has since become universal, i.e. the three year doctoral training. Carrington clearly approached this exercise with the intention of reflecting on her skills and developing them if necessary. It would be interesting to survey a range of supervisors to determine how interested supervisors would be in developing their supervision skills and whether they would prioritise it as part of their own CPD.

Section 4: Integration of theory, research and practice

Review of the author's provision of supervision

Having reviewed the literature on supervision and, more specifically what makes a good supervisor or a good supervisory experience, it has become clear where and why problems arose with aspects of supervision provided to the individuals described in Section 2. These shall each be addressed in turn.

The needs of the undergraduate students were significantly underestimated and from a relatively early stage it became clear that their supervision requirements differed greatly from those of the previous student. However the author proved herself to be

relatively inflexible in her approach to the supervision (a supervision issue discussed by Fernando and Hulse-Killacky, 2005) and, despite the students requesting more input, she did not feel she could prioritise their needs. They were therefore given more ideas regarding how to occupy themselves, approaches were made to other clinics for the students to assist them (which the students did not follow up) and more advice was given regarding how to structure the individual in-school case work. If the author had been able to give more time to their supervision, she could have looked more specifically at the needs of each individual, perhaps removing the casework component, which they possibly had insufficient knowledge about or interest in, and providing more hands-on support. However, due to her own clinical demands and her other supervision responsibilities, more time was not available (a problematic issue raised by Barrett and Barber, 2005). A meeting with the students' university tutor could also have been used to try to determine a more positive way forward. As a consequence of none of these steps being taken, their placement was somewhat unsatisfactory for all concerned and the author did not agree to take on any more students herself. However, she has arranged for other members of the team to take on students. They have done this on the understanding that the supervising psychologists will be able to provide them with a high level of support and have sufficient work for them to do. Their primary role is to assist the psychologists with their own and team research projects, e.g. data analysis and data entry, with the option for observing clinics as time allows. This arrangement has so far been successful as it increases the research output of the team, provides junior psychologists with supervision experience and increases the range of experiences of the students.

The second example of supervision, the supervision of clinical psychologists in training, presented little in terms of difficulties with respect to the process of supervision. It is possible though that these trainees had been well educated regarding their own role in supervision, partly because they were clear about their own needs, but also because, as third year trainees, their emphasis was on learning specific skills in neuropsychology. However the supervision of the trainees enabled the author to reflect on what worked for her in the supervisory relationship; i.e. supervising well-motivated, high-calibre, self-starting individuals who need the teaching of skills and knowledge more than the teaching of psychological processes (suggesting that the author prefers to work to the clinical model of supervision as described by Morgan & Sprenkle, 2007). The trainee discussed in Section 2 has also come to work for the Trust as a paediatric neuropsychologist, which is probably an indication that the placement was also rewarding for her.

Similarly, the third example of supervision, the ad hoc supervision of junior team members, was a successful arrangement in that individuals only came for supervision when faced with case specific problems, which the author found enjoyable as a problem-solving task. However, as the author had no responsibility for the overall development of the individuals' skills, she did not get the satisfaction of observing their successful clinical work. For example, if the individuals found that they had learned from the supervision process and subsequently felt confident in assessing a specific difficulty and the problems that would be expected to arise, they would no longer need to bring cases for supervision. The author would not then see their successes or observe their new skills in action and in the longer term there would be little reward for this work. Carrington (2004) emphasized the mutual benefits of

developing good supervisory relationships and it is clear that the ad hoc nature of this type of supervision was not conducive to longer term satisfaction for the author.

The final example of supervision, within an LEA, combined clinical and managerial supervision, i.e. as a project co-organiser. The problems experienced were more to do with the need to manage organisational change, which the author had no real prior experience of (beyond systemic work in schools) and had not anticipated having to do. The funding for the project was limited and there was not the scope, in the time allowed, to go back to the PEP and negotiate a change in CA's working arrangements to enable her or her colleagues to conduct neuropsychological assessments. This would have required the LEA to fund additional EP posts to cover their commitment to their schools as their service delivery was on a time-allocation basis. The project, in retrospect, would probably need some additional funding, perhaps via a service development or research grant, to set up the project and audit its efficacy. If similar projects are to be set up in the future, the following arrangements will need to be made in advance:

- At the set-up meeting the test-budget, supervision budget, time-allocation, clinical responsibility and outcome measures need to be agreed.
- The test budget for a comprehensive battery of tests is many thousands of pounds and perhaps could be shared across neighbouring LEAs.
- The supervision budget will also be a major component of the expense and similarly could be spread across LEAs.

- One of the unforeseen costs was the time participating EPs needed to dedicate to casework as well as supervision. One case may well require four or five sessions. This is a major, often unaccounted for expense.
- Unless the supervisor is on a contract with the LEA, they will have no clinical responsibility for their work in the LEA. This issue needs to be discussed.
- Given the large time and cost implications, clear outcome measures of success need to be established at the start of any project.

It is interesting to note that the type of supervision being provided to the LEA, in addition to the individual work with the lead EP for the project, was a more systems-based approach (Frederickson, 1990; Miller & Leyden, 1999) to integrate neuropsychological models into EPs' everyday practice. The systems approach to working with schools was being heavily promoted when the author was working as an EP and she was somewhat amused to observe how difficult the LEA managers found it to respond to changes in practice and service delivery, even to incorporate a model they wanted and were paying for. In retrospect a discussion around this issue would have been a useful one.

A number of LEAs are now funding their own EPs to undertake formal Masters training in neuropsychology, an option that was not readily available prior to the inception of the MSc in clinical neuropsychology. This will allow them to apply for Full Practitioner Membership of the Division of Neuropsychology and this exciting development may herald a significant change in the delivery of psychological services within LEAs.

Reflections on the author's experiences of being supervised

The author's own experience of clinical supervision has been very limited and this is perhaps why she is not confident about offering (or particularly keen to offer) supervision beyond the specific training of skills. Her experiences of supervision were entirely positive, both as a trainee EP and as a trainee Neuropsychologist. Both models of training followed appeared to be clinical in that she was trained to do a job and to apply particular models of working. As a trainee EP she was given a small patch of schools for which she took on all the casework over a term and her supervisor discussed her assessments, formulations and interventions on a regular basis. She observed few of her supervisor's sessions but found his expertise and advice extremely helpful. The placement was considered to be a success and the schools involved seemed to agree. Her second supervisor was more hands-on and they worked more closely, i.e. observing each other work. This also proved very useful, as they were able to discuss each other's approaches, decision-making and formulations. Her neuropsychology supervisor provided expert knowledge about neuropsychology, helped her to generate hypotheses, drew her attention to suitable models of working and promoted her own development of interventions and explanations of causes of specific difficulties.

Each of these supervisors set the author in good stead for what appears to be a successful career and each enabled her to feel confident in her own ability to adapt to her working environment. None of them offered any real teaching in psychological skills, or more specifically, the application of psychological models to her interactions with her patients/clients. The only time any supervision of this type was

received was almost as an aside when the author shared a room with a clinical psychologist and they discussed the session with a family that the author had just seen. She mentioned the interchange that had gone on between her and the mother and the clinical psychologist said, 'What do you think would have happened if you had said nothing then?'. This simple comment prompted a big change in the author's style of working and perhaps initiated her transition from being a good educational/neuropsychological specialist into a psychologist. What the clinical psychologist had correctly observed was that the author's tendency in sessions was always to fill gaps and to help children and parents say what she thought they wanted to express. She also liked to avoid uncomfortable silences and ended them by prompting people's answers, believing that she was helping them to formulate their answers, e.g. by giving closed questions rather than open ones. What she has since discovered is that silences are tolerable and can be a very powerful tool for enabling people to say what they really think. Upon reflection the author has noted her own lack of experience of training in any form of therapeutic or counselling psychology. It is possible to take a very pragmatic approach to both educational psychology and neuropsychology as there are always problems to investigate and solve. The author may benefit from arranging some professional supervision of her role as a psychologist rather than as a neuropsychologist and this may both influence her practice and broaden her skills as a supervisor. The author was assisted in coming to such a view by a paper by Falender and Shafranske (2007) which makes recommendations for best practice in the evaluation of competence in supervision. They discuss metacompetence in supervision (knowing what one does and does not know) and it is possible that the author's lack of experience of some areas of supervision in her own practice make her less open to these as she supervises others.

Perhaps the most useful way around this is to broaden her own experiences of supervision in order to improve those of her supervisees.

Section 5: Concluding comments

Having considered various models of supervision and reflected on her own skills as a supervisor, the author proposes that people are best able to supervise those whose expectations and prior experiences of supervision are similar to their own. Being a good supervisor requires similar skills to being a good supervisee and, while many of those skills can vary from situation to situation, in all cases the supervisor must be keen to supervise and have the time to do so effectively. The supervisor must be motivated to learn and have the time to commit to their work. While there is no clear evidence to this effect, the author thinks it likely that the most effective way to create good supervisors is to provide them with a good range of positive supervisory experiences during their own training and working lives so that the skills they experience will become part of their intrinsic ability. This may make it more natural for them to become effective supervisors, rather than forcing less amenable, experienced supervisors to follow a particular model.

Through researching this topic, the author has become aware of her own shortcomings in her supervisory skills. The first problem during the period in question was that she over-committed in terms of the number of people she was supervising. The students received a less good service as a consequence of that lack of time and additional factors. From the students' supervision sessions, the author has also recognised that she really has little interest in teaching people basic

psychological and research skills. Her interest is firmly in teaching neuropsychology and helping people to find ways of developing intervention strategies based on their neuropsychological and other assessments. In supervision terms, experienced trainees and qualified psychologists usually come with similar background knowledge levels of clinical neuropsychology so there is in fact little to differentiate between the two stages of development as far as their need for supervision is concerned.

In order for supervision to be successful, from the point of view of the author, each party must be flexible in their approach to tasks, be receptive to new ideas, find it easy to acquire factual and process information and apply it in complex settings, be able to show a meticulous attention to detail in their case work, be able to act on their own initiative and show a natural curiosity and love of their subject. If an individual does not have these qualities, the author does not currently have a model for working with them. In an ideal world, when faced with less than ideal supervisees, the author would apply another set of skills, such as are described in the models in Section 3.

The author remains very keen to maximise the opportunities for educational psychologists in paediatric neuropsychology but considers it likely that a less direct approach than whole service training might be more successful. She has therefore undertaken to support those EPs wishing to train for Full Practitioner Membership of the Division of Neuropsychology by offering training placements in her clinics, in a similar way to the trainee clinical psychologists, and, wherever possible by supporting their neuropsychological work when they return to their LEAs post-training.

This assignment was commenced prior to having any knowledge of the literature pertaining to the process of supervision and without any training in supervision. Yet for the last nine years the author has regularly supervised trainee and qualified psychologists from a variety of professional backgrounds. The literature suggests that training in supervision is a good thing and being flexible in one's approach generates better trained and more confident psychologists.

Having considered the issues highlighted through the process of evaluating her supervisory skills and having identified her own areas of weakness, the author has identified two possible courses of action.

- 1) To ensure that she only takes supervisees whose needs she is able to meet using her current supervision model.
- 2) To improve her supervisory skills in order to meet the needs of a broader range of supervisees.

The author has acknowledged that it is her own experiences that appear to have the most influence on her style of supervision and therefore, in order to increase the range of her supervisory skills, in the first instance it would seem appropriate to broaden her experience of being supervised. She will review this conclusion with her own supervisor as part of her on-going appraisal.

REFERENCES

Barrett, M.S. & Barber, J.P. (2005) A developmental approach to the supervision of therapists in training. *Journal of Contemporary Psychotherapy*, 35, 169-183.

Benson, K.P. & Holloway, E.L. (2005) Achieving influence: a grounded theory of how clinical supervisors evaluate trainees. *Qualitative Research in Psychology*, 2, 117-140.

Bolam v Friern Barnet Hospital Management Committee (1957) W.L.R. 582.

BPS (2007). *Division of Clinical Psychology Guidelines for Clinical Supervision*. Leicester: British Psychological Society. (<http://www.bps.org.uk>.)

Buckley, J.V., Newman, D.W., Kellett, S. & Beail, N. (2006) A naturalistic comparison of the effectiveness of trainee and qualified clinical psychologists. *Psychology and Psychotherapy*, 79, 137-144.

Butterworth, B. (2000) *The mathematical brain*. Papermac Publishers.

Butterworth, B. & Yeo, D. (2004) *Dyscalculia Guidance: Helping pupils with specific learning difficulties in maths*. London: nferNelson.

Carrington, G. (2004) Supervision as a reciprocal learning process. *Educational Psychology in Practice*, 20, 31-42.

Dehaene, S. (1999) *The number sense*. London: Penguin Books Ltd.

Falender, C.A. & Shafranske, E.P. (2007) Competence in competency-based supervision practice: Construct and application. *Professional Psychology: Research and Practice*, 38, 232-240.

Fernando, D.M. & Hulse-Killacky, D. (2005) The relationship of supervisory style to satisfaction with supervision and the perceived self-efficacy of Master's-level counselling students. *Counselor Education and Supervision*, 44, 293-304.

Fox, M. (2003) Opening Pandora's Box: evidence-based practice for educational psychologists. *Educational Psychology in Practice*, 19, 91-102.

Frederickson, N. (1990) *Soft Systems Methodology: Practical Approaches in Work with Schools*. London: Educational Psychology Publishing.

Haynes, R., Corey, G. & Moulton, P. (2003) *Clinical Supervision in the Helping Professions: A Practical Guide*. Pacific Grove, CA: Brookes/Cole-Thomson Learning.

Hy, L.X. & Loevinger, J. (1996) *Measuring ego development*. (2nd Edn., pp 3-25.) Lawrence Erlbaum Associates: NJ.

Phelan, H. (2007). *Supervision issues for educational psychologists*. DECP Day Conference on CPD and Supervision, London. (2 March 2007).

Miller, A. & Leyden, G. (1999) A coherent framework for the application of psychology in schools. *British Educational Research Journal*, 25, 389-400.

Milne, D.L. & James, I.A. (2002) The observed impact of training on competence in clinical supervision. *The British Journal of Clinical Psychology*, 41, 55-72.

Morgan, M.M. & Sprenkle, D.H. (2007) Towards a common-factors approach to supervision. *Journal of Marital and Family Therapy*, 33, 1-17.

Robinson, M. (2007) *A developmental model for supervision for educational psychologists in training*. DECP Day Conference on CPD and Supervision, London. (2 March 2007).

Rowland, K. (2007). *Supervision for everyone: Plymouth Psychology Service*. DECP Day Conference on CPD and Supervision, London. (2 March 2007).

Stoltenberg, C.D. (2005) Enhancing professional competence through developmental approaches to supervision. *American Psychologist*, 60, 857-864.

Temple, C.M. & Sherwood, S. (2002) Representation and retrieval of arithmetical facts: developmental difficulties. *Quarterly Journal of Experimental Psychology*, 55, 733-752.

Webster, A., Hingley, P. & Franey, J. (2000) Professionalization and the reduction of uncertainty: a study of new entrants to educational psychology. *Educational Psychology in Practice*, 16, 431-448.

Webster, D. (2001) The appraisal of educational psychologists: a very private affair. *Educational Psychology in Practice*, 17, 109-120.