CHILDREN WITH SCHIZOTYPAL PERSONALITY DISORDER : A NEUROPSYCHOLOGICAL INVESTIGATION

Lorraine Connolly
2000
Doctorate in Clinical Psychology

ProQuest Number: 10609194

![ProQuest logo]

ProQuest 10609194

Abstract

Schizotypal Personality Disorder was first introduced as a diagnostic entity in 1980 and has increasingly attracted research focusing on diagnosis and treatment, and the etiological relationship of this personality disorder to schizophrenia (Raine and Lenz 1996). The diagnosis with respect to children remains unclear, as does the relationship of Schizotypal Personality Disorder to autism, Asperger syndrome and schizophrenia. Executive function deficits have been found in people with Asperger's, with schizophrenia and with adult SPD, but there has been little research that clearly describes a neuropsychological profile of children identified as having Schizotypal Personality Disorder. The aim of this study was to describe the neuropsychological deficits of children with Schizotypal Personality Disorder. If distinct profiles could be described, then this would contribute to differentiating neuropsychologically the schizotypal category from the Schizophrenia Spectrum of Disorders or from the Pervasive Developmental Disorders and support the diagnostic validity of this disorder. The participants were 6 children and adolescents with a psychiatric diagnosis of Schizotypal Personality Disorder. Their IQ was measured using the WISC and the executive functions of set-shifting, planning, fluency, sustained attention and attentional control/inhibition were measured using the Trail Making Test (Part A and B), the WISC Mazes subtest, the Thurstone Word Fluency test, and the Opposite Worlds and Walk Don't Walk subtests from the TEA-Ch battery, respectively.

The results do not delineate specific neuropsychological profiles for the six children and therefore do not neuropsychologically differentiate the diagnosis of Schizotypal Personality Disorder from that of a Schizophrenia Spectrum Disorder or a Pervasive Developmental Disorder. Therefore, the neuropsychological validity of SPD and the diagnostic validity of this disorder in children are questioned. The reliability and validity of the TEA-Ch subtest Opposite Worlds is also discussed.

2

LIST OF TABLES

LIST OF
FIGURES

Figure 32. WISC age-scaled VCI, POI, FDI, and PSI Factor Index scores for each case.

Figure 33. Age-scaled Mazes scores for each Case.

Figure 34. Age-scaled scores for the Opposite World test (Opposite World and Same World) for each child.

Figure 35. Mean scores for Part A and B of the Trail Making Test for each Case converted to z scores.

Figure 36. Age-scaled scores on the Walk Don't Walk test for each Case.

Figure 37. Scores for each SPD child on The Thurstone Word Fluency converted to z scores.

Figure 38. IQ, Factor Index and Executive Function scores for each SPD case that they perform poorly on relative to their other test scores and the standardisation sample mean.

ACKNOWLEDGEMENTS

CHAPTER 1

INTRODUCTION

This study aims to provide a detailed neuropsychological assessment of a group of children

and adolescents identified as having schizotypal personality disorder: its objective is to

supplement a wider overall research programme which aims to evaluate the diagnostic validity

of schizotypal personality disorder (SPD) in childhood and to examine the disorder's

relationship to the Schizophrenia Spectrum Disorders by describing the cognitive profiles of

this group of children.

The chapter will begin with a description of SPD and its diagnostic criteria and a discussion of

the literature on children presenting with this personality disorder. Following this, SPD will be

compared and contrasted with the Schizophrenia Spectrum Disorders and the Pervasive

Developmental Disorders. Cognitive psychological theories of autism/Asperger's and

schizophrenia will be considered next, along with the similarities and differences of these

theories. Measurement of IQ in SPD, Asperger syndrome and childhood schizophrenia will be

considered and will be followed by a review of the theoretical accounts of executive function

and tasks designed to assess fluency, set shifting, attention and planning. The known

cognitive profiles of the two disorders will then be presented. Arguments which suggest that

impairments in executive function may be found in children with SPD will be outlined and

methodological considerations which need to be taken into account when conducting

neuropsychological research with children who have SPD will be considered, leading on to a

presentation of the rationale for the present study and details of the specific research

questions which the study sets out to address.

Schizotypal Personality Disorder and Diagnostic Criteria

SPD was first introduced as a diagnostic entity in 1980 in the adult section of the Diagnostic

and Statistical Manual of Mental Disorders (DSM-III) (APA, 1980) and has increasingly

attracted research focusing on diagnosis and treatment and the etiological relationship of this

disorder to schizophrenia (Raine and Lencz, 1996). SPD is a pervasive pattern of social and

interpersonal deficits marked by acute discomfort with, and reduced capacity for, close

relationships as well as by cognitive or perceptual distortions and "eccentricities of behaviour".

It can begin in early adulthood and present in a variety of contexts (DSM-IV 1994). The

diagnostic criteria as outlined by DSM-IV, and described under the personality disorders

section, are five (or more) of the following:

- ideas of reference (excluding delusions of reference),

- odd beliefs or magical thinking,

- unusual perceptual experiences, including bodily illusions,

- odd thinking and speech (e.g., vague, circumstantial, metaphorical, over elaborate, or
  stereotyped),

- suspiciousness or paranoid ideation,

- behaviour or appearance that is "odd" or "eccentric",

- lack of close friends or confidants other than first-degree relatives,

- excessive social anxiety that does not diminish with familiarity and tends to be associated with paranoid fears rather than negative judgements about the self,

- and does not occur exclusively during the course of schizophrenia, a Mood Disorder with Psychotic features, another Psychotic Disorder, or a Pervasive Developmental Disorder. (DSM-IV, 1994).

Ten personality disorders are currently defined on Axis II of DSM-IV and are viewed as patterns of perceiving and relating to the world that are maladaptive across a variety of contexts and result in distress for the individual. These patterns of relating and experiencing the world usually appear in later childhood and adolescence. However, there are several issues that raise questions about the validity and reliability of the personality disorder diagnoses. Firstly, there is diagnostic overlap between a number of the personality disorders, in that a person may meet the criteria for two or three of the disorders, thus calling into question the validity of separate diagnostic categories. Secondly, Axis I and Axis II disorders can overlap, for example, depression and borderline conditions, schizophrenia and schizotypal disorder, and social phobia and avoidant personality disorder, thus calling into question the arbitrary diagnostic boundaries. These issues raise a number of questions: are personality disorders 'true disorders' that are distinct from each other, with clear boundaries and causes? Are personality disorders an arbitrary mix of disorders that do not clearly distinguish normal from abnormal character structures? Are personality disorders a set of pejorative labels for individuals that professionals find difficult to treat?

Rutter (1985) writes that in order to achieve diagnostic validity, a disorder must meet a certain set of criteria. These include a description of the clinical picture, a correlation of the picture with laboratory or psychometric test results, the specification of exclusion criteria, follow-up studies to establish diagnostic stability and a uniform prognosis, family studies to examine the extent to which the disorder runs in families, investigations to establish a specific etiology and studies

looking at response to treatment. However, the comorbidity issues of anxiety and depression further complicate the validity of SPD: are they secondary to the disorder or seminal to the disorder.

In summary, the diagnostic validity of a disorder is strengthened if a specific deficit or pattern of deficits is evident on neuropsychological tests (Nazgy and Szatmari, 1986). Also, if strengths and weaknesses on specific tests can be described in children with SPD, and these cognitive profiles are similar, or different, to those described in autism/Asperger's or schizophrenia, then hypotheses can be made about which psychological theories that account for autism/Asperger's or schizophrenia, best fit SPD.

Children with Schizotypal Personality Disorder

Although it is possible to apply adult diagnoses to children, the validity of this diagnosis with respect to children is still unclear: Firstly, the child is a developing organism whose personality is believed not to be well structured before adolescence, and therefore still evolving and changing, whilst a personality disorder is presumed to be stable and enduring, and secondly, the diagnosis of an Axis II personality disorder may obscure the presence of anxiety or depression. Nevertheless, clinical descriptions of children with schizotypal symptoms have appeared in the paediatric literature, albeit under different names. In 1944, Asperger provided the first description in children, Wing (1988) added to his account and Wolff and Barlow (1979), Wolff and Chick (1980) and Chick, Waterhouse and Wolff (1979) described studies on "schizoid children" who appear very similar to those reported by Asperger (1979), Wing (1981) and the DSM-IV descriptors.

Wolff (1998) comments that in the 1960s before the DSM-III categories of personality disorders were available, her team found that 4% of the children referred to their general child psychiatric department presented with an unusual picture, in that their difficulties could not be explained by adverse life experiences, but they frequently showed psychiatric symptoms such as school refusal or conduct disorders (Wolff, 1964). Of the sample children Wolff (1964) refers to, over half were outgoing, but some were withdrawn and uncommunicative and often could not conform socially, reacting with tears and anger if coerced to do so. Wolff and McGuire (1995) retrospectively reported a 3:4 ratio with more boys than girls affected, and noted that intelligence was within the normal range, but higher for boys. In a prognostic validation study of children with 'schizoid personalities', Wolff and Chick (1980) operationalized what they believed to be the core features of the disorder. Wolff (1998) describes the core features as

"solitariness (the children were 'loners'); lack of empathy for the feelings and thoughts of others, with emotional detachment; increased sensitivity, at times with paranoid ideation; rigidity of mental set, especially the single-minded pursuit of special interests (such as electronics, architectural drawings, antiques, astronomy, dinosaurs, politics); and unusual styles of communicating such as odd use of metaphor, over- or undertalkativeness". (1998, pp. 124).

These core features along with an additional feature of 'an unusual fantasy life', distinguished significantly between a group of schizoid boys and a matched control group of boys who had been referred to the same clinic with other diagnoses, using a semi-structured interview by a 'blind' interviewer (Wolff and Chick, 1980). Wolff (1998) concludes that the follow up study showed that the syndrome was long lasting, as 18 of the 22 schizoid young men were identified as 'definitely' schizoid by the 'blind' interviewer. Previous research has shown then

14

that SPD symptomatology can be identified in children, and a diagnosis using DSM-IV

diagnostic criteria can be given (Wolff, 1998)

If research can identify children who meet the diagnostic criteria, and demonstrate specific

neuropsychological deficits and/or patterns of deficits in children with SPD, then diagnostic

validity is strengthened, prediction of risk of schizophrenia can be followed up by longitudinal

studies, and appropriate interventions can be planned.

Are Diagnostic Labels helpful?

However, it is often argued that attempting to understand the origins of a child's behavioural

and emotional difficulties, and how the child can best be helped within the family and at school,

is far more important than diagnostic labels that might stigmatise, and maybe even obscure,

the individual child's uniqueness (Wolff, 1995). Whilst this is true, it is also true that a

diagnostic label can add to an understanding of a child and guide practitioners to the best

available resources for that diagnosis and child, including educational and psychological help.

A diagnostic label then has the propensity to clarify what a person 'has', not what they 'are',

and therefore does not take away individuality (Wolff, 1998).

A correct diagnosis then is vital for a complete understanding, especially if it is a disorder that

reflects a long lasting and constitutional, rather than environmental, difficulty (Wolff, 1991). A

diagnosis of SPD in childhood may require the acknowledgement that the child's difficulties are

15

part of his/her nature and therefore accommodation to the disorder is needed. SPD children

need to be identified because their difficulties require different interventions than those children

whose difficulties arise from adverse life experiences (Wolff, 1998).

Genetic and language studies suggest that SPD is on a continuum with schizophrenia and

there is emerging evidence that it is also associated with an increased risk for the development

of schizophrenia in early adulthood (Van der Gaag, 1993). Research suggests that onset of

schizophrenia before the age of six is very rare (Werry, 1996); however follow-back studies of

childhood schizophrenia suggest that there are precursors of the condition including

personality styles, neurodevelopmental abnormalities and language problems.

Therefore, given the links between Asperger's and "schizoid" children, and the clinical

implications of treating a disorder that is constitutional rather than environmental, the

importance of distinguishing whether SPD is a valid diagnosis for children, and whether it can

be classified with the Schizophrenia Spectrum Disorders or with the Pervasive Developmental

Disorders is highlighted. The next section will attempt to tease apart this controversy.

Schizophrenia Spectrum Disorder or Pervasive Developmental Disorder?

In order to have validity a disorder must be phenomenologically distinguished from other

established disorders. Although some studies support the view that SPD is related to

schizophrenia, there is still controversy over whether to place SPD in children and adolescents

with the Schizophrenia Spectrum of Disorders or with the Pervasive Developmental Disorders. Autism was viewed as an early onset of schizophrenia, but research now suggests this is not the case (Kolvin, 1971; Rutter, 1972) and that autistic children do not appear to be at an increased risk for schizophrenia (Volkmar and Cohen 1991). In 1986, Nagy and Szatmari argued that the issue of diagnosing the childhood version of SPD is especially problematic since it is now accepted that autism and adult schizophrenia are distinct diagnoses (Rutter, 1972). They argued that studying children with SPD is of considerable importance if SPD in children represents attenuated forms of either of these major disorders. In view of this controversy it is useful to consider the similarities and differences between SPD and each of these two categories of disorders.

Comparing SPD with Autism And Asperger's

The essential diagnostic features for Autistic Disorder described in the Pervasive Developmental Disorders section in DSM-IV (1994) include the presence of abnormal or impaired development in social interaction and communication and a markedly restricted repertoire of activities and interests. The disturbance must be apparent in delays in functioning in at least one of the following areas prior to the age of 3 years: social interaction, language used in social communication, or symbolic or imaginative play. Associated features include specific cognitive difficulties and often a learning disability (IQ < 70), and a profile of mixed cognitive functions within the disorder, for example weaknesses in language comprehension in the presence of average expressive language abilities. Individuals with Autistic Disorder may also have a range of behavioural difficulties, including hyperactivity, short attention span,

impulsivity, aggressiveness and self-injurious behaviours (See DSM-IV (1994) for full diagnostic criteria).

The essential features of Asperger syndrome described in the Pervasive Developmental Disorders section of DSM-IV (1994) include severe and sustained impairment in social interaction and the development of restricted, repetitive patterns of behaviour, interests and activities. The disorder must cause clinically significant impairment in social or occupational functioning (DSM-IV). However, in contrast to the autistic child, the Asperger's child will have no clinically significant delays in language and in addition, no clinically significant delays in cognitive development or in the development of age-appropriate self-help skills, adaptive behaviour (other than in social interaction), or curiosity about the environment. Neuropsychological and neurobiological differences between Asperger's and autism have also been documented in recent research (Lincoln, Courchesne, Allen, Hanson and Ene,1998), in an attempt to make distinct these two Pervasive Developmental Disorders (see below for a fuller discussion).

Neuropsychological profiles of the differences between Asperger's and SPD have yet to distinguish and differentiate the subtleties of these two disorders.

However, Wolff (1998) outlines the recognition that the symptoms of SPD, as well as Asperger's, resemble, but differ from those of childhood autism. Qualitative abnormalities of reciprocal social interactions, unusually intense circumscribed interests, and repetitive activities, and abnormalities in verbal and non-verbal communication are symptoms which are present in both disorders, but the deficits in social interaction in children with SPD only become apparent when the child enters school, and do not affect their relationships with their parents. Consequently, it is their peer relationships that are the most impaired. Additionally, the SPD children's special interest patterns are more elaborate and sophisticated than the stereotypic behaviours of autistic children, their problems in communicating do not involve gross deficits

like the echolalia and pronomial reversals of autistic children, and lastly, SPD children are not deficient in imaginative play and in fact often engage in fantasy.

In addition, the prognoses for Asperger's and SPD are also very different in relation to long-term psychological functioning. Tantam (1986, 1991) notes that the patients he examined who fulfilled the diagnostic criteria for Asperger's Disorder had clear features beginning very early or later in childhood, and that over one-half were in sheltered accommodation in adult life. In contrast, the SPD children studied by Wolff and McGuire (1995) did not have statistically different rates of independent living, marriage or stability of employment from their matched controls.

Arising from the experimental and clinical work of Asperger and Wolff, it can be concluded that there is a group of children who are not as handicapped as children diagnosed with higher-functioning autism or Asperger's disorder, but who have some subtle and long lasting difficulties.

Comparing SPD with Schizophrenia

The essential features of the schizophrenia disorders grouped in DSM-IV (1994) are a mixture of negative and positive signs and symptoms that are associated with marked social or occupational dysfunction. Psychotic symptoms are a defining feature. A narrow definition of 'psychotic' is restricted to delusions or prominent hallucinations, with the hallucinations occurring in the absence of insight into their pathological nature. A less restrictive definition would include hallucinations that the individual realises are hallucinatory experiences. The characteristic symptoms of schizophrenia comprise of a range of cognitive and emotional

difficulties that include perception, inferential thinking, language and communication, behavioural monitoring, affect, fluency, and productivity of thought and speech, hedonic capacity, volition and drive, and attention (see DSM-IV for full diagnostic criteria). However, some theorists have questioned the validity of a diagnosis of schizophrenia, arguing for example that the effects antipsychotic medication confound any hypotheses on theories that attempt to interpret the negative signs and symptoms of schizophrenia (Boyle, 1993).

A body of family-genetic research in schizophrenia has provided empirical evidence for the description of SPD as a non-psychotic schizophrenia syndrome, characterised by milder forms of the symptoms of chronic schizophrenia. Kety, Rosenthal and Weneder (1968), Kety, Rosenthal and Wender (1975) and Kety, Wender, Jacobson, Ingraham, Janson, Faber and Kinney (1994) carried out the Danish-American adoption studies of schizophrenia to explicate which of the syndromes allied with chronic schizophrenia were seen more often among the biological relatives of adoptees with schizophrenia than among the biological relatives of control adoptees (Ingraham, 1995). They found empirical support for the presence of a non-psychotic schizophrenia-like disorder - latent schizophrenia - among the biological relatives of individuals with schizophrenia. Spitzer, Endicott and Gibbon (1979) worked towards developing an operational definition of this non-psychotic-like schizophrenia-like disorder, in response to the empirical evidence of Kety et al. (1994), and set out the diagnostic criteria required for a diagnosis of SPD (see criteria above).

Further research (Wolff, 1991; Wolff, Townsend, McGuire and Weeks, 1991) attempts to clarify the argument about whether SPD is a part of the Pervasive Developmental Disorders or part of the Schizophrenia Spectrum Disorders. Wolff (1991) describes the Danish-American adoption studies (Kety et al, 1975) and how their later re-analyses (Kendler, Gruenberg and

Strauss, 1981: Kendler and Grunberg, 1984) found SPD, as well as schizophrenia and paranoid personality disorder, to have a strong genetic but no familial/environmental relationship to schizophrenia. Wolf (1991) also reports that Baron, Gruen and Anis, (1983), in a study of siblings of people with chronic schizophrenia, found the excess of schizophrenia and of SPD in these siblings to vary according to whether one or both or neither of the parents were schizotypal, concluding that schizotypy, as defined in DSM-IV, as well as DSM-IV schizoid and paranoid personality disorder, are genetically related to schizophrenia. There is also reliable evidence for the pre-morbid presence of DSM-IV schizotypal and schizoid traits in a proportion of schizophrenic patients, especially males (Foerster, Lewis and Owe, 1991). Then again, given that the diagnostic criteria for SPD has been operationalised from the presence of milder and non-psychotic symptoms of schizophrenia, it would appear evident that SPD is part of the Schizophrenia Spectrum of Disorders.

Wolff (1998) reports that in her total research cohort seen over 30 years, of 109 SPD boys and 32 SPD girls, 7 (4 men and 3 women) had developed a schizophrenic illness by the mean age of 26.5 years, compared with only one child in the control group. This is equivalent to an overall prevalence of 5.0% for the SPD group and 0.7% for the control group. The estimated prevalence for schizophrenia by the age of 27 years in the British national birth cohort is 0.31-0.49% (Done, Johnstone, Frith, Goldings and Shepherd, 1991). This would suggest that although the prevalence rate for later risk of developing schizophrenia for a child with SPD is well above that expected for the general population, the prevalence rate is still low, and from this, the clinician could feel reasonably confident when discussing prognosis with the family of the SPD child or adolescent that the child would be unlikely to develop a psychotic illness.

Although there is evidence to suggest SPD is on a continuum with the Schizophrenia Spectrum Disorders and not the Pervasive Developmental Disorders, further research is

21

needed to clarify the diagnostic validity of SPD. On the other hand, behavioural features might

occur together by chance, and this is the problem with the concept of diagnosis at the

behavioural level. The researcher and clinician might not want to cluster together symptoms to

give a diagnosis where the behaviours might hang together by chance, or be too diverse. This

is particularly true of schizophrenia where the heterogeneity of symptoms leads to question the

diagnosis. However, Wing and Gould (1979) conducted a study with children who attended a

special school and were divided into two groups on the basis of social behaviour: 58 children

with appropriate social interaction and 74 children who were socially impaired. The socially

impaired group with a language comprehension age over 20 months showed communication

deficits and poverty of symbolic play and repetitive stereotyped behaviour, in contrast to the

sociable group, of whom all subjects showed symbolic play except those with a language

comprehension age below 20 months. Wing and Gould (1979) concluded that there is a

marked tendency for these behaviours to occur together. This would suggest that difficulties in

social understanding, in communication, and in imagination tend to co-occur in the same

individual, and do not simply arise together by chance in those individuals who are diagnosed

as suffering from autism.

Before proceeding to describe the known cognitive profiles of individuals with

autism/Asperger's and schizophrenia, the cognitive psychological theories of Asperger's and

autism, and then schizophrenia will follow next. This will be followed by a discussion on IQ

measurement and the theoretical accounts of executive function and tasks designed to

measure them.

Cognitive Psychological Theories of Asperger's and Autism

Cognitive psychological theories of Asperger's and autism include theories of impaired social cognition, theories of impaired executive function, and theories of weak central coherence. Each of these will be considered in turn.

Theory of social impairment

Many theorists posit that autism is a disorder of social insight. Interpersonal relatedness, joint attention and imitation are suggested as being the core areas of social interaction and children with autism have been identified as having deficits in these three areas.

The failure to coordinate how self and other feel towards the target of shared attention is thought to be the focus of the social impairment in autism (Hobson, 1986a, 1993). It is thought that the normally developing child realises that s/he is like others, based on observation and mirroring of psychological states. Impairments of this social relatedness would have to begin in the child's earliest months, and since autism is rarely diagnosed before the 3rd year, causal precedence is questioned. Hobson, Ouston and Lee, (1988) studied the recognition of emotional expression in children with autism and found that children with autism were impaired relative to controls at cross-modal matching of emotions (e.g. face to voice), but not of non-emotional stimuli (e.g. sound to picture). However, in most of the studies examining recognition of affect in children with autism the children are age 5 and over, and some studies suggest that autistic participants with autism do not show specific problems if compared to controls of the same language level (Ozonoff, Pennington, and Rogers, 1990). The sharing of a focus of

attention either by pointing or by eye gaze, between a person and an object, called joint attention, is another social skill that children with autism appear to lack (Happe and Frith, 1996). In a screening study, Baron-Cohen, Allen and Gillberg (1992) write that joint attention appears to be the earliest specific marker for childhood autism. Imitation of gestures, such as mouth opening or sticking a tongue out has been demonstrated in new borns (Meltzoff, 1988) and is thought to play a role in social development. Meltzoff and Gopnick (1993) suggest that imitation may underlie emotional contagion, that is, by assuming the same facial expression an infant may come to share the emotion felt by the other and that a deficit in early imitation may inhibit later social development. However, some studies of children with autism having difficulties copying movements, have involved complex movements and older children and therefore do not inform us about the infant child with autism and their primitive imitation abilities. Rogers and Pennington (1991) propose that a biologically based deficit in imitation could be the root factor involved in later failure of the child with autism to share affect with care-givers. However, other studies have found intact imitation in children with autism (e.g., Charman and Baron-Cohen, 1994) and Happe and Frith (1996) conclude that there is not enough evidence to suggest that children with autism lack neonatal imitation. Further studies are needed to clarify this issue.

Theory of Mind

Psychological theories of autism aim to address the imagination, communication and socialisation deficits found in autism. The theory of mind account hypothesises that people with autism are unable to represent the mental states of themselves and others or to understand

and predict behaviour in terms of these states. Theory of mind can be demonstrated in a person's ability in making an accurate prediction of someone's behaviour involving making an inference about the person's mental state. This ability has been shown to develop in normal children between the ages of three and five years (Perner, Leekham and Wimmer, 1987). The experimental paradigm involves telling a child a story in which a character places an object in a specific location and then leaves the scene. While the first character is away another character moves the object to a different location and the child is asked where the first character will look for the object when s/he returns. The majority of three-year olds will rely on their knowledge of the actual state of the world and will predict that the doll will look in the new location. However, by age 5 most children are able to use their knowledge of the now false belief of the object's location to predict that the second character will look in the original location. The failure of children with autism to attribute mental states independent of reality has been replicated in a number of studies (Baron-Cohen, Leslie and Frith, 1985 and see Happe, 1994, for review). This mentalising deficit appears to account well for the triad of impairments. In particular children with autism lack the joint attention behaviours that require the ability to mentalise the affective state of others. The communication difficulties that children with autism show can also be accounted for within the theory of mind metaphor. A person with autism can communicate a message but fails to recognise who does or does not already have access to the information. Lastly, impairment of imagination, which requires mentalising ability to distinguish between a real state of affairs and pretend play, also can be accounted for within the theory of mind deficit.

However, not all children with autism fail theory of mind tasks. Ozonoff, Rogers and Pennington (1991) report that performance on a theory of mind task discriminated between individuals with autism and Asperger's and Bowler (1992), found that adults with Asperger's did not show deficits on theory of mind tasks relative to a control group of patients with schizophrenia. Also, the theory of mind account cannot explain the non-social difficulties, for

example the features of autism such as the insistence on sameness, stereotypies and self-injurious behaviour. In summary the theory of mind account cannot explain all people with autism or all features of autism.

Theory of executive function deficits

As well as the triad of impairments, outlined above, individuals with autism also present with restricted, repetitive and stereotyped patterns of behaviour which may have some parallels with those seen in patients with frontal lobe injury. Specifically people with autism can demonstrate motor stereotypies and puppet-like gait, language impairments like mutism or poverty of initiation, and abnormalities of attentional focus. Neuropsychological studies involving the brain and behaviour relationship have influenced a cognitive theory of autism based on the concept of executive dysfunction. Executive function is an umbrella term for a number of higher cognitive processes including staying on task, inhibition of inappropriate responses, planning sequences of willed action, monitoring performance and using feedback, shifting attention. Numerous studies have described a range of executive function deficits in people with autism (see below for fuller description). Studies have also found executive function deficits in people with Asperger's and this has led to the suggestion that the impairments are therefore basic to the whole spectrum of autistic disorders. However, several other developmental disorders also show executive dysfunction, e.g. attention deficit and hyperactivity disorder, phenylketonuria, Tourette syndrome and conduct disorder (Pennington and Ozonoff, 1996). The key question is how other developmental disorders differ in executive function deficits when clinical presentations can differ so much between autism and other

26

developmental disorders. Also, executive dysfunction cannot explain all of the nonsocial

impairments in autism, or indeed the strengths on certain subtests of IQ measures: people with

autism show peak performance on the Block Design subtest of Wechsler Intelligence Scales

for Children-III) (WISC) (Wechsler, 1992) which is a measure of 'fluid' intelligence. Fluid

intelligence is presumed to rely on executive abilities (Duncan, 1995).

Theory of Weak Central Coherence and Field Independent/Dependent Cognitive Style

The theory of a weak central coherence does not present as a deficit account. Normal children

and people with learning difficulties show superior performance on processing meaningful and

patterned information over random and meaningless stimuli, but people with autism show a

reduction or absence of this benefit from meaning or central coherence. Tager-Flusberg (1991)

report that children with autism were almost as good at recalling random word strings as they

did meaningful sentences, relative to normal controls.

Shah and Frith (1993) examined the Block Design subtest skill found in people with autism and

concluded that strength on this task was due to an advantage in segmenting the original

design. This adds to the idea that people with autism give more attention to parts rather than

wholes and why they might show skills in some areas and deficits in others. Frith and Happe

(1994) termed this attention to parts of the whole, rather than the whole, 'weak central

coherence'. People with autism appear to process information in a 'raw' form, which preserves

the detail, resulting in strengths in tasks like the Block Design subtest. Cognitive psychology

suggests that the 'normal' setting for processing incoming information is to eliminate detail and encode in terms of overall impression (Bartlett, 1932). Witkin and Goodenough (1977) describe the two cognitive styles of field dependence and field independence with the latter sharing similarities with a 'weak central coherence'. However, neither cognitive style is thought to be more advantageous than the other. Rather, an individual would need to be flexible as to which style might be more appropriate given the situation. Witkin and Goodenough (1977) also suggest that an individual's cognitive style influences their social behaviour and that field independent individuals were likely to prefer nonsocial situations and to distance themselves from others both physically and psychologically and show greater skill in analytic tasks. This description is implicative of the social impairment that is characteristic of autism and Asperger's.

The three separate theories of cognitive functioning outlined above describe both strengths and weaknesses in the individual with autism or Asperger's syndrome. However, influences from biology and genetics, which suggest that multiple primary deficits cause autism, might lead to the hypothesis that there could be a causal link between two of these or all three. For example, Bailey, Phillips and Rutter (1986), suggest that in order to monitor one's own intentions to follow a plan of action towards a goal, in other words to carry out an executive function, the ability to understand one's own mind would be necessary: the latter being an important aspect of intact theory of mind. As outlined above the theory of mind deficit in autism can also be integrated with the weak central coherence account to explain social and non-social characteristics (Frith and Happe, 1994). The relationship between executive function deficits and IQ profiles, however, is still unclear. Frontal lobe injury has been associated with 'fluid intelligence' deficits, which are linked to executive functions, but 'crystallised intelligence' appears to remain intact: the opposite is seen in autism. However, seeing as autism has an early onset, the effects of this disorder on the developmental sequelae of IQ and executive

28

function may result in a very different picture from that seen following insult or injury in adulthood. A direction of cause and effect between the different theoretical positions has yet to be delineated. Nevertheless, there are distinctive patterns of cognitive profiles that have emerged from the research that support the theories discussed above. Next, the cognitive theories that have been proposed to explain the schizophrenia spectrum of disorders will be discussed and a description of the cognitive IQ and executive function profiles of autism/Asperger's, schizophrenia and known schizotypal profiles will follow this.

Cognitive Psychological Theories of Schizophrenia

As more and more evidence has accumulated to support the hypothesis of a genetic basis to schizophrenia (Fowles, 1992; Meehl, 1999), research has turned increasingly towards examining biological mechanisms that might underlie the disorder. In addition, attempts are being made to isolate neuroanatomical, psychophysiological, cognitive, and neuropsychological impairments in people with schizophrenia that may be expressions of what Meehl (1990) termed an "integrative neural defect".

It is postulated that the frontolimbic system and the development of cerebral specialisation are based on a genetic etiology: they are thought to mirror a breakdown of the genes controlling normal neuronal migration (Crow Ball, Bloom, Brown, Bruton, Coller, Frith, Johnstone, Owens and Roberts, 1989), and are therefore likely candidates for exploration in participants with schizophrenia and those genetically related to them, such as adults or children with SPD. Evans, Chua, McKenna and Wilson (1997) write that whilst Schizophrenia Spectrum Disorders are regarded as biologically determined, neuropsychological and cognitive neuropsychological

approaches have increasingly joined the genetic, biochemical and neuroanatomical/neurophysiological accounts of the aetiology of this spectrum of disorders. Therefore, the cognitive neuropsychological theories of schizophrenia will be reviewed next.

Theory of Metarepresentation

"In the most thoroughly articulated cognitive neuropsychological account of schizophrenia, Frith (1992) has proposed that three principal cognitive abnormalities could underlie all its major signs and symptoms; a disorder of willed action, a disorder of self-monitoring and a disorder of monitoring the intentions of others" (Evans et al., 1997).

Frith (1992) proposes a single cognitive framework, that of metarepresentation, which he posits can link the signs and symptoms of schizophrenia to abnormal brain function. He describes three principal abnormalities that account for all the major signs and symptoms in people with schizophrenia, including disorders of willed action, disorders of self-monitoring and disorders of the intentions of others. Here, they will be outlined, along with the cognitive mechanisms that underlie them, leading on to a description of Frith's 'metarepresentation' theory, followed by a review of studies that support the theory of mind account in schizophrenia.

Individuals with schizophrenia can experience poverty of action in speech, movement and affect, and in extreme cases can show no will (abulia), no words (alogia), or no feelings (athymia). This can also lead to the person with schizophrenia being unable to generate behaviour of their own will, and being unable to suppress inappropriate behaviour, so that recent actions are repeated (perseverations) and responses are made to irrelevant stimuli so

that an action cannot be completed. These behaviours are also very similar to those seen in patients with frontal lobe lesions and can be understood as a failure at the level of the Supervisory Attentional System (SAS) in the Norman and Shallice (1986) model of the control of action, and as forming core features of the 'dysexcutive syndrome' (Baddeley, 1986). The SAS is posited as being necessary for effective control of actions, including planning, error correction, responses for novel situations and overcoming a strong habitual response or resisting temptation. The SAS modulates a process called contention scheduling, whereby a system of mutual inhibition means that the most highly activated action 'wins' and is carried through to completion while the rest are temporarily suppressed. The SAS modifies the competing actions systems by suppressing the action most currently activated by the environment. However, the SAS can also activate an action when there have been no environmental stimuli. So, the SAS can prevent perseverative behaviour, suppress responses to stimuli and generate novel actions in new situations. It is also suggested that patients with frontal lobe lesions have behaviour that is no longer controlled by a SAS; this in turn can lead to poverty of action, perseveration, and inappropriate action: a disorder of willed action (Frith,1992), leading to deficits in the executive function domain. Neuropsychological research studies offer evidence for a dysexcutive syndrome in schizophrenia. Impairments on a number of executive function tests, including the Wisconsin Card Sorting Test, verbal fluency, design fluency and other tasks sensitive to frontal lobe function, have been found in individuals with schizophrenia (Kolb and Whishaw, 1983; Goldberg, Kelsoe, Weinberger, Pliskin, Kirwan and Berman 1988; Allen, Liddle and Frith, 1993; Beatty, Josie, Manson and Katzburg, 1994; Franke, Maier, Hardt, Frieboes, Lichtermann and Hain,1993), although findings are inconsistent. There are several methodological issues surrounding the interpretations of the results for a number of these studies. Firstly, the considerable symptomatic heterogeneity within the schizophrenia disorder necessitates subtype comparison, and this has not been achieved in the aforementioned studies. Secondly, the varying degrees of participants'

chronicity and severity of illness amongst the studies, the criteria used for diagnostic group

membership and medication effects, make comparison of research results in this area very

difficult. Thirdly, recent research suggests that the different subgroups of schizophrenia have a

unique pattern of neuropsychological impairment (Zalewski, Johson-Selfridge, Ohriner, Zarrela

and Seltzer, 1998), which implies that theories need to be refined to incorporate hypotheses of

multiple causal pathways in schizophrenia.

Frith (1992) suggests that the first rank symptoms of schizophrenia, such as hallucinations,

delusions or thought disorder, can be interpreted as arising from a disorder of self-monitoring.

These symptoms suggest that the individual experiencing them is no longer aware of what

Frith calls 'sense of effort'. So individuals with schizophrenia can only monitor their actions by

seeing the actual consequences of their actions, and therefore if they are not aware of carrying

out their actions, they may well experience them as being carried out by someone else.

Similarly, patients who experience auditory hallucinations may perceive their own thoughts or

subvocal speech as coming from someone else. These difficulties are thought to be

specifically linked to actions that the individual has to make: s/he has willed action but is not

aware of those intentions (Frith, 1992).

Individuals with schizophrenia can sometimes experience delusions of reference, paranoid

delusions, incoherent speech, and third person hallucinations. Frith (1992) suggests that these

symptoms of incorrectly believing that other people are trying to communicate with them or

harm them, or perceiving information coming from an external source, are due to the inability to

monitor the beliefs and intentions of others.

Frith (1992) writes that the abnormalities underlying the signs and symptoms described above

are due to a deficit of metarepresentation. That is the ability that underlies self-awareness or

being aware that you are 'aware'. It follows from this that if you have an abnormality with metarepresentation, then your self-awareness or consciousness would also be affected. Frith also suggests that, in the individual with schizophrenia, unconscious processes reach awareness and compete with, and have greater influence than, conscious thought because of a lack of control from the SAS which has ceased to function, causing deficits as described above. Metarepresentation has also been described above, albeit with different terminology: theory of mind. The similarities of the negative symptoms of schizophrenia to those of autism led Frith to consider the relevance of the understanding of Uta Frith's (1989) theory of mind deficit in people with autism in explaining the cognitive basis of schizophrenia. U.Frith, Morton, and Leslie's (1991) research posits that the triad of key features of autism - aloneness, abnormal communication and lack of pretend play - can be explained by a lack of theory of mind or the ability to mentalise. C.Frith (1992) argues that the negative features of schizophrenia resemble those of autism and explains them as a lack of mentalising ability. However, he also writes that the positive symptoms of schizophrenia can be explained in terms of a mentalising ability; but people with autism do not have the positive symptoms of schizophrenia. In answer to these discrepancies, he suggests the two disorders have a very different age of onset. As autism starts in childhood, people with autism never develop the ability to mentalise and so never develop delusions about the intentions of others. In contrast people with schizophrenia have developed the ability to mentalise and infer the mental states of others and therefore the propensity, if developing schizophrenia, to develop delusions. However, Frith's model fails to account for the fact that some individuals with the psychotic symptoms of schizophrenia do not show cognitive dysfunctions and may be able to cope with their symptoms.

Theory of Mind Studies

Corcoran, Mercer and Frith (1995) outline their predictions about the abilities of people with schizophrenia on theory of mind tasks, positing that patients with negative symptoms, or incoherent speech or with delusions of reference or persecution, will perform poorly on these tasks, but patients with passivity experiences are believed to have difficulties with their own mental states. In a recent paper, Garety and Freeman (1999) critically review the evidence for three contemporary theories of delusions in people with schizophrenia. The review examines seven 'theory of mind' studies and concludes that the results of the seven studies demonstrate that groups of patients with schizophrenia, and particularly those with negative symptoms and incoherent speech, show a poorer ability on theory of mind tasks than non-psychiatric controls and some psychiatric controls. However, patients with paranoid symptoms (persecutory delusions) or passive symptoms do not show theory of mind deficits. In addition, in most of the studies reviewed there was a correlation with poor performance on theory of mind tasks and general cognitive ability, suggesting that the patients with schizophrenia who performed poorly on the theory of mind tasks did so because of poor reasoning ability. Nevertheless, IQ alone cannot account for the specificity of the poor performance of subgroups of patients with schizophrenia. Whilst some subgroups within the Schizophrenia Spectrum Disorders show poor theory of mind skills other subgroups do not, suggesting that an integrative cognitive theory of metarepresentation cannot solely account for the deficits found in schizophrenia. However, these theories do not take into the specific social contexts in which 'bizarre' behaviour occurs or the situational variability. Social antecedents of severe psychological problems have been documented in research into theories of schizophrenia, and are particularly relevant given the high rate of the schizophrenia diagnoses being applied to black people (Boyle, 1996).

Similarities and Differences in Cognitive Theories of Autism/Asperger's and Schizophrenia

Autism and schizophrenia are segregated for diagnostic purposes in DSM-IV (American Psychiatric Association, 1994) and the presence of positive symptoms rules out a diagnosis of autism. As previously mentioned the core features of autism are similar to the negative symptoms of schizophrenia, and as will be described in the following sections there are similarities and differences between the two disorders on performance on 'frontal lobe' tasks. Also individuals with autism do not display positive symptoms. Frith and Frith (1991) have suggested that the differences in these two disorders could be due to the early onset in one disorder, and the late onset in the other, but could both be accounted for by the same underlying cognitive deficit: metarepresentation. Theories of executive dysfunction, metarepresentation (theory of mind) and weak central coherence have been described as accounting for some of the difficulties being present in varying degrees in one or both of the Pervasive Developmental or Schizophrenia Spectrum of Disorders, suggesting that the theories are in some way intercorrelated. The question of cause and effect comes into play. Does a lack of metarepresentation cause executive dysfunction, or is the reverse true? It could be that executive dysfunction underlies the difficulties shown in both people with autism/Asperger's and schizophrenia acquiring a theory of mind or metarepresentation, or that metapresenatation and executive dysfunction are independent but share the same biological substrate (Hughes, Russell and Robins,1994). However, not all individuals with autism/Asperger's or schizophrenia in research studies demonstrate executive dysfunctions on all of the interrelated cognitive constructs (planning, organisation, flexibility, inhibition, working memory). This could suggest that there are distinct cognitive profiles for each of the two disorders and if there are, it is also of interest to consider whether specific cognitive profiles

can also be described in SPD that would support the disorder's genetic relatedness to the

Schizophrenia Spectrum of Disorders. Before presentation of the known cognitive profiles of

the two disorders, general issues in the measurement of IQ and executive function will be

considered.

Neuropsychology and IQ

Neuropsychological tests can assist with identifying specific deficits in intellectual functioning

and sometimes highlight language and performance discrepancies. Lezak (1995) asserts that

patterns of differences between verbal functions on the one hand and visuospatial function on

the other are a product of a neuropathological condition, and can reflect a result of

lateralisation. However, it is also considered normal for some differences to occur. A battery of

neuropsychological tests may help neuropsychologically profile children with SPD and

differentiate them, or not, from the known cognitive profiles of autism/Asperger syndrome and

from the Schizophrenia Spectrum Disorders.

Profiling analysis methods which examine the direction and magnitude of differences between

Verbal and Performance quotients and the range or variability among subtest scores have

often been used to interpret intellectual strengths and weaknesses and guide diagnosis of

clinical disorders. The Wechsler Intelligence Scale for Children (WISC-III) (Wechsler, 1992) is

the most widely used psychometric instrument and measures global ability (full scale IQ) with

Verbal IQ and Performance IQ subscores. The Performance scale comprises of 7 subtests

including Picture Completion, Coding, Picture Arrangement, Block Design, Object Assembley,

Symbol Search and Mazes, whilst the Verbal scale comprises 6 subtests including Information,

Similarities, Arithmetic, Vocabulary, Comprehension and Digit Span. Lincoln, Allen and Kilman (1995) suggest though that Verbal IQ versus Performance IQ discrepancies may not be the best way of assessing intellectual abilities. Through factor analysis of the subtests studies on normal standardisation samples have outlined 4 factors, Verbal Comprehension (Information, Similarities, Vocabulary and Comprehension), Perceptual Organisation (Picture Completion, Picture Arrangement, Block Design and Object Assembly), Freedom from Distractibility (Arithmetic and Digit Span), and Processing Speed (Coding and Symbol Search) (Gutkin, 1979, Kaufman, 1990, Sattler, 1988).

Other studies e.g. Cattel (1971) and Cattell and Johnson (1986) have suggested that the two subscales of Verbal and Performance IQ can also be divided into two main second order factors: "fluid" and "crystallised" ability. The Vocabulary and Comprehension subtestss are agreed to measure crystallised cognitive function, and the subtests Block Design and Object Assembly to measure fluid ability (Happe, 1994a; Kaufman, 1990; Lincoln, Allen and Kilman, 1995). Fluid intelligence has been described as reflecting the basic reasoning ability and crystallised intelligence is the set of skills which are valued by our culture and highly dependent on learning experiences.

Neuropsychology and Executive Function

Executive function processes include set shifting, planning, inhibition, sustained attention, and fluency. In cognitive psychology, the concept of executive functions is closely related to the notion of a limited-capacity central processing system (Welsh and Pennington, 1988). In their recent research paper examining executive function and developmental psychopathology,

Pennington and Ozonoff (1996) outline a number of executive function measures that are both theoretically and/or empirically reliable.

Set Shifting

Tests of set-shifting or flexibility require the participant to shift their thought processes or behaviour to the changing demands of the task (Lezak,1995).

Pennington and Ozonoff cite five measures of set shifting, The Wisconsin Card Sorting Test (Milner, 1964), the Trail Making Test, Part B (Reitan, 1958), the Contingency Naming Test (Taylor, 1988), the Necker Cube (Gorestein, Mammato and Sandy, 1989) and the Intra-dimensional , extra-dimensional shift (Hughes et al., 1994). Recently, Shute and Huertas (1990) subjected the scores from several neuropsychological and cognitive tests to a factor analysis and found that the Wisconsin Card Sorting Test, Trail Making Test (A and B), and the Category Test load on a distinct factor.

Planning

The executive function of planning is the ability to identify and organise the steps needed to carry out an intention or achieve a goal, and involves being able to conceptualise changes from present circumstances, deal objectively with the environment and weigh and make choices (Lezak, 1995). Pennington and Ozonoff (1996) cite five measures of planning, including, Porteus Mazes (Mettler, 1949; 1952), Cork out of a Burette (Klosowska, 1976), the Tower of London (Shallice, 1988) and the Tower of Hanoi (Welsh, Pennington, Ozonoff, Rouse and McCabe, 1990). The Porteus Maze Test can be quite sensitive to the effects of brain

damage (Klebanoff et al., 1954) and a study by Levin, Yurgelin Todd and Craft (1989) demonstrated that a small group of severely injured head trauma patients with frontal lobe damage solved the Porteus Mazes more slowly than either severely injured head trauma patients with posterior damage or matched controls.

Fluency

Tests that measure the executive function of fluency or flexibility require the participant to shift a course of thought or action. Inflexibility of response results in perseverative and stereotyped behaviour due to difficulties in regulating and modulating behaviour (Lezak, 1995). A fluency problem can show up in speech, reading, and writing, and generally will affect all three (Perret, 1974; Taylor, 1979). Impaired verbal fluency is also associated with frontal lobe damage (Janowsky, Shimamura and Squire, 1989). Pennington and Ozonoff (1996) cite two fluency tasks, the Thurstone Word Fluency Test (Milner, 1964) and the Design Fluency Test (Jones-Gotman and Milner, 1977).

Attention

Posner and Peterson (1990) have proposed, on the basis of lesion and functional imaging studies, that there is evidence for at least three attentional systems within the brain: selective attention, sustained attention and spatial attention. Abnormalities in attentional development are relatively common in childhood disorders, including a wide range of developmental disorders, acquired disorders and emotional disturbances. The Test of Everyday Attention for Children (TEA-Ch) (Manly, Robertson, Anderson and Nimmo-Smith) (1999) supports the

division of attentional skills but divides them into the different factors of selective attention,

sustained attention and attentional switching (inhibition).

A close examination of the known neuropsychological profiles of children and adults with

Asperger's/autism and then schizophrenia will follow. IQ will be considered first, followed by

executive function.

Neuropsychological and Cognitive Profiles of People with Asperger's/Autistic Spectrum Disorder

IQ and Asperger's and Autistic Spectrum Disorders

Cognitive psychology has sought to identify deficits at a cognitive level that might assist in

distinguishing autism from other developmental disorders. Temple (1997) has supported the

cognitive neuropsychological approach as it may advocate more theory–driven remediation.

Rumsey (1992) and Yirmiya and Sigman (1991) report specific Wechsler Intelligence Scale

profiles for people with autism characterised by a lower Verbal IQ (VIQ) than Performance IQ

(PIQ), with lowest subtest scaled scores on Comprehension and the highest scales scores on Block Design.

However, Siegel, Minshaw and Goldstein (1996) list 16 studies of the intellectual abilities of children, adolescents and adults with autism, where the prototypic VIQ < PIQ has not been found consistently in autistic individuals. They suggest that any unique pattern of abilities in IQ quotients may be ability dependent and that the higher the Full Scale IQ score, the smaller the VIQ versus PIQ discrepancy. In addition, Siegel, Minshaw and Goldstein (1996) write that the 16 studies they examined, with a few exceptions, reported the pattern of strengths and weaknesses on subtest scores considered characteristic of autism. The lowest subtest score obtained for the Verbal scale being Comprehension and the highest subtest score being Digit Span, and for the Performance scale, the lowest subtest being Picture Arrangement or Coding/Digit Symbol and the highest subtest score being for Block Design. In their own study, Siegel and his colleagues tested high-functioning autistic children and adults with Verbal and Full Scale IQ equal to or higher than 70 using the Wechsler Intelligence scales to determine if distinct profiles of scores could be found. They did not find the prototypic VIQ<PIQ or any VIQ-PIQ differences, but consistent with previous findings they did find the participants obtained lowest scores on the Comprehension subtest and highest on the Block design. However, the absence of the prototypic VIQ<PIQ in Siegel, Minshaw and Goldsteins study (1996) is interesting given that other studies have reported this directional result with Verbal and Performance IQ Scales. It could be explained by the fact that their eligibility criteria required subjects demonstrate VIQ and FSIQ scores of at least 70 which may have eliminated the lower ability individuals with autism in whom the VIQ<PIQ has been shown to be found. Some studies have required only Full Scale IQ be greater than 70 and have found a 14 point higher mean PIQ than VIQ (e.g. Asarnow, Tanguay, Bott and Freeman, 1987), whilst other studies (e. g. Rumsey and Hamburger 1990) found no VIQ-PQ differences in a sample of adults with autism who were required to have Verbal and Performance IQ scores above 80. However,

autism is found at all IQ levels (but is usually accompanied by a general learning difficulty)

Happe (1994) and therefore it would seem very important not to have an IQ level exclusion

criteria, so that all IQ abilities and their cognitive profiles could be examined.

Lincoln et al. (1998) present a meta-analytic review of six recent studies (Szatmari, Tuff,

Finlayson and Bartolucci, 1990; Ozonoff, Rogers and Pennington,1991; Fine, Bartolucci,

Szatmari and Ginsberg, 1994; Klin, Volkmar, Sparrow, Cichetti and Rourke,1995; Marjiviona

and Prior, 1995 and Ghaziuddin, Leininger and Tsai,1995), as well as their own recent

research (Lincoln, Allen and Kilman, 1995), that have included IQ measurements on separate

groups of autistic and Asperger's individuals. Lincoln et al. (1998) present the mean group

scores for Verbal and Performance and Full scale IQ across all of these studies. The autistic

group showed impaired Verbal IQ relative to their Performance IQ, whilst the Asperger's group

across studies had higher Verbal IQs relative to their Performance IQ. The Asperger's group

across studies were generally of higher intelligence and less impaired in their verbal abilities

compared to the autistic group across studies.

 According to the reported findings in the literature it would appear that individuals with autism

and Asperger's have different VIQ and PIQ discrepancies. Nevertheless, there are at least a

dozen major studies which report the unusually uneven profile across the subtests with a

strength in performance on Block Design and a weakness in performance on Comprehension,

in both high- and low –functioning participants with autism (e. g. Shah and Frith, 1993), in

children with autism (e.g. Freeman, Lucas, Forness and Ritvo, 1985) and in participants with

Aspergers syndrome (e. g. Bowler, 1992; Szatmari et al., 1990).

In a recent study, Ehlers, Nyden, Gillberg, Dahlgren, Hjelmquist and Oden (1997) argue

against the existence of the characteristic peaks and troughs across the WISC subtests for

children and adults with autism or Asperger's as outlined above. Their study contrasted the

cognitive performance of school-aged children with Asperger syndrome with that of high-

functioning children with autism and with that of children with attention disorders. They report

that the group of children with autism demonstrated the characteristic peak on Block Design

which does accord with previous research (Frith, 1989; Happe; 1994a; Rumsey and

Hamburger, 1988; Shah and Frith, 1993), however, the Asperger group showed good verbal

ability, reflected in a subscale cluster identical with Kaufman's Verbal Comprehension Factor

(Kaufman, 1994). Kaufman's Verbal Comprehension Factor or VCI Factor Index is made up of

the five Verbal subtests in the Verbal IQ. The Asperger group also demonstrated low scores

obtained in Object Assembly, Coding and Arithmetic, suggesting difficulties with perceptual

organisation, processing speed and distractibility, respectively. Ehlers et al. (1997) also state

that individual WISC profiles within each group demonstrated a heterogeneous picture with

both characteristic and uncharacteristic profiles and accords with Green, Fein, Joy and

Waterhouse (1995), who also found individual differences in cognitive profiles and deficits.

Ehlers et al. conclude that Asperger syndrome and autism share certain WISC cognitive

deficits but the findings do not argue for a clear association of 'autism spectrum disorder' and a

specific cognitive profile on the WISC, but do provide a useful basis for comparison of

cognitive peaks and troughs within and between clinically defined groups (Ehlers et al., 1997).

Executive Function and Asperger's and Autism Spectrum Disorders

Dysfunction of the executive system has been documented in children, adolescents and adults

with autism with a variety of IQ functioning levels (Bennetto, Pennington, and Rogers, 1996;

Hughes and Russell, 1993; Minshew, Goldstein, Muenz, and Payton, 1992; Ozonoff, 1995).

Pennington and Ozonoff (1996) write that people with autism have more impaired executive

functions than other people with developmental disabilities, and that whilst these impairments are more pervasive, there may be some executive functions that are spared and therefore a cognitive profile may be delineated. It would appear that not only is there good theoretical evidence for there being an executive function deficit in autism, there is also strong empirical evidence too.

The interest in executive function as a possible central neuropsychological deficit in autism has lead to researchers examining the executive functioning skills of children with Asperger's as well (Ozonoff, 1998). Szatmari et al. (1990) found that their Asperger's group performed more poorly than the control group on the Wisconsin Card Sorting test (WCST), a test measuring cognitive shifting ability. Ozonoff, Rogers and Pennington (1991b) found that Asperger's participants performed significantly less well than age and IQ matched controls, with 90% performing below the mean of the control group on the WCST and the Tower of Hanoi. Bethier (1995) described Asperger's participants performing less well than normal controls on both the WCST and the Tower of Hanoi.

However, Hughes, Russell and Robbins (1994) write that some previous studies measuring executive function have involved participants with autism with near normal intelligence: approximately 70% of people with autism have an IQ less than 70. Hughes and her colleagues conducted a study to examine whether there is a specific aspect of executive control that is impaired in autism. This study used two executive function tasks to measure set-shifting using the Tower of London, and planning using the Intra-dimensional /Extra-dimensional. The tests had been simplified enabling a wider range of IQ ability subjects with autism to participate (ranging in ability from high functioning to moderately learning disabled) and also included internal controls (for visual attention and sensorimotor coordination in the Tower of London task, and for discrimination learning, set-maintenance, rule reversal and transfer of learning in

44

the Intra-dimensional/Extra-dimensional task). The results demonstrated significant executive dysfunction in set-shifting and planning across the ability range for people with autism. The authors conclude that specific executive function deficits can be found in people with autism and that the lack of association between the two tasks suggests separable elements of executive control (Hughes, Russell and Robbins, 1994). Nevertheless, the study did not include tasks measuring other executive functions so cannot be conclusive that set-shifting and planning are the only specific executive function deficits in autism.

Numerous studies have utilised the Wisconsin Card Sorting Test in measuring set-shifting in autism. However, the interpretation of poor performance of this test is far from exact. For successful completion of this task other cognitive operations are required, such as categorisation, working memory, inhibition, selective attention, and encoding of verbal feedback (Ozonoff, 1995b). A deficit in inhibition or a deficit in flexibility may be reasons why someone might perform poorly on the Wisconsin Card sorting Test. Inhibition and flexibility are closely related but not identical and could affect performance on a task measuring set-shifting in different ways. In a study measuring inhibition and flexibility, Ozonoff, Strayer, McMahon, and Filloux (1994) attempted to isolate these two closely related executive functions and found that the participants with autism were impaired both in flexibility and inhibition of prepotent responses. In a later study, Ozonoff and Strayer (1997) suggest that a confounding of the inhibition and flexibility conditions complicated those results. In their 1997 study, they attempted to isolate inhibitory motor mechanisms from the cognitive process of flexibility by using the Stop-Signal task and a Negative Priming Task. They found that high-functioning children with autism were unimpaired relative to age and IQ matched controls on these two tasks. These results conform to those that also suggest inhibition may be less affected than other executive functions in people with autism e.g. Bryson, Wainwright-Sharp and Smith (1990) and Rincover and Ducharme (1987).

45

Also, clarification of specific executive functions in individuals with Asperger's/autism can be gathered from studies of executive function deficits in other neurodevelopmental disorders. McClaren (1989) reported in Houghton and Tipper (1994) that reduced negative priming could be found in children with ADHD and other studies have reported children with attention difficulties perform poorly on the Stop-Signal task (Aman, Roberts, and Pennington, 1998; Schachar and Logan, 1990). Ozonoff and Strayer (1997) conclude that these findings may help distinguish children with autism from those with other neurodevelopmental conditions that involve executive dysfunction, as it appears that some components of inhibition are spared in high-functioning individuals with autism. However, the low statistical power, given the small numbers in this study, should be kept in mind when interpreting these results. The authors do suggest that the number of subjects (13 in each group) was sufficient to detect effects of medium to large size.

Summary

In summary, research into the cognitive abilities of children and adults with autism and Asperger syndrome using the WISC outlines specific peak and troughs on subtests, VIQ versus PIQ differences, strengths and weaknesses, and certain factor profiles. Some studies have demonstrated that children and adults with autism have a Verbal versus Performance discrepancy IQ in favour of the Performance IQ scale, whilst Asperger's participants demonstrate a Verbal versus Performance discrepancy in favour of the Verbal IQ scale. Other studies have not reported this VIQ versus PIQ discrepancy in high-functioning autistic participants, however, these studies have had participants with higher Full scale and Verbal IQ's and it is argued that higher Verbal and Full scale quotients reduces the VIQ versus PIQ discrepancy. Specific WISC subtest profiles have also been reported by researchers including

for the Verbal scale, low subtest scores for Comprehension and high subtest scores for Digit

Span, and for the Performance scale, low subtest scores for Picture Arrangement or

Coding/Digit Symbol and high subtest scores for Block Design. Recent research that adopts

the factor analytic methodology outlined by Kaufman (1990), also reports specific strengths

and weaknesses on the subtests associated with specific factor scales. People with Asperger's

have demonstrated good performance on the Verbal Comprehension Factor and poor

performance on the Perceptual Organisation, Processing Speed and Freedom from

Distractibility Factors. It is evident that individuals with Autism Spectrum Disorders also

demonstrate a number of executive function deficits using research-validated instruments of

executive function. It has also been suggested (Ozonoff, 1998) that the executive functions

most affected in children and adults with autism spectrum disorders are those of planning.

However, studies have also suggested that the executive function of set-shifting is another

cognitive process that individuals with Asperger's/autism have difficulty with. But, when this

executive function is broken down into its constituent components of flexibility and inhibition,

the inhibition element is spared in individuals with Asperger's/autism.

Neuropsychological and Cognitive profiles of people with Schizophrenia Spectrum Disorders

This section will begin with a review of the literature that examines the IQ and executive

function profiles of adults and children with schizophrenia, followed by a section describing the

known IQ and executive function profiles of adults with SPD.

A number of studies have investigated IQ profiles in adults with a diagnosis of schizophrenia.

Peuskens, DeHert, Christiaens and Joos (1999), report that participants with schizophrenia

performed significantly worse on the WAIS-R subtestss of Comprehension, Arithmetic, Digit

Symbol, Picture Completion, Picture Arrangement and Object Assembly, as compared to the

other subtests, and consequently had lower scores on the POI Factor Index. However, the

participants in their study were of a mixed schizophrenia diagnosis (paranoid and

disorganised) and recent research suggests that different schizophrenia diagnoses have

distinct cerebral correlates of each symptom cluster and distinct neuropsychological correlates

(Basso, Nasrallah Olson and Bornstein, 1999); therefore, the importance of sub-grouping

participants with different schizophrenia diagnoses and symptomatology is highlighted. This is

also confirmed by a study by Frith, Leary, Cahill and Johndtone, (1991b), who report that many

participants with schizophrenia show a marked decline from their premorbid level on tests of IQ

but that performance is often linked with negative signs and incoherence. Also most of the

patients who participated in Peuskens et al's (1999) study were taking neuroleptics and were

hospitalised which can confound interpretation of the results. In another study, Ott, Rock and

Erlenmeyer-Kimling (1998) investigated the WAIS-R and WISC-R subtest profiles of a group of

participants with schizophrenia, a group with major affective disorder and a control group, to

explore the "scatter" of subtests as indicators of liability for schizophrenia. They found that the

Vocabulary subtest was significantly different from all of the other subtests for the participants

with schizophrenia compared to the other two groups and concluded that schizophrenia is

preceeded not by a generally low profile between all subtests, but rather a lesser difference

between vocabulary and other subtests. However, this study also included a mixed group of

schizophrenia diagnoses.

Stevens, Crow, Bowman and Coles (1978) state that 25% of hospitalised patients with schizophrenia are functioning at an extremely low level of ability and neurological abnormalities and premorbid deficits in IQ have also been reported as characteristic of patients with schizophrenia (Castle and Murray, 1991). Werry (1992b) found that lowered IQ preceded schizophrenia, beginning in childhood.

However, Purcell, Lewine, Caudle and Price (1997) report in their study that the proportion of all participants with schizophrenia with either VIQ > PIQ or PIQ > VIQ (17%) was not significantly different from that of the normal participants, whilst Seltzer, Conrad and Cassens (1997) report significantly better Verbal IQ for participants with paranoid schizophrenia compared with participants with undifferentiated schizophrenia.

In conclusion, research indicates a lowered Full scale IQ for patients and participants with schizophrenia, but a mixed profile of Verbal vs Performance IQ discrepancies. There is however, limited research on the strengths and weaknesses on WAIS and WISC subtests for individuals with different symptoms of schizophrenia, suggesting further research is needed in this area.

IQ and Childhood Schizophrenia

Whilst controversy surrounds the diagnosis of schizophrenia in childhood, examining the cognitive deficits and neuropsychological dysfunction of those children diagnosed with schizophrenia remains an important area of research (Volkmar, 1996; Asarnow, Asamen, Granholm and Sherman, 1994).

Children diagnosed with schizophrenia tend to fare better on intelligence tests in comparison to autistic children. Kolvin et al. (1971) reported IQs within the normal range for over half of a late onset psychosis group of children, whose characteristics were consistent with DSM-III criteria for childhood schizophrenia. The remainder of the group had IQs in the mild to moderate

range. Eggers (1978) reported IQ as average or above in over 90% of the children diagnosed with schizophrenia in his sample, and in Kydd and Werry's (1982) sample of 15 children for whom no psychometric assessments were available, 10 were described as functioning at an average or above average level in school performance. However, two other studies, Hertzig and Walker (1975) and Walker and Bortner (1975), report borderline intelligence, whilst Green, Campbell, Hardesty, Grega, Padron-Gayol, Shell and Erlenmeyer-Kimling (1984) reported a comparative study describing a group of children with schizophrenia, diagnosed via DSM-III criteria, as having a mean Full scale IQ of 86, with individual scores ranging from 65-125.

Walker and Birch (1974) found that Performance IQ was higher than Verbal IQ for a sub-group of their 10 to 15 year old male sample with IQs over 75, while for children with an IQ below 75, the discrepancy was reversed. Waterhouse and Fein (1984) found that their group of children diagnosed with schizophrenia showed extremely delayed development, but not as delayed as that found in autistic children. However, the diagnostic validity of their sample of children was questionable, as they did not use the DSM-III criteria. Whilst research indicates that Full scale IQ is not as impaired for children with schizophrenia as it is for children with autism, there still remains a mixed profile within and between studies.

Executive Function and Schizophrenia

Neuropsychological tests measuring frontolimbic deficits and abnormalities of cerebral asymmetry have been used extensively in schizophrenia research.

"Frontolimbic" is a broad term and can refer to number of hypothesised circuits. It is used here to refer to learning and executive functions such as the filtering of information and the maintenance of cognitive focus or the shifting of a cognitive set. These executive functions and

50

learning systems are believed to be served by the frontolimbic circuitry, including specifically

the prefrontal lobes (Stuss and Benson, 1986). There are several circuits connecting the

prefrontal and limbic cortex and different deficits that would be expected from breakdowns at

different points in the circuit (Frith and Done, 1988). Brooks, Hodde-Vargas and Vargas (1998)

found metabolic changes associated with adult schizophrenia in the frontal lobes of children

with some or all of the symptoms of schizophrenia in a magnetic resonance spectroscopic

study, supporting a neurodevelopmental theory for schizophrenia.

Current researchers have described executive dysfunction in schizophrenia, but with mixed

results. Several studies have found that individuals with schizophrenia are impaired on some

but not all of a number of executive function measures (Braff, Heaton, Kuck, Cullum,

Moranville, Grant and Zisook, 1991; Morrison-Stewart, Williamson, Corning, Kanuchen, Snow

and Merskey, 1992). Discrepancies in the precise characterisation of the general

neuropsychological deficits associated with schizophrenia are due to the heterogeneity of

chronic patients who vary in illness duration and symptomatology. Here, a collection of studies

will be considered, including those examining executive function in adults and children with

schizophrenia, individuals with first episode schizophrenia and early onset schizophrenia, and

adults with SPD, in an attempt to delineate the specific executive function deficits in this

spectrum of disorders.

Adults

Hanes, Andrews, Smith and Pantellis (1996) evaluated the discriminant validity and

homogeneity of planning, set shifting and fluency measures of executive dysfunction in

patients with schizophrenia, Parkinsons disease and Huntington's disease. They found that the

3 tasks could successfully discriminate between the patient group and controls and proposed

that the 3 tasks are sensitive and relatively homogenous in their recruitment of executive

functions (Hanes et al., 1996).

However, Nestor, Shenton, Wible, Hokama, Odennell, Law and McCarley (1998), whilst finding that thought disorder in the participants with schizophrenia correlated strongly with tests of verbal memory, abstraction and executive functions, reported that neither thought disorder scores nor their neuropsychological correlates were associated with frontal or basal ganglia magnetic resonance imaging (MRI) measures.

Pantelis, Barnes, Nelson, Tanner, Weatherley, Owen and Robbins (1997) measured spatial working memory and planning abilities in participants with schizophrenia and compared them with normal participants and patients with neurological disorders (frontal lobe, temporal lobe, and amygdalohippocampal lesions). Planning ability was measured using the CANTAB "Tower of London" and they found that patients with schizophrenia and frontal lobe lesions made fewer solutions and required more moves for completion. Pantelis et al. (1997) suggest that the results are characteristic of an overall deficit of executive functioning and were similar in pattern to patients with frontal lobe lesions.

Research has also shown that participants with schizophrenia also make perseverative errors on speech and writing fluency tasks. Pennington and Ozonoff (1996) suggest two fluency measures, including the Thurstone Word Fluency Test (Milner, 1964) and the Design Fluency test (Jones-Gotman and Milner, 1977). In a study examining the cognitive impairments associated with schizophrenia, Raine, Dennis, Sauer and Kant (1995) found that participants with schizophrenia were impaired on measures of general intelligence, verbal memory, set shifting and word fluency but not on design fluency. Using a number of executive function measures, including a word fluency measure, Jaquet, Lancon, Auquier, Bourgerol and Scoffo (1997) described frontal cognitive impairments in 42 participants with schizophrenia as compared to normal controls. Basso et al. (1999) used a number of measures in their study to examine the cognitive correlates of negative, disorganised and psychotic symptoms of participants with schizophrenia in an attempt to explore the theory that schizophrenia may be a

heterogeneous set of syndromes rather than a disease entity. The researchers employed several executive function tests, including The Trail Making Test (Part A and B), The Wisconsin Card Sorting Test and the F-A-S test of verbal fluency and found that the severity of negative symptomatology was related to a worsening of performance across all of the executive function measures and other neuropsychological measures used. The group of participants with disorganised schizophrenia achieved inverse associations with performance on the measures of IQ, but not on the executive function measures, whilst the psychotic group of participants were not associated with neuropsychological impairment. The authors conclude that the findings demonstrate that distinct schizophrenic symptoms have differing patterns of neurobehavioural correlates.

Early onset/first episode

In a study examining the hypothesis that adolescent-onset schizophrenia represents a distinct neurodevelopmental disease, Basso et al. (1997) found that their adolescent-onset schizophrenia group performed worse than the adult-onset and control groups on measures of memory and executive function, supporting previous studies which suggest that patients with schizophrenia who have an adolescent symptom onset have a worse clinical course and greater frequency of cerebral anomalies than those with adult-onset (Basso et al.,1997).

In an attempt to circumvent the mixed findings of neuropsychological deficits in individuals with chronic schizophrenia, Hutton, Puri, Duncan, Robbins, Barns and Joyce (1998) designed a methodology to include subjects with first episode schizophrenia and a discrete number of tests to elucidate fundamental cognitive deficits. They measured a range of executive abilities, including planning, spatial working memory and attentional set shifting. The results highlighted that first-episode schizophrenic patients could be characterised by a impoverished ability to plan ahead and construct responses, but an intact ability to switch attention and inhibit prepotent responses in comparison to their matched controls. Hutton et al. (1998) argue that

this study shows that schizophrenic patients do have profound executive impairments even at the beginning of their illness. The findings of this study are particularly important for understanding the cognitive dysfunction in schizophrenia as other researchers suggest that cognitive impairments in schizophrenia may be a result of prolonged anti-psychotic medication. Other studies have reported that patients with long-term schizophrenia have difficulties with the WCST (see Levin et al., 1989; Elliot and Sahakian, 1995) and are more impaired on the CANTAB attentional set shifting task than on planning and spatial working memory tasks (Elliot, McKenna, Robbins and Shahakian, 1995, 1997; Pantelis et al., 1997), whereas the participants with schizophrenia in Hutton et al's (1998) study do not show a difficulty with this executive function. It does suggest the possibility that the nature of executive dysfunction changes over the course of the illness. However, there are limitations to this piece of research, Hutton et al. (1998) did not subgroup the participants into their specific symptom categories, i.e. paranoid symptoms, passivity experiences or negative symptoms. As mentioned above, previous research has shown that symptom groups within the schizophrenia spectrum show different abilities on theory of mind tasks (Frith and Corcoran, 1996; Garety and Freeman, 1999). The question remains whether executive dysfunctions would be the same or different for different subgroups given that different schizophrenia subgroups perform differently on theory of mind tasks. Whilst Basso et al. (1999) have shown this to be true in their recent study for participants with negative, disorganised and psychotic symptoms, further research is needed to replicate and clarify these findings for the different syndromes within the Schizophrenia Spectrum of Disorders. Also, further research is needed to examine whether there is a recovery of certain executive function abilities in those individuals who recover from an episode of schizophrenia and who have shown executive function deficits during the acute phase.

Previous research with schizotypal children and adolescents has included IQ measures using the WISC. As previously mentioned, Wolff and Barlow (1979) describe a wide range of full scale IQ scores but found no significant discrepancies between Verbal and Performance IQ for their SPD group, while Wing (1981) states that Performance IQ is often lower than Verbal IQ. However they both accede that rote memory is preserved but comprehension of material can be severely impaired in both SPD and Asperger's. Reported studies also present varying evidence for and against Verbal vs Performance IQ discrepancies in SPD clinical samples.

In a recent study, Cadenhead, Perrry, Shafer and Braff (1999) found that adults diagnosed with SPD performed intermediate to normal participants and participants with schizophrenia on a number of measures, including IQ. However, the researchers used just one of the WAIS-R subtests- Vocabulary. Whilst this subtest is highly correlated with the WAIS-R full-scale IQ and is often used to assess premorbid intellectual functioning (Lezak, 1995), other researchers suggest that assessing intellectual functioning using one WAIS or WISC subtest is not comprehensive enough and that a battery of subtests or measures should be used. However, it is argued that because of concentration difficulties, fatigue, or poor motivation, administration of all 11 WAIS-R subtest to a severely mentally ill patient can take 2 or more hours to complete (Ryan and Rosenberg, 1984), and that a shortened version is preferable. However, when a full neuropsychological profile is to be examined, the full range of subtest on the WAIS or WISC should be employed.

Reviewing the research on IQ in SPD, Nagy and Szatmari (1986) conclude that whilst there is little agreement on whether there is a pattern of deficits on neuropsychological tests for children and adolescents with SPD, there can be no diagnostic validity on this criterion and

suggest a closer look at IQ measurement and other neuropsychological tests to describe more

clearly the cognitive strengths and weaknesses of children who present with SPD.

Executive Function and Adult SPD

A number of executive function deficits have been found in adult participants with SPD.

The Wisconsin Card Sorting Test (WCST), which involves shifting cognitive set in addition to

maintaining a cognitive set against distractors (Heaton, 1981) has been used to measure set

shifting in schizotypy. It is believed to tap the ability of subjects to inhibit the contents of

consciousness. Lyons, Merla, Young and Kremen (1991) and Spaulding, Garbib and Dras

(1989) both found perseverative errors between groups identified as schizotypal (on the basis

of MMPI scores and diagnostic interviews, respectively) and controls. However, Raine, Sheard,

Reynolds and Lencz (1992b) failed to find any significant deficit on the WCST in a study of 14

undergraduates with DSM-III-R-diagnosed schizotypal personality disorder, demonstrating that

findings have been mixed. Nevertheless, the results in Raine et al's study could be due to a

variation in IQ levels of the participants.

Trestman et al. (1995), using the TMT and other executive function measures to assess

executive function in adults with SPD and other personality disordered (OPD) participants,

found that SPD participants performed more poorly on the TMT Part B than did OPD

participants or normal Ss suggesting that SPD participants may share some of the cognitive

deficits observed in schizophrenia.

Poor sustained attention has been demonstrated in participants with schizophrenia using the

Continuous Performance Test-Identical Pairs (Lenzenweger, 1991). Attentional impairment has

also been demonstrated in adults diagnosed with SPD. Roitman, Cornblatt, Bergman and

Obuchowski (1997) compared participants with SPD with a normal comparison group and with

participants with other personality disorders using the Continuous Performance Test-Identical

Pairs and found that participants with SPD, like participants with schizophrenia, performed

significantly worse than the normal comparison group, and that participants with other

personality disorders performed similarly to the normal comparison group.

Cadenhead et al. (1999), as well as examining the IQ of three groups of participants, as

outlined above, also examined the executive functions of the groups. They found that the SPD

group performed intermediate to normal participants and participants with schizophrenia on

measures of attention, abstract reasoning and cognitive inhibition using The Seashore Rhythm

Test (SRT) from the Halstead-Reitan Test Battery (Reitan and Wolfson, 1993), The Wisconsin

Card Sorting Test and The Stroop Colour and Word Test, respectively. However, the authors

point out that, as the SPD participants, and the participants with schizophrenia performed

relatively poorly on all the measures used, a general performance deficit versus a cognitive

deficit specific to schizophrenic-spectrum patients cannot be ruled out: a general performance

deficit might support the notion that the cognitive deficits of schizophrenic-spectrum patients

are pervasive, affecting multiple levels of functioning. However, the researchers did not

counterbalance the presentation of their cognitive measures to minimise the order effects that

might have contributed to poor performance later in their testing sessions, and as mentioned

above, they only used one WAIS subtest to measure IQ.

Summary

In summary, some studies demonstrate a decline in Full Scale IQ for individuals with negative

symptoms of schizophrenia. However, the Full Scale IQ scores for children with schizophrenia

have been reported to fall within the normal range. There have been very mixed results for the

patterns of Verbal versus Performance IQ discrepancies in the literature for both individuals

with schizophrenia and with SPD. However, some studies have suggested lower Verbal

Comprehension Index scores for both children and adults with SPD. Verbal Comprehension

Index scores have also been correlated with thought disorder in children with schizophrenia

and in children with SPD. Profiles on executive function tasks describe deficits even at the

early stages of a diagnosis of schizophrenia; including planning difficulties. Several studies

report planning, set-shifting deficits and fluency deficits for adults with schizophrenia and

adults with SPD. Recent studies have reported that participants with different symptom clusters

perform differently across executive function measures, although further research in this area

is needed. Several studies have also found poor sustained attention abilities in participants

with SPD and Cadenhead's (1999) recent study found attention, set-shifting and cognitive

inhibition deficits in participants with SPD.

This section ends with a table summarising the impairments of individuals with autism,

Asperger's, childhood and adult schizophrenia and child and adult SPD (Table 1).

Table 1. Impaired or Intact functions of Children and Adults with Schizophrenia, Children and Adults with SPD, and individuals with autism and Asperger's.

	PDD		SSD			
Function	Autism	Asperger's	SC Adults	SC Child	SPDAdults	SPD Child
IQ↓	X	√	X	√	√	√
PIQ>VIQ	**yes**	**no**	√X	√X	√X	√X
VIQ>PIQ	**no**	**yes**	√X	√X	√X	√X
IQFactorIndex↓	X	X	X	?	?	X
Set-shifting	X	X	X	√X	X	?
Planning	X	X	X	X	X	?
Fluency	?	?	X	?	?	?
Sustained attention	?	?	X	?	X	?
Attentional switching	√	√	?	√X	X	?

↓=lowered function, X= impaired, √ = intact, √X= mixed results, ?not known

Table 1 summarises the previous sections that describe the cognitive profiles of individuals with a Schizophrenia Spectrum Disorder or a Pervasive Developmental Disorder. The table does not include the WISC subtest profiles that have been documented for individuals with Asperger's /autism. What is clear from the table is that it is difficult to delineate specific and cohesive cognitive profiles that distinguish the Pervasive Developmental Disorder from the Schizophrenia Spectrum Disorders, apart from the attentional switching/inhibition executive function that appears to be intact in individuals with Asperger's /autism and impaired in adults with SPD.

Executive Function and Children

Despite a substantial amount of neuropsychological and cognitive research about executive functioning in adults, there is relatively little information about executive functioning in children. (Gyns and Willis, 1991). However, executive function skills have been demonstrated as emerging in infancy and early childhood. Bruner (1973), Haith, Hazan, and Goodman (1988) and Piaget (1954) found evidence of anticipation and planning in infants, whilst Kopp (1982) and Mischel and Patterson (1979) found evidence of impulse control, self-monitoring, and set maintenance in toddlers. Studies using adult neuropsychological measures with little or no adaptation for the child's developmental level converge on the age of 10 to 12 years old as the time that adult-level performance is achieved (Appelof and Augustine, 1986; Chelune and Baer, 1986; Kirk and Kelly, 1986). Welsh, Pennington and Grossier (1991) argue that given the developmentally appropriate behavioural measures, rudimentary forms of prefrontal skills are exhibited in very young children. In terms of development, it appears that the prefrontal areas

are at least partly functional earlier in life than was previously thought. Glucose utilisation as measured by PET scan reaches adult levels in the human frontal areas at about 8 months of age (Chugami and Phelps, 1986) and synaptogenesis in the primate prefrontal areas follows the same developmental trajectory as other cortical areas and reaches a peak number of synapses in the first year of life (Rakic, Bourgeois, Zecevic, Eckenoff, and Goldman-Rakic, 1986).

The findings of Welsh et al. (1991), who tested children of 3 through to 12 years old, support other research which asserts the view that prefrontal skills emerge in a stage-like fashion throughout childhood. Welsh and Pennington (1988) place these developmental trends in executive function skills within a larger context of normal cognitive development. An improvement in prefrontal skills at age 6 dovetails with what has been referred to in the field of developmental psychology as the "5 to 7 year shift" (White, 1970), and other researchers have documented rapid advances in systematic problem solving during this period, including logical thought (Piaget, 1954), verbal mediation (Luria, 1973), working memory (Case, 1985), and selective action (Miller and Weiss, 1981).

Executive Function and Children with SPD?

The study by Basso et al. (1997), mentioned previously, suggests that schizophrenia represents a distinct neurodevelopmental disease entity with specific executive dysfunctions. Genetic and language studies have also reported the relationship of SPD to the schizophrenia spectrum of disorders. The cognitive theories and research presented earlier suggest that the signs and symptoms of schizophrenia can be described as resulting from a cognitive deficit in

the 'metarepresenation' domain leading to executive dysfunction, although this theory cannot account for all of the symptoms presenting in the different subgroups of individuals with schizophrenia. However, the theory leads to the possibility that SPD in children and adolescents will suggest to a neurodevelopmental disease with specific executive function deficits.

On the neuropsychological side, considerable evidence supports the broad conclusion that executive functions are mediated by the prefrontal cortex (Fuster, 1985; 1987; Shallice, 1982; Stuss and Benson, 1986). Beyond this broad conclusion, no consensus has been reached on a cognitive taxonomy of executive functions.

Given that SPD is theoretically related to schizophrenia, and schizophrenia has been conceptualised as a brain morphological deficit of the frontolimbic system which serves executive function processes, it was decided to measure a number of executive function processes in children with SPD as well as profile their IQ. Wolff (1998) writes that whilst Asperger's and high-functioning autistic individuals have deficits in tests of executive function (Ozonoff, Pennington and Rogers, 1991; Bishop, 1993; Ozonoff and McEwey, 1994), it is disappointing that to date no SPD research with children and adolescents has incorporated executive function tests and measures into the methodology. However, as previous sections and Table 1 describe, no clear neuropsychological dysfunction on executive measures have been described in the Schizophrenia Spectrum Disorders or the Pervasive Developmental Disorders, and therefore it may be difficult to distinguish SPD from these two groups in terms executive dysfunction. Nevertheless, it would be valuable to describe any neuropsychological profiles that emerge in the SPD children identified in this study.

Methodological Considerations

There are a number of methodological issues to consider when conducting neuropsychological and executive function research with a potentially small group of children and adolescents with a Schizophrenia Spectrum Disorder. Each issue will be addressed in turn.

Small n

Previous research with children and adolescents diagnosed with SPD has been based on small or moderate sized groups and researchers have often gathered their cohorts over a number of years. Nagzy and Szatmari (1986) studied 20 DSMIII defined SPD children consisting of 18 males and 2 females ranging in age from 7 to 18. In 1991, Wolff, matched 32 boys on age, IQ and socio-economic status (SES), through retrospective analysis of clinical records, and followed these boys into adulthood. Caplan and Gutherie (1992) studied 12 SPD children and 12 schizophrenic children, and in 1994, Caplan studied a further 14 SPD children. A larger sample of SPD children was studied by Wolff (1995) with 32 SPD girls identified over the years by case note analysis. Insufficient recognition of SPD children, as well as the rarity of the disorder, presents the researcher with the difficulty of having to investigate a small sample from the population. This puts further constraint on any conclusions that can be drawn, and statistical analyses have limited power.

However, there is much in the literature that suggests the use of group studies for studying neuropsychological syndromes can be inappropriate (Caramazza, 1986), and that the small n case study approach (Yin, 1989) has much to offer when looking at individual complexity (Barker, Pistrang and Elliot, 1994). In relation to schizophrenia research, Shallice, Burgess and

Frith (1991) point out that traditionally, neuropsychological studies applied a small number of tests and measures to a large group of participants and this potentially has two drawbacks. Firstly, the heterogeneity of schizophrenia and Schizophrenia Spectrum Disorders might convey group means that do not reflect difficulties of any individual, and secondly, it could be problematic to infer the nature of possible underlying cognitive impairments from a small number of tests (Shallice, Burgess and Frith, 1991). However, the case study approach also has its drawbacks because it is impossible to be certain that the cases studied are representative of the full spectrum of the disorder. The ideal methodology, as described by Shallice, Burgess and Frith (1991), would be to examine a large group of participants with a particular disorder, and treat each as a case study, and then attempt to generalise across the individual cases. In practice this could be difficult: a solution is to carry out a detailed study of several individual participants using a number of tests and measures, and then compare the results obtained with those of group studies. This methodology would appear to be the 'best fit' when neuropsychologically studying a small number of child SPD cases, especially in view of the rarity of this disorder.

Testing children with Neuropsychological Measures

Beardsworth and Harding (1996) note that child neuropsychology is still in its infancy. A continuing problem in child neuropsychology is the need for better normed and standardised tests. Whilst a number of widely used measures of children's intelligence have been updated, including the WISC, there is still a scarcity of measures of verbal and non-verbal memory and learning and of visuo-spatial skills across the age span from 4 to 15 years (Fennell, 1994).

There is also a need for more data on the strengths and weaknesses on neuropsychological

tests of groups of children suffering with neurological disorders. A number of

neuropsychological tests for children have been adapted from adult batteries of tests and

ignore the differences in cognitive strategies that mature with a specific skill, and therefore, the

researcher must be aware of the limitations of these tests when considering normal variation.

Shallice, Burgess and Frith (1991) suggest that to capture the overall profile of a particular

case on a number of tests, the best approach is to convert the scores obtained to normative

data, i.e., age scaled scores or percentiles. Unfortunately as outlined above this cannot always

be achieved in child neuropsychology.

Assessing children neuropsychologically involves assessing an ever-developing organism

(Beardsworth and Harding, 1996). The effects of a change in brain development, or the effects

of a lesion, depend on when it occurs in the developing brain of the child, and thus the same

insult may produce different effects at different developmental stages.

Executive Function Measures and Children

As discussed above, neuropsychological testing and interpretation with children is not always

as straightforward and informative as clinicians and researchers would like it to be; and this

also applies to the testing of executive functions in children. Many of the executive function

measures described in the literature mentioned above are not well normed and have been

derived from studies that did not use random sampling or assess enough participants.

Therefore, it can be difficult to compare the test performances of any experimental group on

these executive function measures with that of the normal population and/or other control groups, and to interpret the results clearly.

When interpreting executive function performance in any individual, whether child or adult, it is very important to consider the general intellectual abilities of that person. Choosing a suitable intelligence test will enable the researcher to see if a child's executive functions are significantly better or worse than would be predicted by his or her general intellectual abilities by looking at significant discrepancies in standard scores, provided that standard score conversions are available for both tests (Ozonoff, 1998). As noted above, however, this is not always the case. In the present study an attempt was made to select tests that have standard score conversions.

Appropriate Controls

Establishing the specificity of the deficit in SPD requires comparison with a control group. However, this raises the question of which control group would be appropriate. Raine and Lencz (1995) suggest that maybe borderline personality, which has been associated with SPD, would be appropriate, or alternatively an Axis II disorder that is unrelated to SPD, such as self-defeating personality disorder. It is also necessary to consider that comorbidity is a potential confound, and affective disorders are common in SPDs. If it was already established that the particular correlates of SPD that are believed to be of etiological significance are independent of coexisting psychiatric conditions, then this would make selection of an appropriate control group easier. However, until the essential core features of SPD are teased apart from other affective disorder features, selection of appropriate control groups remains a concern when studying children identified with SPD. Some researchers have utilised normal groups, while others have selected children with schizophrenia.

In the longer term, given the arguments presented above, a study comparing the cognitive deficits of children with SPD, children with schizophrenia and children with Asperger's, would provide valuable evidence, and a starting point is a detailed study of the neuropsychological profiles of a series of individual SPD children.

Rationale

Evidence from a variety of domains then, including phenomenological, genetic, neuropsychological, neurochemical, imaging and treatment response, suggests that SPD is related to schizophrenia and that it is part of a continuum of schizophrenia related disorders (Cornblatt, 1994; Levy, 1994; Rogeness, 1985). Studying participants who present with SPD has a number of advantages for the classification of psychological, cognitive, and psychophysiological deficits that are vulnerability markers for the disorder. SPD participants are generally functionally intact, nonpsychotic, unmedicated and unhospitalised. This helps overcome some of the confounds that arise when participants are on neuroleptic medication or in long-term institutionalisation. Replication in adults with SPD of the deficits found in adults with schizophrenia lends support to the hypothesis that such deficits are etiological factors, possibly with a genetic basis (Raine et al, 1996).

Following from this hypothesis, this study starts with the premise that children and adolescents clinically presenting with the diagnostic criteria for SPD could be described as having a disorder that is part of the Schizophrenia Spectrum of Disorders, and not the Pervasive Developmental Disorders. However, there has been little research which clearly describes cognitive anomalies and neurpsychological dysfunction in children identified as having SPD.

Further research is needed to clarify the neuropsychological profile of children with SPD. This in turn would provide further evidence in relation to both the diagnostic validity of SPD and its hypothesised relationship with the Schizophrenia Spectrum of Disorders and the Pervasive Developmental Disorders.

In particular, there has been no empirical investigation that explores executive functioning in children who have been diagnosed with SPD. Wolff (1998) comments (as noted above) that whilst Asperger's and high-functioning autistic individuals show deficits in tests on executive function, no research to date has attempted to document executive function disorders in children identified as having SPD. Frith (1992) outlines the similarities of the signs and symptoms of autism/Asperger's and schizophrenia and describes the single cognitive process of 'metarepresention' or theory of mind as being the underlying deficit for both disorders, resulting in a lack of SAS control and leading to executive dysfunction. Research outlines executive dysfunction for individuals with schizophrenia and with autsim /Asperger's. Similarities between the signs and symptoms of SPD and Asperger's, and SPD and schizophrenia include difficulties with social interaction, abnormalities in verbal and non-verbal communication, repetitive activities and unusual and intense circumscribed interests. The key question is whether children with SPD will show similar or different patterns of cognitive strengths and weaknesses of measures of IQ and executive function to those of individuals with schizophrenia and autism/Asperger's, and whether their profiles can be accounted for within the cognitive model that C.Frith describes. However, given that the cognitive profiles of individuals with Asperger's/autism and schizophrenia have been hard to clearly distinguish from one another, the neuropsychological validity of SPD may be drawn into question.

Research Hypotheses

The present research aims to describe deficits in cognitive processing and neuropsychological dysfunction in a group of children with the diagnosis of SPD. It examines whether executive function deficits, Verbal vs Performance IQ discrepancies, IQ subtest profiles and Factor Index scores can be described in children and adolescents who have been diagnosed as having SPD, and how these IQ and executive function profiles might contribute to the diagnostic validity of SPD as Schizophrenia Spectrum Disorder.

Hypothesis 1: SPD is a valid category in children that can be distinguished on the basis of a clear neuropsychological profile and therefore, a clear profile of strengths and weaknesses will be demonstrated that is consistent across participants. If this hypothesis is not supported and a consistent and clear profile cannot be demonstrated then the neuropsychological validity of SPD will be questioned.

Hypothesis 2: SPD is related to the Schizophrenia Spectrum of Disorders and not to the Pervasive Developmental Disorders and will be demonstrated by a neuropsychological profile more similar to the Schizophrenia Spectrum of Disorders profile. If this hypothesis is not supported then no conclusions regarding its relationship to the Pervasive Developmental Disorders or the Schizophrenia Spectrum Disorders can be drawn.

Hypothesis 3: SPD will be characterised by specific WISC anomalies and executive dysfunctions that can be accounted for within a cognitive model described by C.Frith (1992). If this hypothesis is not supported and no specific strengths and weaknesses are found then no conclusions can be drawn on which cognitive theories can provide an account of SPD.

CHAPTER 2

Method

Participants

A research team at a London School of Medicine and teaching hospital identified a number of children who presented to secondary child psychiatric services with schizotypal features. The aim of the project was to assess the presence of SPD in these children and adolescents by obtaining detailed information about the child from interviews with the child, parents and teachers about specific schizotypal symptomatology. This included an exploration of the social relationship difficulties, language anomalies, and presence of autistic features to investigate how these children differ from children with autism and Asperger's. The child's family history was also assessed with special emphasis on schizophrenia and SPD.

The Specialist Registrars involved in the study mailed questionnaires to the Consultants of every Child and Adolescent Psychiatric Service in North (West) Thames area. The Consultants were sent a copy of the DSM-IV checklist of SPD diagnostic criteria and asked to identify any child or adolescent that fulfilled the criteria for SPD and had been difficult to treat. It was anticipated that approximately 20 referrals would be made; however, 12 children and adolescents were identified as having SPD by their Consultants and were referred to participate in the study.

The potential sample of SPD children was 12 children and adolescents, who originally presented to secondary child and adolescent psychiatric services in North (West) Thames area

with schizotypal features, and who through a detailed psychiatric assessment had been given

a diagnosis of schizotypal personality disorder.

Table 2 presents the age and sex for each SPD Case. The SPD group had an age range of 8

to 16 years with a mean age of 12 (s.d = 2.7).Of note is that the youngest child is 8, but old

enough to have reached and passed the "5 to 7 year shift" (White, 1970).

Table 2. Participant age and gender.

	SPD AGE	GENDER
Case 1	16	M
Case 2	13	F
Case 3	13	M
Case 4	11	M
Case 5	11	F
Case 6	8	M

The SPD children had already been interviewed and diagnosed by the Registrars, using a

number of semi-structured and standardised measures to exclude other diagnoses.

Ethical Approval

The researcher applied to the St.Mary's Local Research Ethics Committee for ethical approval. Approval was given as an amendment to the main project (see Appendix 1).

Measures

Diagnostic Measures

The diagnostic measures were administered to the SPD children by the Registrars.

Denckla's Neurological Examination of Subtle Signs(NESS)(Denckla 1985)

This scored neurological examination is designed to assist in determining whether subtle neurological signs are present in a child. The child is asked to demonstrate 13 tasks using eye, foot or hand manipulation, such as looking through a hole in some paper, kicking a ball, combing hair, or cutting with a pair of scissors. These tasks will demonstrate the lateral preference of the child or adolescent. Young adults with soft neurological signs have presented with the clinical characteristics of SPD (Quitkin and Klein, 1969), and minor neurological signs have been identified as common in high-risk follow-back studies of persons identified as preschizophrenic (Davies, Russell, Jones and Murray, 1998).

St.Mary's Schizotypal Personality Interview

The St.Mary's Schizotypal Personality interview is a semi-structured questionnaire for children. It is adapted from The Baron Schedule for Schizotypal Personality Disorder (Baron, Anis and Gruen, 1981, 1983) which is a tool used for diagnosing SPD in adults. The St.Mary's Schizotypal Personality Interview can be given to children over the age of 11years, (see Appendix 2) and if the child is under this age, their parents as well (see Appendix 3). The

questionnaire covers schizotypal symptoms, including depersonalisation/derealisation, ideas of reference, suspiciousness/paranoid ideation, magical thinking, inadequate rapport, social isolation and obsessive ruminations, and with the SPD children was used in conjunction with the Kiddie Schedule of Affective Disorders and Schizophrenia (Kiddie-SADS-IVR). The St. Mary's SPD interview covers 8 of the twelve diagnostic symptoms. Each of the 8 symptoms is represented in the interview by 7 or more questions covering that symptom, and is diagnosed by a respondent having mild, moderate severe or no experience of a feeling, thought or behaviour relating to one of those questions within that symptom category. The Kiddie- SADS-IVR interview schedule uses the diagnostic criteria of DSM-IV for Affective Disorders and Schizophrenia.

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997)

The Strengths and Difficulties Questionnaire (SDQ) is a short behavioural screening questionnaire. It provides a balanced view of child and adolescent behaviours, emotions and relationships and asks about 25 attributes which are divided between 5 scales of 5 items each, covering conduct problems, hyperactivity, emotional symptoms, peer problems and prosocial behaviour. The SDQ has two versions: an informant rated version, which can be completed by either parents or teachers of young people aged between 4 and 16, and a self-rated version which can be completed by 11 to 16 year olds (see Appendix 4).

Three Wishes (Kanner, 1972)

Asking a child to play the Three wishes game has been used frequently in clinical settings and Kanner (1972) attaches great importance to the child's wishes, using these as a projective method. The wishes are also useful in eliciting the child's major concern, which s/he has been unable to discuss conversationally. Simmons (1969) stated that "wishes may often be associated with the child's deepest psychological problems" and pointed out that it is important

to know whether a child's wishes are similar to those of his peer group. Winkley (1982) uses

five categories, each with sub-categories for classification of the child's wishes and compares

the wishes of a psychiatric population with those of a normal population.

The child or adolescent is asked to "imagine that magic could really happen and that wishes

could come true" and then asked to write down their three wishes. The wishes are classified

using Winkley's (1982) categories, plus an additional category of 'unusual or bizarre wishes'.

The different types of wishes made by the SPD group will be examined.

The Dodge (Dodge, 1980)

The Dodge consists of two hypothetical stories that are read out to the child who is then asked

what they think happened in the story. The aim of the stories is to assess the child's

interpretations of the intention of the named peer and what they think their reaction might be in

the story by asking them to attribute either a hostile, benign or not sure intention to the peer,

and outline a aggressive, non-aggressive or not sure reaction. The Dodge might also

distinguish SPD children and adolescents who may make more hostile interpretations.

Neuropsychological Measures

The neuropsychological measures were administered to the SPD children by the researcher.

The Wechsler Intelligence Scales for Children (WISC-III)(Wechsler, 1992)

IQ was measured using the WISC, which is an individually administered clinical instrument for

assessing the intellectual ability of children aged from 6 years through to 16 years 11 months.

The WISC consists of 13 subtests each measuring a different facet of intelligence.

Performance on these 13 subtests is summarised in three composite scores, the Verbal,

Performance and Full Scale IQs, which provide an estimate of the individual's intellectual

ability. Four factor-based index scores can also be calculated: 1) Verbal Comprehension

(VCI), 2) Perceptual Organisation (POI), 3) Freedom from Distractibility (FDI) and

4) Processing Speed (PSI). Table 3 summarises the relationship between the WISC subtests

and the Factor Indices.

Table 3. Subtests of WISC-III included in each of the four Factor Index scores.

FACTOR I (VCI)	FACTOR II (POI)	FACTOR III(FDI)	FACTOR IV(PSI)
Information	Picture Completion	Arithmetic	Coding
Similarities	Picture Arrangement	Digit Span	Symbol Search
Vocabulary	Block design		
Comprehension	Object Assembly		

The reliability coefficients for the WISC-III subtests, IQ scales, and factor-based scales were

estimated by the split-method, except for Coding and Symbol search, for which stability

coefficients were used as reliability estimates obtained from a test-retest study. The reliability

coefficients range from .65 through to .97 (Wechsler, 1992).

Here, using the WISC-III, Full scale, Verbal and Performance IQs will be measured along with

the four factor-based index scores of Verbal Comprehension (VCI), Perceptual Organisation

(POI), Freedom from Distractibility (FDI), and Processing Speed (PSI). Scores that are 2

standard deviations or more from the standardization sample mean will be considered a

significant difficulty, whilst scores that are between 1 and 2 standard deviations from the

standardization sample mean will be considered a mild difficulty. Strengths and weaknesses

relative to participants' other scores will also be considered.

<u>The Schonell Graded Word Reading Test (Schonell and Goodacre, 1974)</u>

This test measures the reading ability of the subject. The child or adolescent is required to read out aloud a series of graded words, allowing the calculation of a 'reading age'.

Executive Function Measures

The executive function measures were administered to the SPD group by the researcher.

<u>Set shifting</u>

<u>The Trail Making Test Part A and B (Reitan, 1966)</u>

The Trail Making Test (TMT) was used to assess set shifting. It has a children's version, has been factor analysed and appears to measure the same factor as the WCST which is sensitive to the preservative errors of schizophrenic and SPD participants, and, a very important factor when 'battery testing' children, it is very quick and easy to administer. It is also associated with frontal lobe dysfunction (Segalowitz, Unsal, and Dywan, 1992). Electrophysiological measures that appear to be associated with frontothalamic functioning correlate significantly with both TMT-A and B, leading support to the hypothesis linking the TMT to frontal activation (Segalowitz, Unsal, and Dywan, 1992).

The Trail making Test is given in two parts, A and B. The subject must first draw lines to connect consecutively numbered circles on one work sheet (Part A) and then connect the consecutively numbered and lettered circles on another worksheet by alternating between the two sequences (Part B). The subject is asked to connect the circles as fast as she/he can without lifting the pencil from the paper. It is a test of complex visual scanning with a motor component, with motor speed and agility contributing to success on this task.

Reliability coefficients vary considerably, with most above .60 but several in the .90s and more in the .80s (Lezak, 1995). Spreen and Strauss (1991) report age and sex normative data for children by age and sex. Unfortunately, the normative data for this test does not allow for subtraction of the two raw scores for each part of this test and therefore does not supply an aged normative equivalent score: it only gives aged norm for each part of this test. Therefore Part A and Part B test scores will be presented and compared separately to the normative data (see Discussion for comment), and for presentation of the groups scores together (see Figure 35) the aged normative scores will be converted to z scores.

Planning

WISC-III- Mazes (Lezak,1995)

The WISC-III Mazes subtest which measures planning was used to assess and compare this executive function in the SPD children. This maze test can be used instead of the lengthier Porteus mazes test (Porteus, 1965), and as part of the WISC battery of subtests, would already be included in the IQ testing, thus keeping testing time to a minimum. The most difficult item in the WISC mazes is almost as complex as the most difficult items in the Porteus series. The format and the time limits make the WISC Mazes easier to administer and this test has the advantages of giving an error score system (Lezak, 1995).

Fluency

The Thurstone Word Fluency Test (Milner, 1964)

The Thurstone Word Fluency Test was used to measure the executive function of fluency and was chosen rather than an oral version because there are age and sex normative data for

children. This test of frontal lobe functioning in the verbal sphere assesses written word fluency. The subject is asked to write as many words as possible beginning with S, in 5 minutes, and then to write as many 4-letter words as possible beginning with C, in 4 minutes. Generated proper names, places and repetitions are not allowed. The score is the number of words written. There are adult norms for this test as well as for patients with left and right frontal lesions, left temporal and left central lesions and right fronto-central lesions. Spreen and Strauss (1991) report age and sex normative data for children. For presentation of the groups' scores (see Figure 37) the age normative scores will be converted to z scores.

Attention

The Test of Everyday Attention for Children (TEA-Ch) (Manly,Robertson, Anderson and Nimmo-Smith, 1999)

The Test of Everyday Attention for Children (TEA-Ch) (Manly, Robertson, Anderson and Nimmo-Smith (1999) is a normed and standardised battery of 9 subtests and is used to assess attention in children between 6 and 16 years of age. The test supports the division of attentional skills into the factors of focused or selective attention, sustained attention and attentional control or switching (inhibition). TEA-Ch has nine subtests which provide separate measures of the three attentional skills; each is measured by 3 different subtests The subtests measure how well children can control their attention in order to achieve goals that will be useful for them.

The types of tasks used in TEA-Ch minimise the need for other skills such as memory, language and comprehension, and they have age scaled normative data. Two subtests were selected for use in the present study to assess sustained attention and inhibition.

Sustained Attention.

The subtest WALK DONT WALK was adapted from a computerised task used with adults, the Sustained Attention to Response Test (Robertson, Manly, Andrade, Baddeley and Yiend, 1997). When performing this test, participants have to actively maintain attention to what they are doing in order to avoid lapsing into a task-driven, 'absentminded' way of responding. WALK DONT WALK measures sustained attention to action. 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 to what they are doing and not get 'carried away' into task driven, 'automatic' style of responding.

The test retest reliabilty correlation coefficient for WALK DON'T WALK is 71.0%

Inhibition

OPPOSITE WORLD/SAME WORLD measures attentional control/switching or 'inhibition'. In the SAMEWORLD children are asked to follow a path naming the digits 1 and 2, which are scattered along it. In the OPPOSITE WORLD they are asked to do the same task except this time they have to say "one" when they see two and "two" when they see one. The speed with which they can perform this cognitive reversal is the crucial measure.

The test retest reliability correlation coefficient for OPPOSITE WORLDS is .85.

The OPPOSITE WORLD subtest examines the ability to suppress an automatic or 'prepotent' verbal response. This test is similar to other measures used in testing this ability in children (Gerstadt, Hong and Diamond, 1994). In adults, measures that emphasise these executive tasks of response initiation and inhibition have been found to be sensitive to frontal lesions (Burgess and Shallice, 1997). Unfortunately, the manual for the TEA-Ch battery does not allow

for subtraction of the two raw scores for each part of this test and therefore does not supply an age scaled equivalent score: it only gives age scaled scores for each part of this test. Therefore the age scaled scores for each part of the test will be presented (see Discussion for comment).

DESIGN

A neuropsychological case study approach was adopted to examine the individual strengths and weaknesses of each of the SPD children and adolescents on IQ and executive function tests, and to explore whether any clear patterns of performance could be discerned within the SPD group as a whole.

The neuropsychological tests were presented in counterbalanced order (see Appendix 5). As equal presentation of every possible order of each test was not possible given the number of participants, care was taken to ensure that the first and last tests were never the same, as these are likely to be most sensitive to order effects.

PROCEDURE

Diagnostic Measures

Two Specialist Registrars interviewed and assessed the SPD group using the diagnostic measures including

1) The Kiddie-SADS (Puig-Antich and Chambers, 1978) in conjunction with the St. Mary's SPD Interview

2) The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997)

3) Story Game: Thought Disorder (Caplan et al., 1989)

4) Denkla's Neurological Examination of Subtle Signs (NESS) (Denckla, 1995)

5) The Dodge (Dodge, 1980)

6) Three Wishes (Kanner, 1972)

7) The Gillberg Questionnaire (Gillberg and Gillberg, 1989)

to screen for the presence of SPD, and to screen out Asperger's. The Specialist Registrars

had found it difficult to negotiate the co-operation of the families of the child or adolescent and

obtain consent for their participation. Similarly, the children and adolescents were often less

than co-operative when interviewed.

Neuropsychological Testing

As each child or adolescent was seen and diagnosed, a referral was then made for them to

participate in the next phase of the study, the neuropsychological profiling. A letter was sent

out to each family informing them about this part of the study (see Appendix 6), and followed

up with a telephone call to invite the child and family or adolescent into the department and to

answer any questions and concerns about the study. Once again, negotiating with the families

to allow their son or daughter to participate in the final stage of the study was a long process. It

became apparent that a number of the families and children did now not want to continue with

further 'testing'. Of the original twelve, one sixteen year old boy did not want to be seen again,

one family now lived in France and did not want to commit to being seen during the child's next

spring term break, two other families thought it would not benefit them and so did not want to

participate, one child also fulfilled the criteria for Asperger's, and another family did not reply to

letters sent and messages left on answering machines. This left six SPD children and

adolescents whose families agreed for them to participate in this part of the study. A rigorous

approach was taken to exploring the possibility of recruiting further participants, but control

over this was very limited: each referral had to be interviewed and diagnosed by the Registrar before participation in the neuropsychological testing component of the study.

All the participants were seen in a quiet room within the department of child and adolescent psychiatry. Each child or adolescent, if under sixteen years of age, was initially seen with his or her carer who was asked to sign the consent form (see Appendix 7). If the adolescent was over sixteen years of age they were asked to sign the consent form themselves. The following format was used to introduce the psychological assessment: the family and participant were told that testing would take up to two and a half hours and would comprise a number of tests involving reading, maths, puzzles etc. They were informed that a break could be taken if and when the participant felt tired. They were also told that some of the tests would be timed and that they would be told beforehand when this would be so and that answers to the individual tests would not be given during testing. At this stage the parent/s and child or adolescent were asked if they had any questions. If the younger children appeared comfortable then their carers or parents were asked to leave the room and the child or adolescent was asked to sit alongside the desk and testing began.

If a participant was in the middle of an individual test and became tired, they were encouraged to complete that test before a break was taken. When testing was complete, debriefing began and the child or adolescent was thanked for their participation and told that a copy of the results could be sent to the family home, or another interview arranged to feed- back the results and other questions answered.

CHAPTER 3

Results

This section will begin with a presentation of the results of the diagnostic measures including

the St. Mary's SPD interview, the SDQ, the Ness, the Dodge, and the 3 Wishes in that order.

This is followed by the individual case profiles for the SPD children and will include

presentation of their individual WISC subtest scores, IQ and Factor IQ Index scores, and

scores on the executive function measures, either age-scaled or in relation to norms.

Next, group profiles for the WISC IQ, WISC Factor Index scores, and executive function

measures will be presented. Finally, a brief summary of the overall pattern of performance will

conclude the results section.

Diagnostic Measures

As stated above the Registrars had already interviewed the SPD children and adolescents

using the St. Mary's SPD semi-structured interview, The K-SADS, The SDQ, The NESS, The

Dodge, and The 3 wishes. The results are reviewed below.

St. Mary's semi-structured interview and K-SADS

Table 4 presents each SPD case and their informant-rated and self rated response to the

ST.Mary's SPD semi-structured interview, and the K-SADS. For the St. Mary's SPD interview,

5 of the 12 symptoms need to be present to make a diagnosis of SPD. A symptom was

marked present if indicated by either the parent or the child's responses.

Table 4 shows the diagnostic criteria met by each of the 6 cases in the SPD group across self

or informant rated responses for The St. Mary's Interview and The K-SADS. All of the cases in

this group show between 5 (Case 2) and 10 (Case 6) of the criteria needed to meet a

diagnosis of SPD on the St. Mary's semi-structured interview. This infers that a diagnoses of

SPD can be made for all of these children and adolescents using the St. Mary's Interview. The

K-SADS produced a slightly wider dispersion of number of criteria met: from 2 through to 10.

Table 4. Diagnostic criteria present as rated by informant and child, on the St.Mary's semi-structured Interview and The K-SADS for the SPD group.

Subject	Case 1				Case 2				Case 3				Case 4				Case 5				Case 6			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1. Illusions		X																X	X	X		X	X	
2. Depersonalisation / derealisation		X																				X		
3. Ideas of reference	X	X			X				X			X	X				X	X	X	X	X	X	X	X
4. Suspiciousness / paranoid ideation	X	X		X			X	X	X	X		X	X				X		X	X	X	X		X
5. Odd beliefs / magical thinking / bizarre fantasies		X		X								X	X				X		X	X	X		X	
6. Inadequate rapport / restricted affect	X				X				X			X	X				X				X			X
7. Odd communications	X				X		X	X					X				X				X			X
8. Social isolation	X	X			X				X	X			X	X			X				X	X		
9. Social anxiety / hypersensitivity	X		X	X			X	X	X			X	X		X		X			X	X	X	X	X
10. Delusions / hallucinations									X			X					X				X		X	X
11. Obsessive ruminations																								
12. Odd, eccentric behaviour																			X	X				

1= St. Mary's parent -rated Questionnaire, 2= St. Mary's Self-rated Questionnaire

3= KSADS Informant-rated Questionnaire, 4 = KADS Self-rated Questionnaire

X= the criteria was met on that symptom.

Strengths and Difficulties Questionnaire (SDQ)

The SDQ had also been administered by the Registrars to the SPD group and as shown in Table 5 all of the SPD children scored 17 and above on the total difficulties score on the parent -rated version of the SDQ. Scores of 17 and above for total difficulties on the parent-rated version fall into the abnormal range. Also, all except 1 of the SPD children score in the 'abnormal range' on the 'emotional symptom score' on the parent-rated version. Four of the SPD children did not complete the self-rated version of the SDQ as the Registrars used the 11 years of age cut-off and gave the form to the childrens' parents to complete.

Table 5. SPD participants' scores across each scale of the self-rated (SR) and parent-rated

(PR) Strengths and Difficulties Questionnaire.

Scale	CASE 1		CASE 2		CASE 3		CASE 4		CASE 5		CASE 6	
	SR	PR	SR	PR	SR	PR	SR	PR	SR	PR	SR	PR
ES	5	6	4	5	na	3	na	8	na	7	na	10
CP	6	6	4	2	na	6	na	2	na	2	na	6
H	2	5	2	5	na	9	na	10	na	9	na	10
PP	6	8	5	7	na	2	na	5	na	6	na	3
PB	10	7	4	8	na	2	na	6	na	9	na	7
TOT	19	25	15	19	na	19	na	25	na	24	na	29

ES= Emotional Difficulties score, CP= Conduct Problem score, H= Hyperactivity score, PP=
Peer Problem score, PB= Prosocial Behaviour score, TOT= Total Difficulties score, na=not
applicable.

Denckla's Neurological Examination of Subtle Signs (NESS)

Scores on the Denkla's Neurological Examination of Soft Signs revealed that all of the participants were right handed and showed no abnormal co-ordination: no further analysis was done.

The Dodge

Table 6 presents scores on the Dodge story of social attribution. Data was available for 5 of

the SPD children: two thought it was a hostile act, two thought it was a non-aggressive act,

and the other said she did not know. Only one of the SPD group thought they would act in an

aggressive way, one child said she was unsure what to do and 3 thought they would behave in

a non-aggressive way.

Table 6. Response to Dodge story of social attribution for each SPD case.

	PARTICIPANTS					
	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6
INT	1	DK	2	2	1	na
ACT	2	3	1	2	2	na

INT= Intention, 1= hostile, 2 benign, 3= not sure.

ACT= Action, 1= aggressive, 2= non-aggressive, 3= not sure.

DK= Child responded "Don't Know"

na=not available

The 3 Wishes

Table 7 presents results for the 3 Wishes task. Data was available for 4 of the SPD children, of whom 2 made bizarre unusual wishes, whilst the other two made wishes for possessions. Only one of the SPD children used the category of future achievements.

Table 7. 3 wishes made by each SPD case.

	PARTICIPANTS					
	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6
W1	3	UC	UC	1	1	7
W2	1	UC	UC	1	3	8
W3	8	UC	UC	1	1	8

1=possessions, 2= social conscience, 3=achievements for future, 4=personal need, 5=change

in home/school, 6=travel, 7=removal of fears, 8=Bizzare or Grandiose.

UC= uncooperative.

Next the WISC and executive function case profiles for each child will be presented.

CASE 1.

MM is a 16 year old boy. He wears glasses, is right handed, and there is no history of a specific learning difficulty. His parents have been described as "loners", and his father had suffered a depressive episode. His sibling has no reported psychiatric difficulties. The socio-economic status (SES) of their household is group V (Social Classification and Coding Methodology, 1991). MM has also been diagnosed with separation anxiety disorder and depressive disorder following his parent's separation, and most recently had a 6-month episode of generalised anxiety disorder. He appeared very anxious and tense during his assessment and talked at length to the researcher about how he might answer the questions. He frequently asked if he had got the answers right, and sometimes got annoyed with "what exactly" the question was asking of him. He voluntarily spoke about his anxieties and his fantasy life.

IQ Measures

His individual WISC subtest scores can be seen in Figure 1. An examination of MM's subtest scores reveals that he performs within + or - 1 s.d of the standardisation sample mean for all of his subtest scores suggesting a non-impaired profile. However, he shows particular strengths on the Information, Vocabulary and Picture Arrangement subtests as he scores just over 1 s.d from the standardisation sample mean for all three of these subtests. An ipsative analysis reveals that none of his subtest scores are statistically signficantly different from his average subtest score (11.23) at the .05 level apart from the Mazes subtest. His Mazes subtest score (8) when compared to 7 of his other individual subtest scores, including Picture Completion, Information, Similarities, Picture Arrangement, Vocabulary, Object Assembly and Digit Span is statistically significantly different at the .05 level.

MM's Full scale, Verbal and Performance IQs and Factor Index scores are presented in Figure 2. MM performs at a high average for his FSIQ, VIQ and PIQ, as well as for VCI and POI Index scores. His FDI and PSI Index scores fall in the average range of ability. There is no statistically significant difference between his Verbal and Performance IQs at the .05 level of signficance. All of his IQ and Factor IQ scores fall within 1 s.d of the standardised sample mean. An analysis of simple differences between his Factor Index scores reveals:

i) For VCI and PSI a statistically significant difference of 21 points at the .001 level with a 21.5

   % frequency of this difference or greater in the standardised sample.

ii) For POI and PSI a statistically significant difference of 17 points at the .01 level with a

   28.7% frequency of this difference or greater in the standardised sample.

In summary, MM performs at a high average ability, showing a good academic aptitude. His lower PSI Index score indicates some visual-motor co-ordination and scanning difficulties relative to his other abilities; however, this score is not significantly different from the mean standardised age scaled score.

Executive Function

As can be seen in Figure 3 MM's age scaled score for the Walk Don't Walk test shows him performing at the mean for the standarisation sample indicating no difficulties with the exceutive function of sustained attention. Whilst his Mazes subtest score of 8 does not place him in the impaired range, as described this score is statistically significantly different from his average score suggesting some difficulties with this executive function task relative to his other abilities. However, his age- scaled scores on the two parts of the Opposite Worlds are more than 1 s.d below the standardisation sample mean and although not in the impaired range, the Opposite World subtest score of 5 does suggest a weaker ability in attentional control and inhibition of automatic verbal responses.

94

Figure 4 presents his completion times for the Trail Making test Part A and Part B. His times

fall within 1 s.d from the standaradisation sample mean for MM's age and sex (Spreen and

Strauss, 1991) indicating no difficulties with set-shifting, and as can be seen in Figure 5 his

number of words recalled on the Word Fluency Test also falls nearly 1 s.d above the mean

score for his age and sex as compared to a normative sample (Kolb and Whishaw, 1985)

suggesting no fluency difficulties.

Figure 1. WISC age-scaled subtest scores for Case 1.
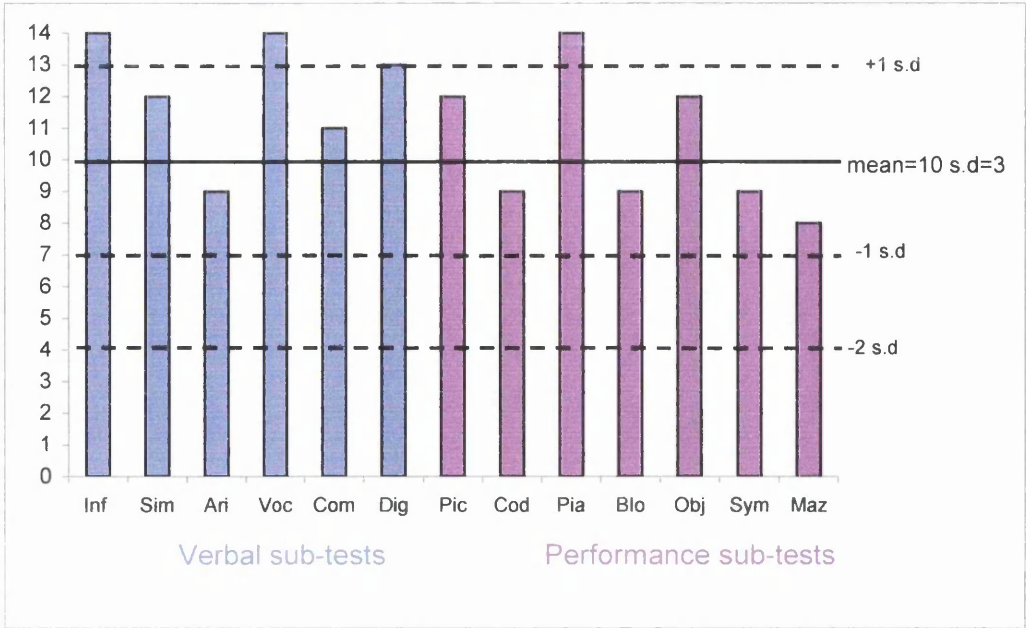
Figure 2. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ(PIQ), VCI Index(VCI),
POI Index(POI), FDI Index(FDI) and PSI Index(PSI) scores for Case 1.
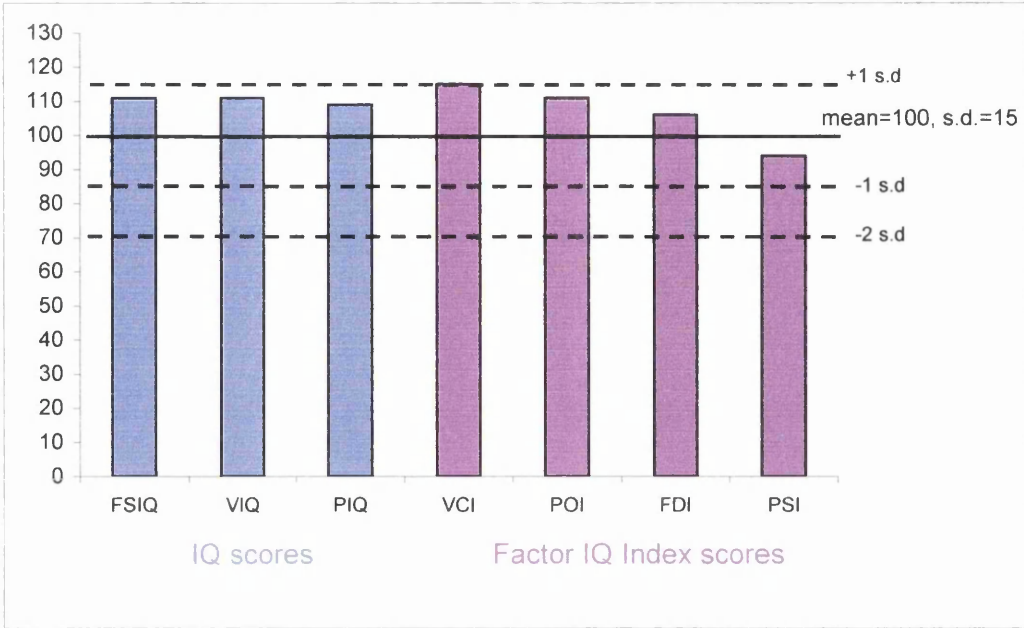
Figure 3. Executive Function scores for Mazes, Opposite World (SW and OW) and Walk Don't Walk (WDW) for Case 1.

Figure 4. Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for Case 1.
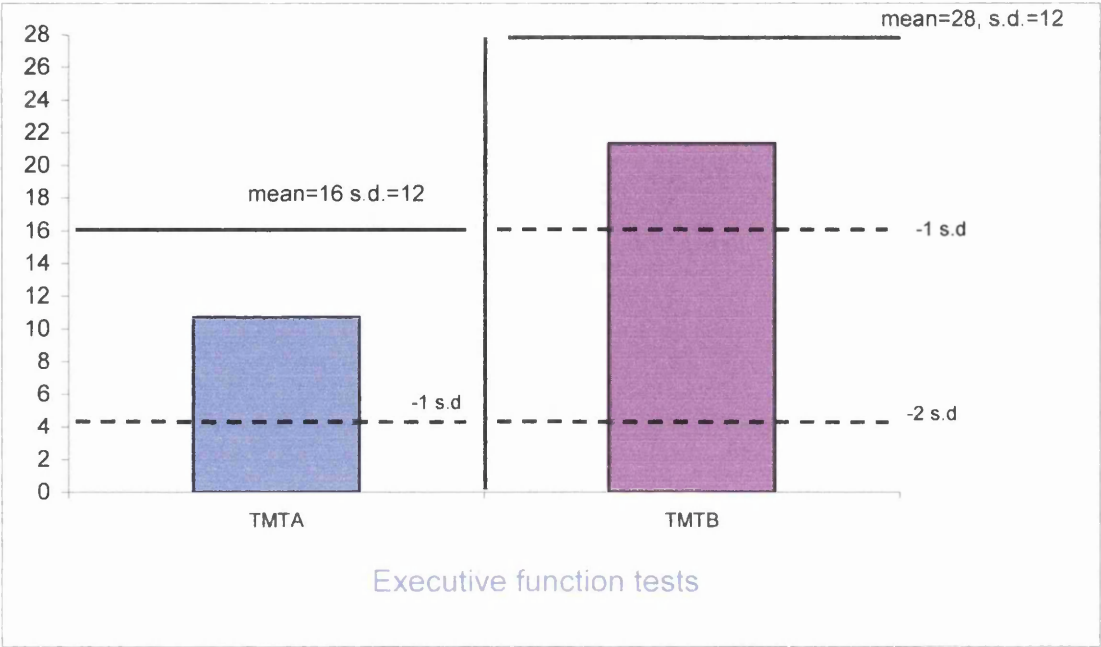
Figure 5. Number of words recalled on Thurstone Word Fluency Test score Case1.
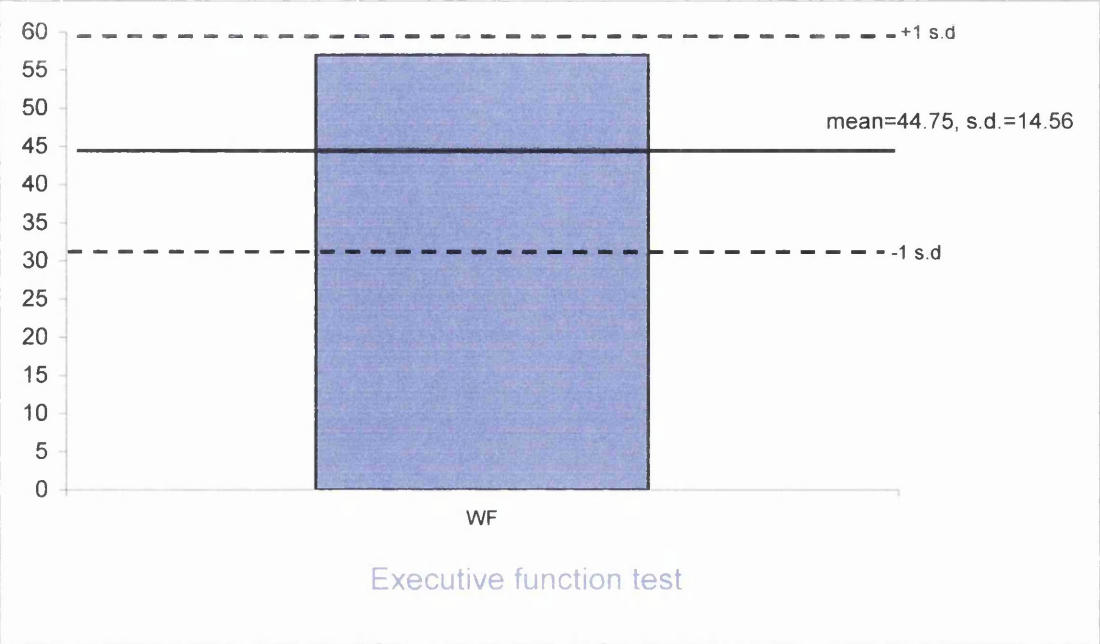
CASE 2.

CB is a 13 year old girl. She is right handed, does not wear glasses and has no reported learning difficulty. There are no reported parental psychiatric difficulties, but a half-sister suffers from anorexia nervosa and depression. CB also had a diagnosis of Oppositional Defiant Disorder. On first meeting she found it hard to meet the researcher's eye gaze. It was hard to engage her in conversation and she did not speak unless asked a question. Her individual WISC subtest scores can be seen in Figure 6 and reveal an interesting profile.

All of her subtest scores, apart from Coding and Mazes, fall within or just over 1 s.d from The standardised sample mean, suggesting a non-impaired ability on these subtests. Her Coding subtest score is over 2 s.d above the standardisation sample mean indicating an exceptional visual-motor speed and rote learning ability. Her Mazes subtest score is 2 s.d below the standardised sample mean indicating an impaired ability in the planning domain (see below for further discussion). An ipsative analysis reveals a statistically significant difference bewteen her average subtest score (8.76) and her Mazes and Coding subtest scores at the .05 level. CB's Digit Span and Object Assembly are also statistically significantly different from 6 of her other subtest scores at the .05 level of significance.

CB's Full scale, Verbal and Performance IQs and Factor Index scores can be seen in Figure 7. CB performs at an average ability level for her FSIQ, PIQ, VIQ, and VCI IQ. However, she performs at a low average ability for her POI IQ and FDI IQ, but in the high ability range for her PSI IQ. There was no statistically significant difference between her Verbal and Performance IQs at the .05 level and all of her IQ and Factor Index scores are within 1 s.d of the standardisation sample mean, apart from her PSI Index score which is nearly 2 s.d above the standardisation sample mean.

An analysis of simple difference revealed:

i) For VCI and PSI a statistically significant difference of 32 points at the .001 level with 7.1% frequency of this difference or greater in the standardised sample.

ii) For POI and PSI a statistically significant difference of 40 points at the .001 level with a 1.7% frequency of this difference or greater in the standardised sample.

iii) For FDI and PSI a statistically significant difference of 37 points at the .001 level with a 3.4% frequency of this difference or greater in the standardised sample.

In summary CB shows an average ability in her verbal comprehension skills and some perceptual organisation skills, but a weaker aptitude in her ability to form relatively abstract concepts and relationships without the use of words and her ability to sustain attention and short - term memory or encoding difficulties.

Figure 8 shows that CB performs at the mean score for her age and sex on the Walk Don't Walk test. However, her age scaled score on the Mazes was significantly lower relative to her other subtest scores indicating a weakness in her planning ability. Her Opposite World age scaled score is 1 s.d from the standardisation sample mean suggesting no difficulties in attentional control and the ability to inhibit automatic responses. Figure 9 presents her Trail Making Test times which for both parts fall within 1 s.d from the standardisation sample mean (Spreen and Strauss, 1991) and Figure 10 presents her Thurstone Word fluency score which falls on the mean score for her age and sex as compared to the normative sample (Kolb and Whishaw, 1985) indicating no difficulties with the executive functions of set-shifting and fluency.

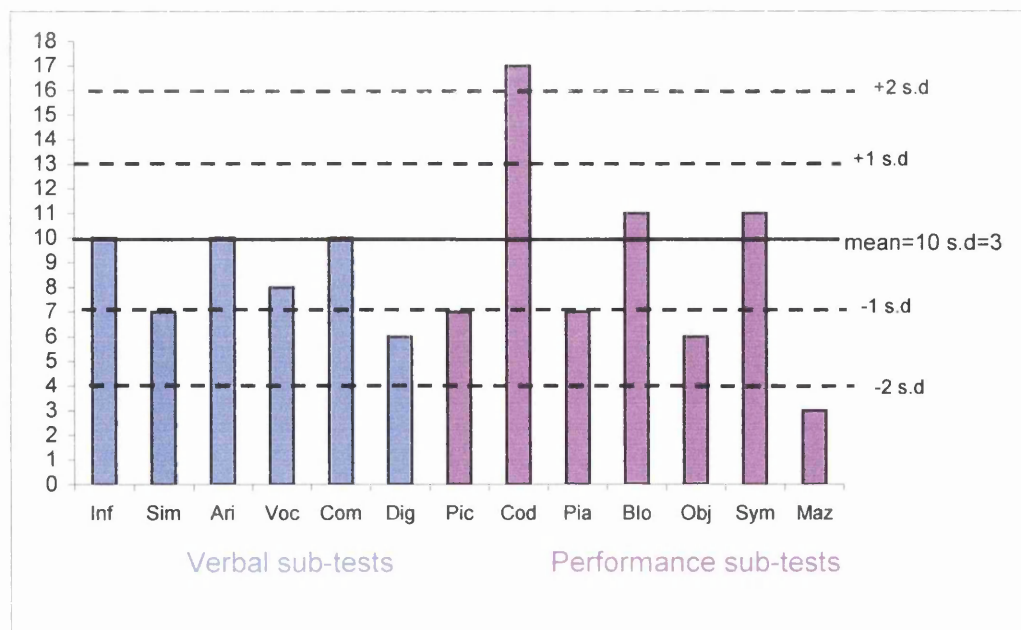Figure 6. WISC age-scaled subtest scores for Case 2.

Figure 7. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), VCI Index(VCI),

POI Index(POI), FDI Index(FDI) and PSI Index(PSI) scores for Case 2.

Figure 8. Executive Function scores for Mazes, Opposite World (SW and OW) and Walk Don't

Walk(WDW) for Case 2.

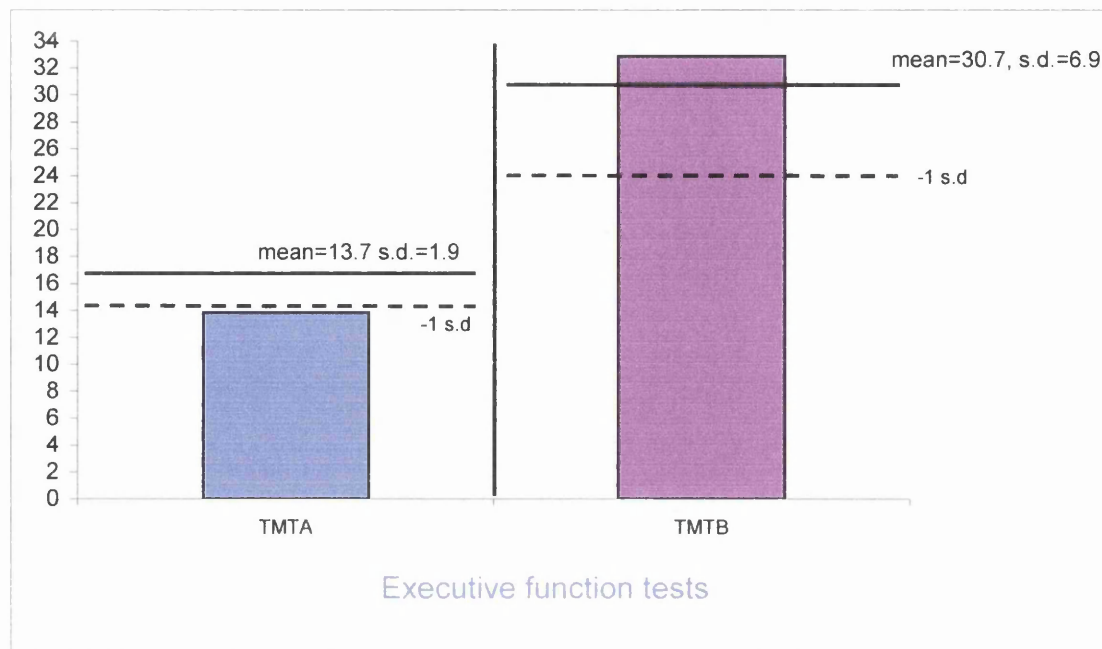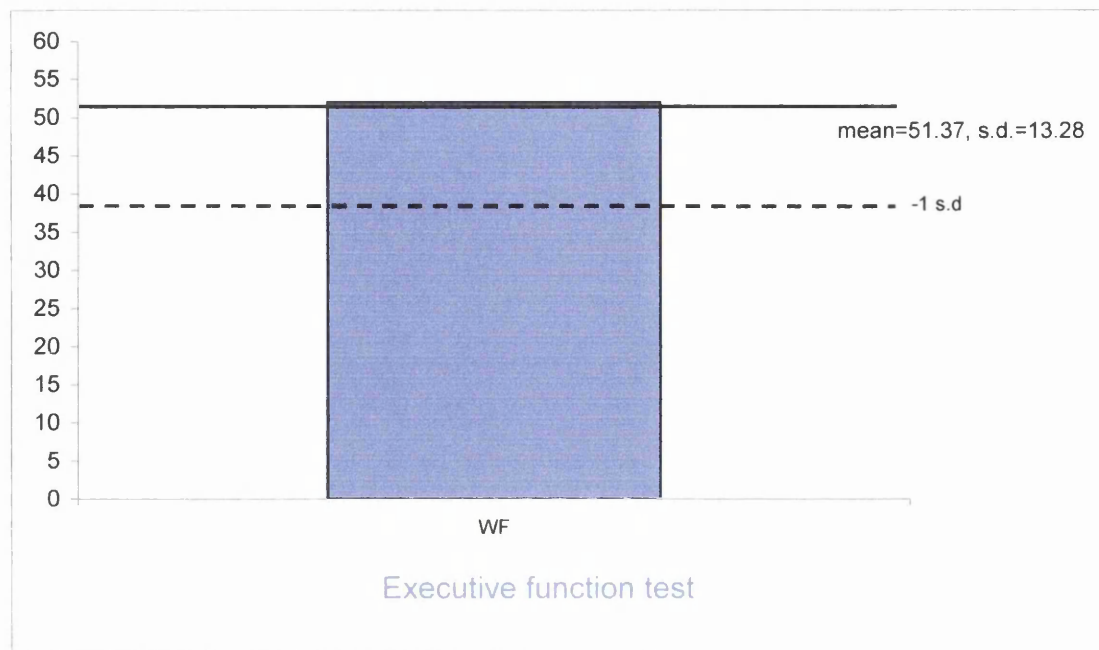Figure 9. Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for Case 2.

Figure 10. Number of words recalled on Thurstone Word Fluency Test score Case 2.

SPD CASE 3.

PQ is a 13 year old boy. He wears glasses, is right handed and had no reported specific learning difficulty. His parents had no reported psychiatric difficulties. A 3rd degree relative had schizophrenia. His siblings have behavioural difficulties. PQ has also had a diagnosis of Oppositional Defiant Disorder.He did not speak unless asked a question, and only occasionally met the researcher's gaze. He appeared very shy and anxious, but performed all of the tests quickly and without stopping for a break. When the testing finished he appeared to want to leave very soon and did not stop to listen to any informal feedback.

PQ's WISC subtest scores can be seen in Figure 11 and reveal a mixed profile. The majority of subtest scores fall within 1 s.d of the standardisation sample mean, apart from Picture Completion, Picture Arrangement and Object Assembly which fall just below 1 s.d from the standardistaion sample mean, and Vocabulary which falls 2 s.d below the standardisation sample mean. This indicates possible mild difficulties with the ability to assess non-verbal social interactions and seeing relationships of parts to wholes. An ipsative analysis reveals that there is a statistically significant difference between his average subtest score (8.61) and his Vocabulary (4), Digit Span (13) and Symbol Search (13) subtest scores at the .05 level.

In summary PQ shows strengths in sustained attention, encoding ability and short term memory, the ability to process rote tasks quickly, and visual motor speed. However, he shows weaknesses in the ability to form abstract concepts, to think in terms of visual images, and to understand verbal material.

His IQ and Factor Index IQ scores can be seen in Figure 12. PQ performs at a low average ability level on his FSIQ and VIQ and PIQ, and for his VCI Index score. His POI index score was significantly lower than his other IQ and Index Factor scores, falling in the low range of ability. There is no statistically significant difference between his VIQ and PIQ at the .05 level.

PQ performs in the high average ability range for his FDI and PSI Index scores. His Verbal IQ

and his FDI and PSI Index scores all fall within 1 s.d of the standardisation sample mean and

his PIQ, FSIQ, VCI IQ and POI fall between 1 s.d below the standardisation sample mean.

An analysis of simple differences between these IQ and Factor scores reveals:

i)   For VCI and FDI a statistically significant difference of 33 points at the .001 level with a

     1.7% frequency or greater of this difference occurring in the standardised sample.

ii) For VCI and PSI a statistically significant difference of 33 points at the .001 level with a 4%

     frequency or greater of this difference in the standardisation sample

iii) For POI and FDI a statistically significant difference of 41 points at the .001 level with a .6%

     frequency of this difference or greater in the standardisation sample .

iv) For POI and PSI a statistically significant difference of 40 points at the .001 level with a

     1.1% frequency of this difference or greater in the standardisation sample.

Figure 13 presents PQ's score on the Mazes subtest, which falls within the mean range and

suggests no difficulties with the executive function of planning. His scores on the Opposite

World Test for both parts are 1 s.d from the standardisation sample mean indicating no

difficulties for him in his ability to inhibit automatic responses. His age scaled score on the

Walk Don't Walk test also falls within 1 s.d of the mean. Figure 14 presents his TMT Part A and

B times for completion of the test and reveals his score for Part A falling above the mean score

for his age and sex as compared to a normative sample, and for Part B, just above the mean

score (Spreen and Strauss, 1991; Kolb and Wishaw, 1985), suggesting no difficulties with set-

shifting. Figure 15 shows his word fluency score which falls 2 s.d above the mean for his age

and sex, suggesting a particular strength on the executive function of fluency.

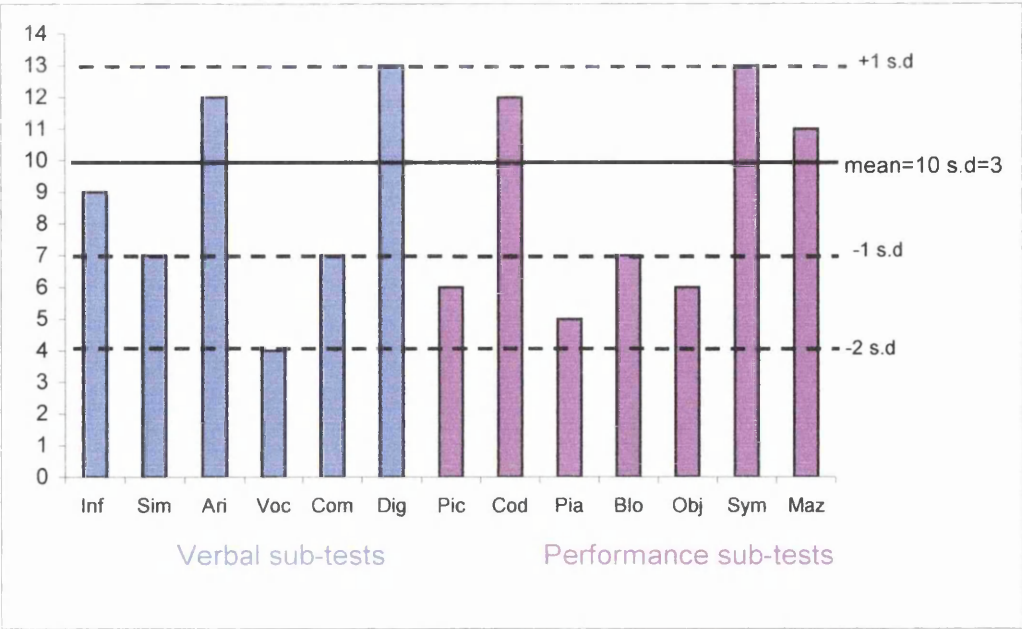Figure 11. WISC age-scaled subtest scores for Case 3

Figure 12. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), VCI Index

(VCI), POI Index (POI), FDI Index (FDI) and PSI Index (PSI) scores for Case 3.
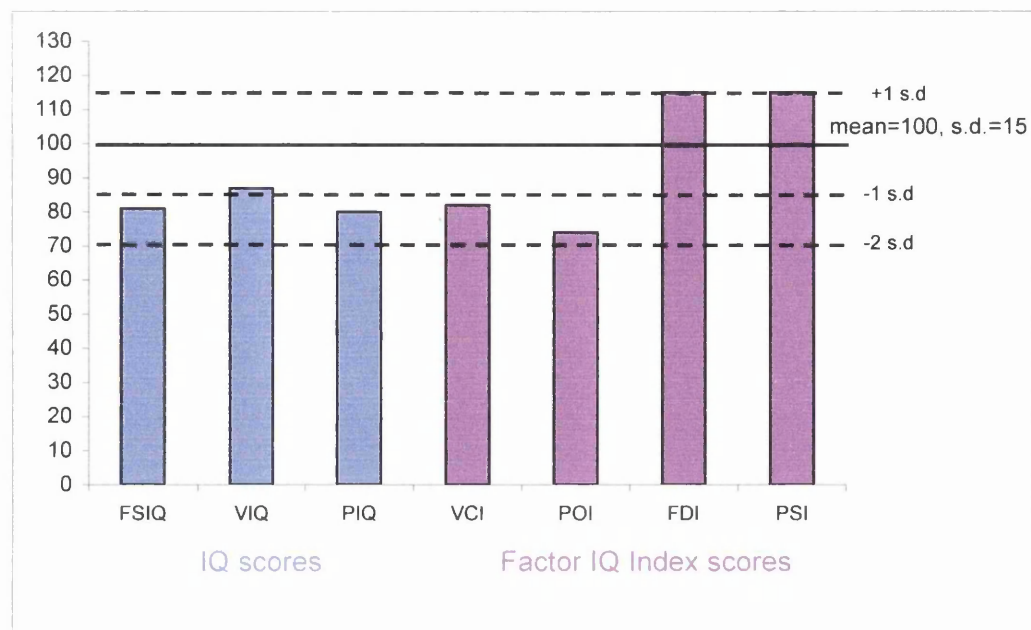
Figure 13 . Executive Function scores for Mazes, Opposite World (SW and OW) and Walk
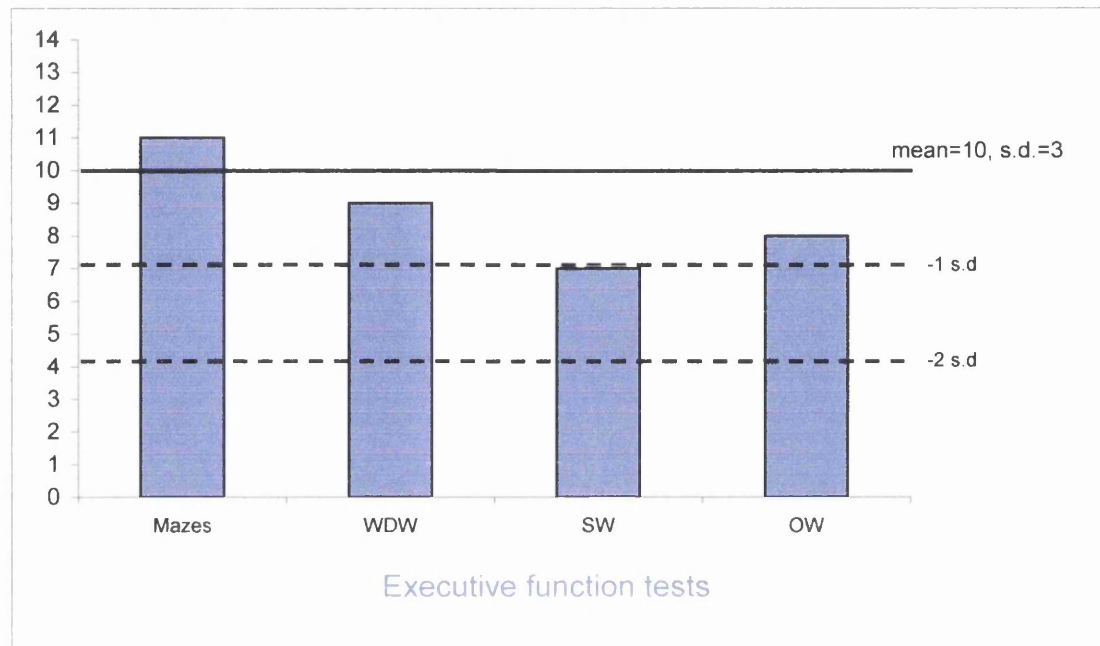
Don't Walk (WDW) for Case 3.

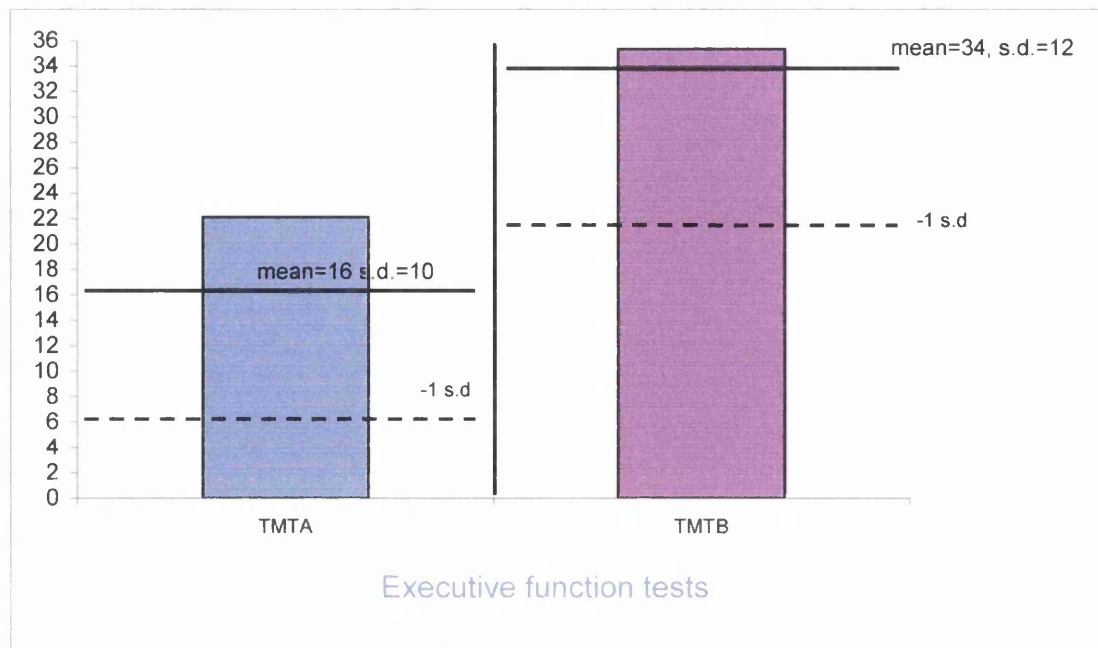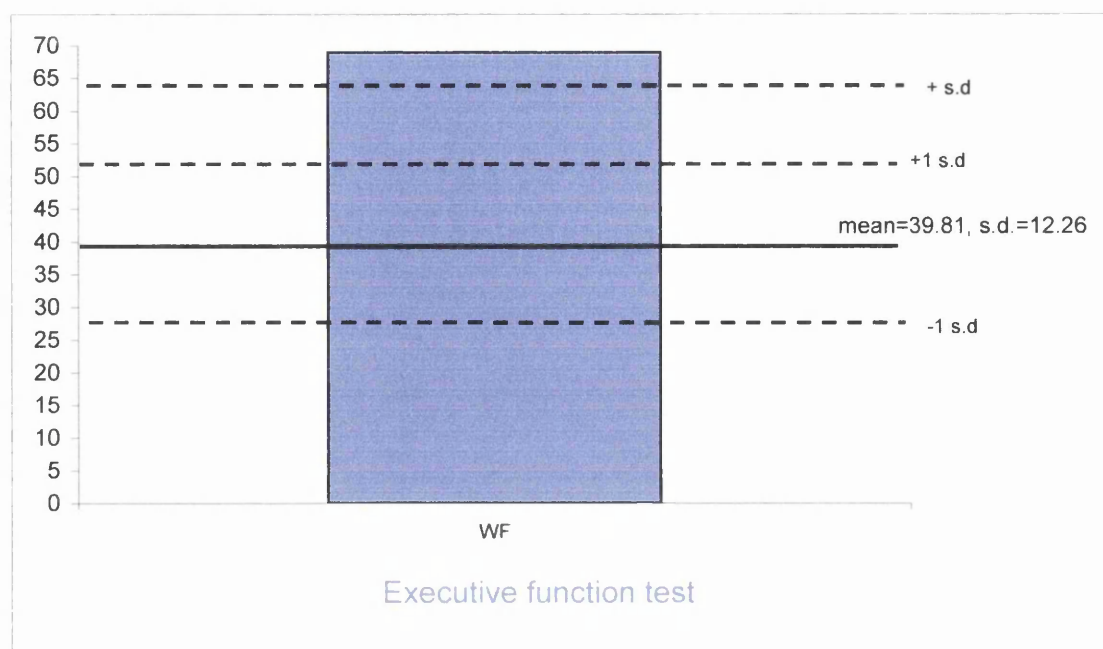Figure 14 . Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for Case 3.

Figure 15. Number of words recalled on Thurstone Word Fluency Test score Case 3.

SPD CASE 4.

DF is an 11year old boy. He is right handed, does not wear glasses and has no reported specific learning difficulty. His father was an alcoholic, had antisocial personality disorder and had made a suicide attempt. DF's sibling had no reported difficulties. The SES for their household is group II. DF has had generalised anxiety disorder since very young and PTSD following assault by peers aged 7. He appeared keen to start the testing and once he did, did not want to stop. Once again this young boy did not engage in any conversation other than what was asked of him, even when encouraged. After spending three hours with him he did not relax or seem any more at ease.

His individual WISC subtest scores can be seen in Figure 16 and reveal most of his subtest scores fall within 1 s.d of the standardisation sample mean. However, his Picture Arrangement and Mazes subtest scores are just over 1 s.d above the standardisation sample mean suggesting that DF shows relative strengths in the ability to plan and to assess non-verbal social interaction. His Vocabulary, Comprehension, Arithmetic and Digit Span are just over 1 s.d below the standardisation sample mean suggesting a relative weakness but no major impairment in these areas. An ipsative analysis reveals that there are no significant differences between his average subtest score and other subtest scores at the .05 level.

Figure 17 shows DF's Full scale, Verbal and Performance IQs and Factor Index scores. DF performs at an average level of ability in comparison to the standardised sample for his FS IQ and PIQ. There is a statistically significant difference bewteen his Verbal and Performance IQs at the .05 level, in favour of the PIQ. All of his IQ and Factor Index IQ scores fall within 1 s.d of the standardisation sample mean indicating no impairment, however, his FDI score is just over 1 s.d below the standardisation sample mean suggesting very mild difficulties with language based tests.

An analysis of simple differences between his VIQ and PIQ, and between his Factor Index scores shows:

I) For VIQ and PIQ a statistically significant difference of 17 points at the .005 level with a 19.4% frequency of this difference or greater in the standardised sample.

II) For VCI and POI a statistically significant difference of 13 points at the .005 level with a frequency of 33.7% of this difference or greater in the standardised sample.

III) For VCI and PSI a statistically significant difference of 13 points at the .05 level with a 44.6% frequency of this difference or greater in the standardised sample.

IV) For POI and FDI a statistically significant difference of 24 points at the .001 level with a 11.1% frequency of this difference or greater in the standardised sample.

V) For FDI and PSI a statistically significant difference of 24 points at the .002 level with a 14.5% frequency of this difference or greater in the standardised sample.

In summary DF is of average ability in his perceptual organisation skills, as shown by his PIQ and POI Index scores. However, he demonstrates weaknesses in his application of verbal skills and his ability to process verbal information, as well as working memory difficulties and ability to sustain attention.

Figure 18 shows DF's Mazes subtest score, which is just over 1 s.d above the standardisation sample mean suggesting a relative strength on the executive function of planning. His Walk Don't Walk test score falls within the mean range showing he has good planning ability and sustained attention skills. Figure 18 also presents his Opposite World score, which is just under 1 s.d from the standardisation sample mean suggesting a relative weakness with attentional control. His Trail Making Test scores, Part A and Part B are presented in Figure 19. DF's Part A score falls within the mean range for his age and sex as compared to a normative sample, and does his Part B, suggesting no particular difficulties with set-shifting. Figure 20 presents his Thurstone Word Fluency score, which falls just over 1 s.d below the

standardisation sample mean for his age and sex, sugggesting he has very mild difficulties

with word fluency skills.
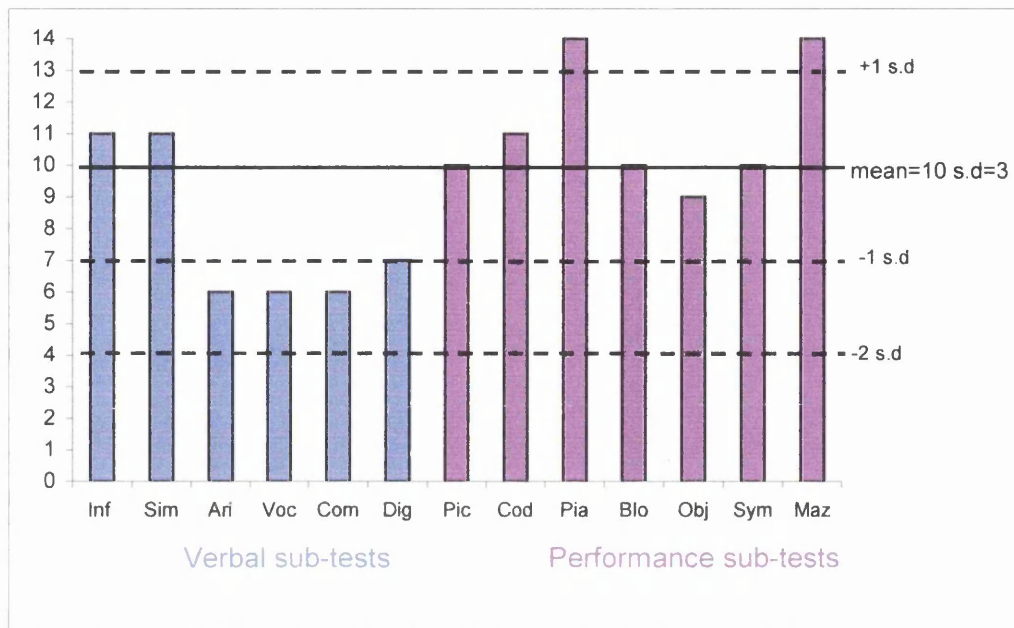
Figure 16. WISC subtest scores for Case 4.

Figure 17. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), VCI Index (VCI),

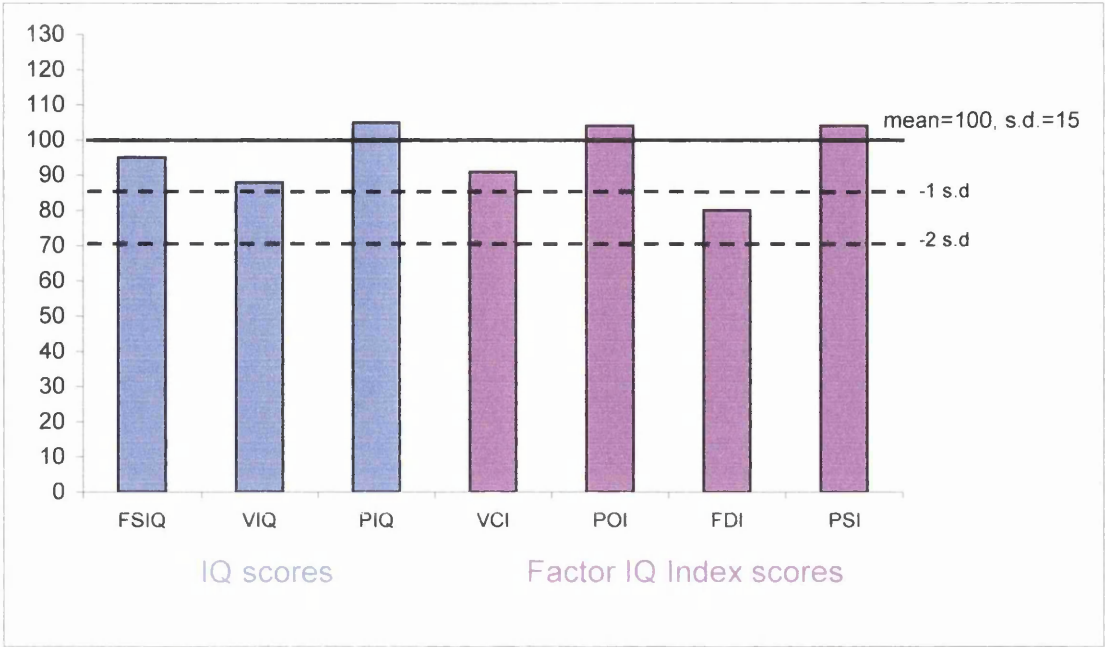POI Index (POI), FDI Index (FDI) and PSI Index (PSI) scores for Case 4.

Figure 18. Executive Function scores for Mazes, Opposite World (SW and OW) and Walk
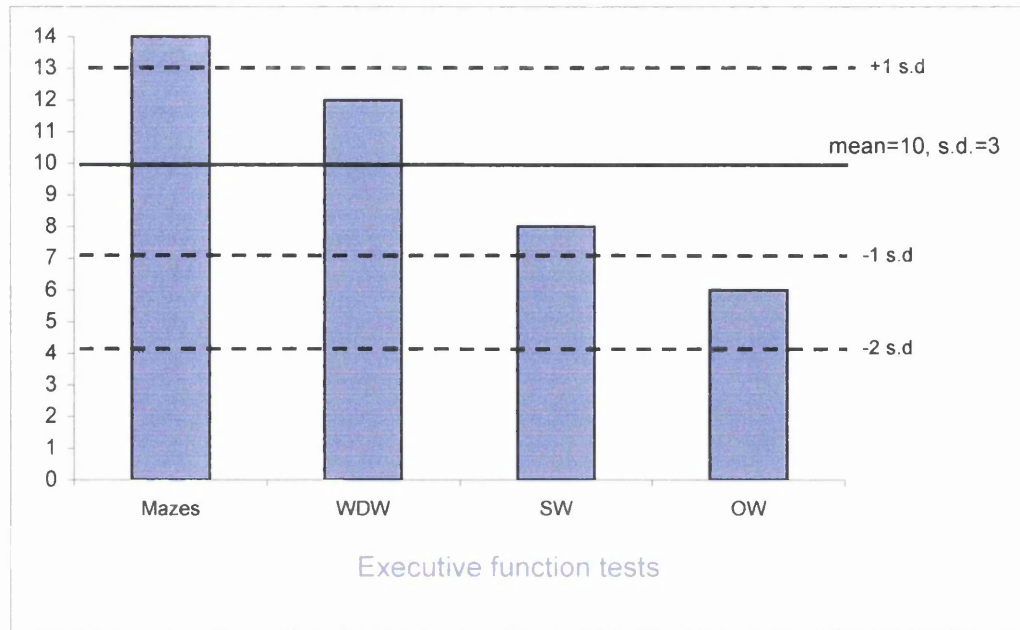
Don't Walk (WDW) for Case 4.

Figure 19. Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for
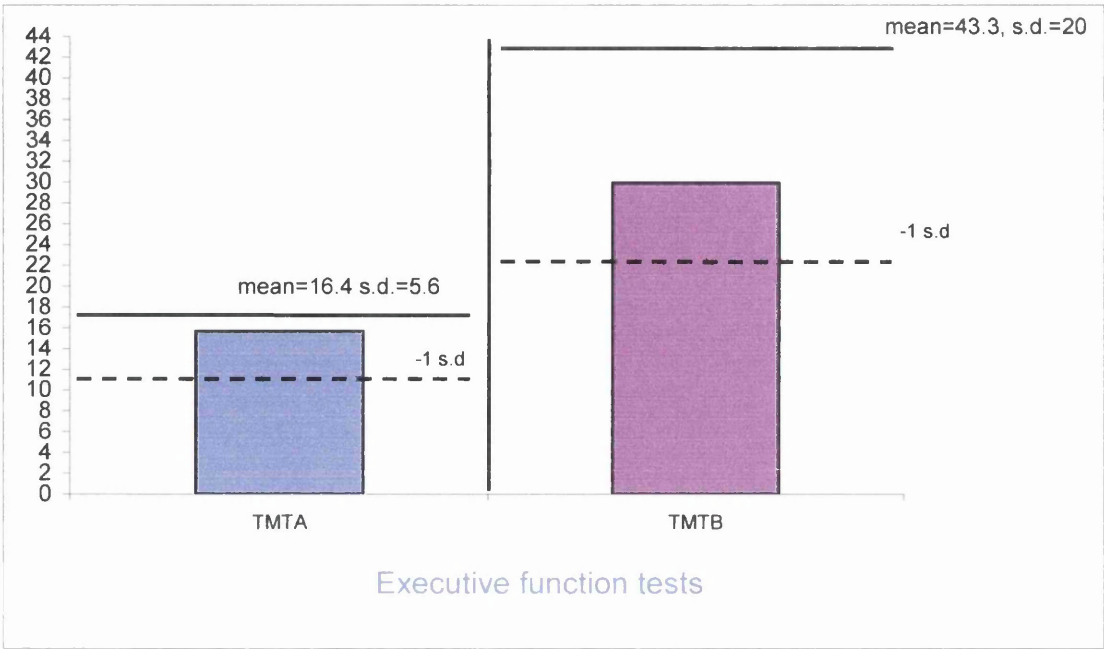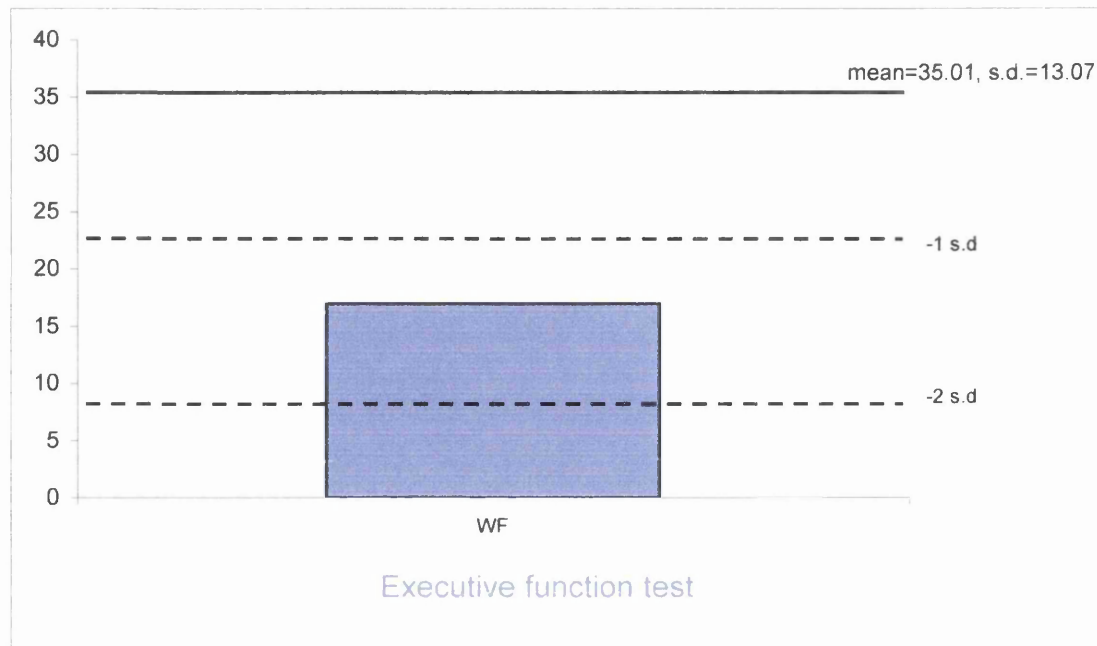
Case 4.

Figure 20. Number of words recalled on Thurstone Word Fluency Test score Case 4.

mean=35.01, s.d.=13.07

-1 s.d

-2 s.d

WF

Executive function test

SPD CASE 5.

AA is an 11 year old girl. She is right handed, does not wear glasses and has no reported specific learning difficulty. Her Mother has a diagnosis of PTSD and depression secondary to a thyroid disorder. AA's maternal Grandmother had Panic disorder with agoraphobia and her maternal Grandfather had Antisocial personality disorder. AA is an only child and the SES of the household is V. She appeared quite anxious but chatted away, commenting on the tests and tasks as the testing progressed and but often she made references to objects or people that did not link to the main theme of her conversation.

Her individual WISC subtest scores can be seen in Figure 21 and reveal a mixed profile. She shows particular relative strengths on Picture Completion which falls nearly 2 s.d above the standardisation sample mean. This test relies on the ability to visually differentiate information and on good visual concentration. Her Comprehension subtest score falls at just over 1 s.d above the standardisation sample mean and sugests a good ability in social judgement, common sense and practical knowledge. Subtests on which AA shows relative weaknesses are Mazes and Coding, which fall just over 1 s.d below the standardisation sample mean. An ipsative analysis reveals statistically significance difference bewteen her average subtest score(9.53) and her Picture Completion subtest score(15), her Comprehension subtest score(14) and her Coding subtest score(6) at the .05 level.

Figure 22 shows AA's Full scale, Verbal and Performance IQs and Factor Index scores. She performs at an average level of ability as compared to the standardised sample on the 3 IQ scores (FS IQ= 103, VIQ= 103, and PIQ=99). There is a no statisticallly significant difference between her VIQ and PIQ at the .05 level. All of her IQ and Factor Index IQ scores fall within the mean range indicating no impairment, apart form her FDI and PSI scores which are nearly 2 s.d below the standardisation sample indicating some relative weaknesses in these areas.

122

An analysis of simple differences between the Factor Index scores shows:

i)   For VCI and POI a non-significant difference of 3 points with 85.5% frequency of this difference or greater in the standardised sample.

ii) For VCI and FDI a statistically significant difference of 25 points at the .001 level with a 6.8% frequency of this difference or greater in the standardised sample.

iii) For VCI and PSII a statistically significant difference of 25 points at the .001 level with a 13.1% frequency of this difference or greater in the standardised sample.

iv) For POI and FDI a statistically significant difference of 22 points at the .005 level with a 14.1 % frequency of this difference or greater in the standardised sample.

v)   For POI and PSI a statistically significant difference of 22 points at the .005 level with a 16.6 % frequency of this difference or greater in the standardised sample.

In summary, AA is of average ability in verbal comprehension and perceptual organisation as indicated by her FSIQ, VIQ and PIQ. Her strengths lie in her application of verbal skills and solution of problems and in her ability to think in terms of visual images, whilst her weaknesses lie in her ability to sustain attention, to self monitor and to shift mental operations.

Executive Function

Figure 23 presents AA's Mazes subtest score is just over 1 s.d below the standardisation sample mean indicating a relative weakness in her planning ability. Her Opposite World test score falls 3 s.d below the standardisation sample mean as can be seen in Figure 23 indicating a definite weakness with her ability to inhibit automatic responses. AA's score on the Walk Don't Walk Test is 1 s.d below the standardisation sample mean indicating no difficulty with sustained attention. Figure 24 presents her TMT Part A and B scores: she performs within 1 s.d of the standardisation sample mean for Part A and just below 1 s.d below the

standardisation sample mean for her age and sex for Part B suggesting no impairment on this

executive function measure. Similarly, her Thurstone Word Fluency score falls within 1 s.d

from the standardisation sample mean range for her age and sex.

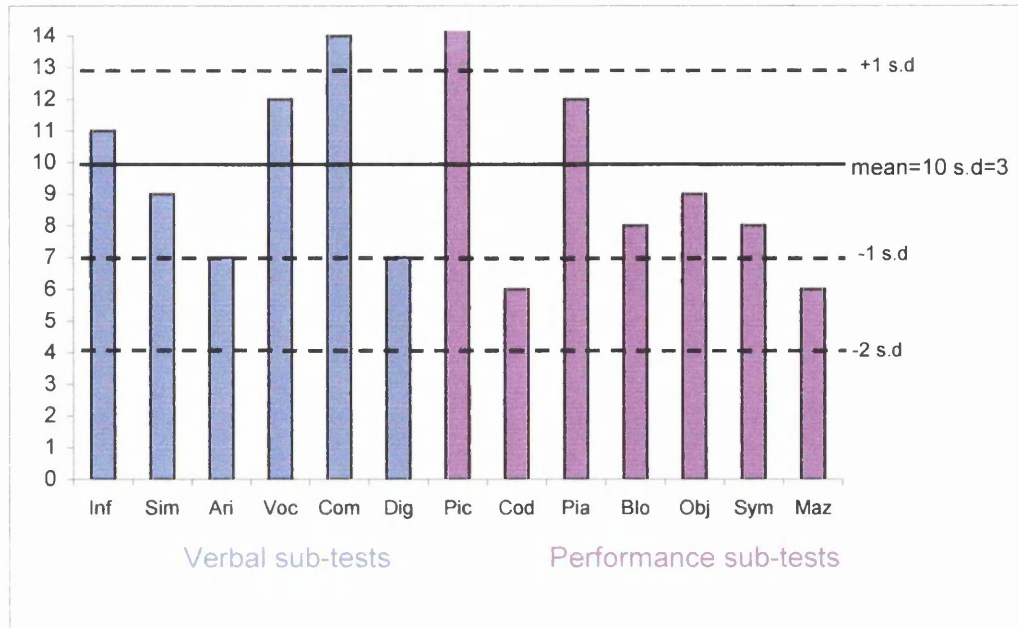Figure 21. WISC subtest scores for Case 5.

Figure 22. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), VCI Index (VCI), POI Index (POI), FDI Index (FDI) and PSI Index (PSI) scores for Case 5.

Figure 23. Executive Function scores for Mazes, Opposite World (SW and OW) and Walk Don't Walk (WDW) for Case 5.
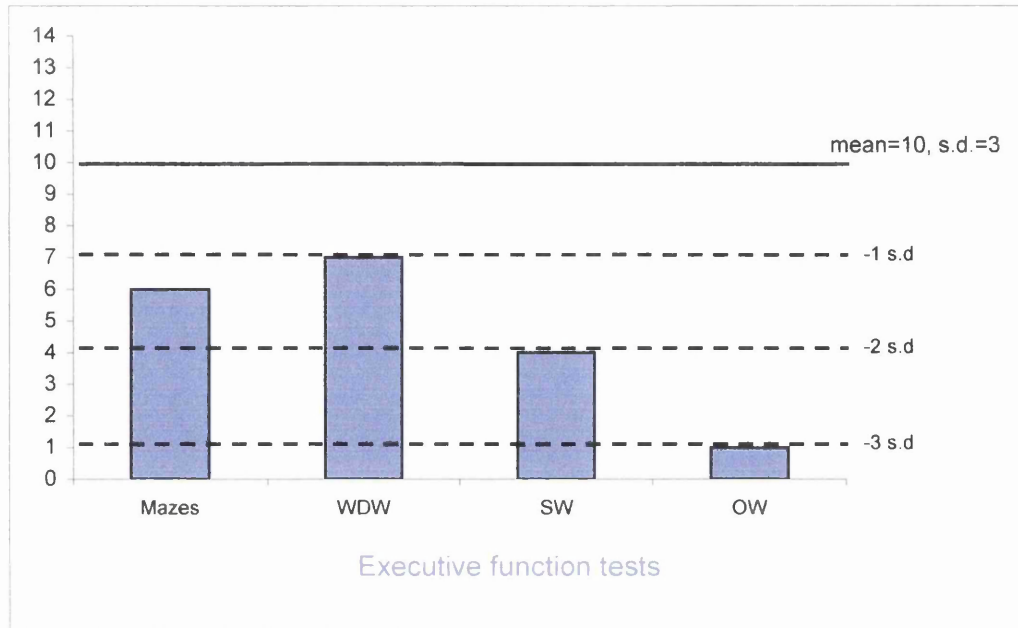
Figure 24. Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for Case 5.
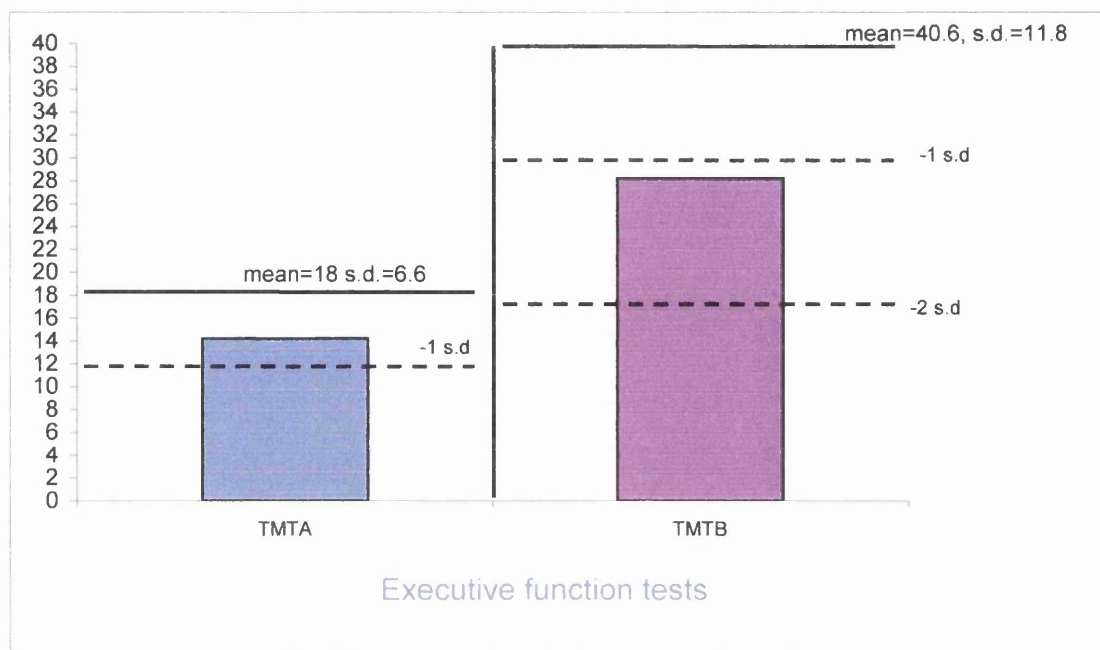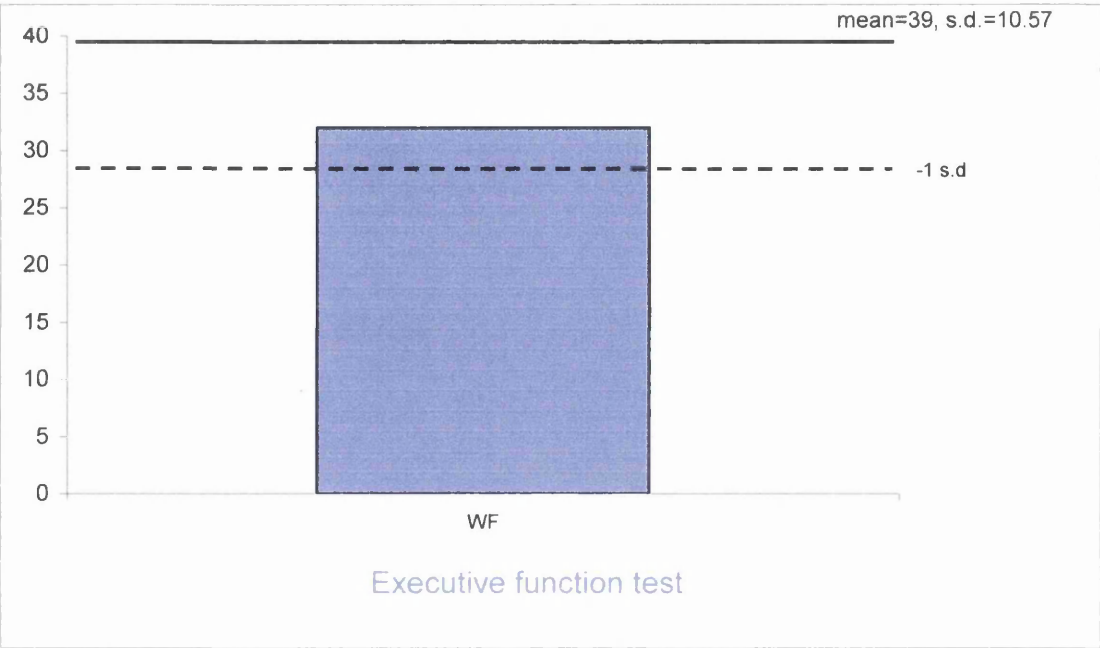
Figure 25. Number of words recalled on Thurstone Word Fluency Test score Case 5 .

SPD CASE 6.

PP is an 8 year old boy. He is right handed and does not wear glasses. A learning difficulty has not previously been reported.His mother has chronic depression and depression is reported in both maternal grandparents,in a maternal uncle,and in a number of cousins. A half-brother has a diagnosis of conduct disorder and learning difficulties. His father was a shy man with significant alcohol problems. The SES for their household is V. PP has had a history of longstanding social anxiety and social isolation and possible schizophrenic or psychotic symptoms since aged 6-7 years. He did not appear anxious. It was sometimes difficult to follow his train of thought and he would often refer to animals or people in his family as answers to questions. Some of the tests he clearly could not complete, but he appeared oblivious to his limitations.

PP's WISC subtest scores can be seen in Figure 26 and reveal a very mixed pattern. Only 6 of his subtest scores fall within 1 s.d from the standardisation sample mean. His other subtest scores are of a varied profile. For example, he did not score at all for the Block Design subtest, a test requiring spatial problem solving abilities, and scored only 1 point for the Object Assembly subtest, again a task requiring visual -motor co-ordination, and 2 points on the Picture Arrangement subtest, a task requiring planning and the ability to assess non-verbal information. These tests were 3 and 2 s.d below the standardisation sample mean respectively suggesting an impaired ability across these areas. His Arithmetic subtest score was 1 s.d below the standardisation sample mean. An ipsative analysis reveals a statistically significant difference between his average subtest score (5.76) and his Block Design and Object Assembly subtests at the .05 level.

Figure 27 shows PP's Full scale IQ, and Verbal and Performance IQ, and Factor Index scores. His Full scale IQ and Performance IQ fall in the exceptionally low range of ability, whilst his Verbal IQ falls in the low average range. There is a statistically significant difference between his Verbal and Performance IQ scores at the .05 level in favour of the VIQ. His VIQ, VCI , FDI and his PSI Index scores are just over 1 s.d below the standarisation sample mean,indicating none or very mild difficulties, whilst his PIQ, FSIQ are 2 s.d and his POI 3 s.d below the standardisation sample mean indicating impairments in these areas.

An analysis of simple differences reveals:

i) For Verbal and Performance IQs a statistically significant difference of 23 points at the .001 level with a 12.3% frequency of this difference or greater in the standardised sample.

ii) For VCI and POI a statistically significant difference of 27 points at the .001 level with a frequency of 4.7% or greater of this difference in the standardised sample.

iii) For POI and FDI a statistically significant difference of 21 points at the .01 level with a frequency of 18.4% or greater of this difference in the standardised sample.

iv) For POI and PSI a statistically significant difference of 27 points at the .001 level with a 10.3% frequency or greater of this difference in the standardised sample.

In summary PP's overall ability was poor. His ability to process verbal information is at a relatively low level as is his ability to think in relatively abstract terms, and visual motor organisation.

Figure 28 shows his performance on the Mazes subtest as being within 1 s.d from the standardisation sample mean indicating intact planning skills. However, he performs particularly poorly on the Opposite World test with a test score just over 2 s.d below the standardisation sample mean, indicating a weakness in the attentional control and inhibition domain. PP 's score on the Walk Don't Walk test is just over 1 s.d from the standardisation sample mean showing some relative weakness in sustained attention. Figure 29 presents his TMT Part A and B scores and shows that his Part A score is 2 s.d above the standardisation

sample mean for his age and sex, and that he could not complete Part B, suggesting that he

has difficulties shifting mental set quickly. Figure 30 presents his Thurstone Word Fluency

score which is just over 1 s.d below the standardisation sample mean showing very mild

difficulty in his word finding ability. It was difficult to determine whether PP did infact have a

learning disability, or whether his particular symtomatology, i. e. thought disorder, made it

difficult for him to concentrate and understand what the tasks required of him. Since PP was

tested he has been admitted to a residential unit where he is being assessed. He has been

administered anti-psychotic medication and his thought disorder has diminished.

Figure 26. WISC subtest scores for Case 6.
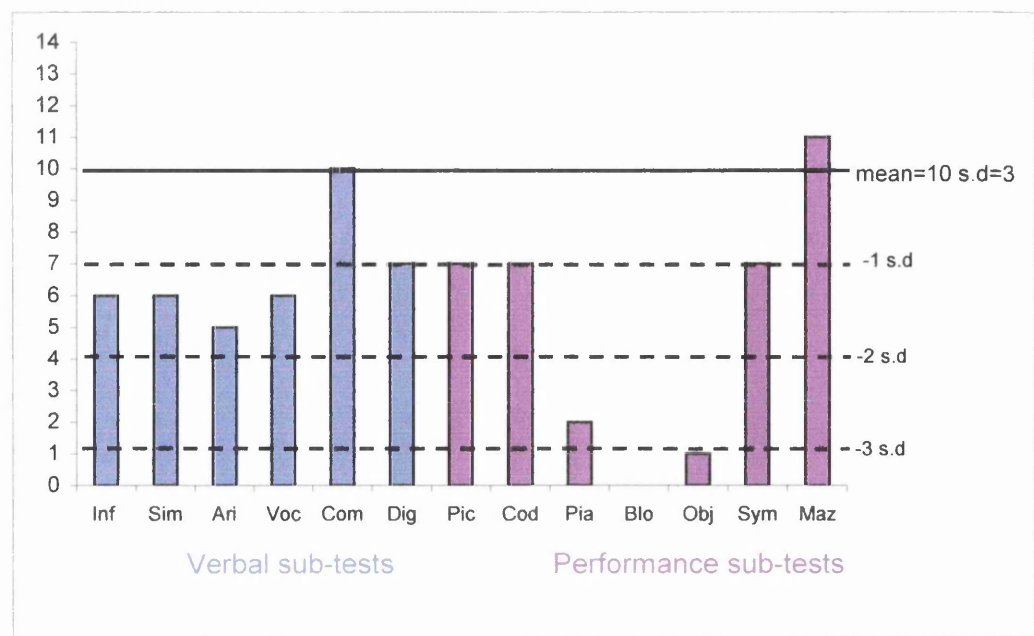
Figure 27. WISC Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), VCI Index

(VCI), POI Index (POI), FDI Index (FDI) and PSI Index (PSI) scores for Case 6.
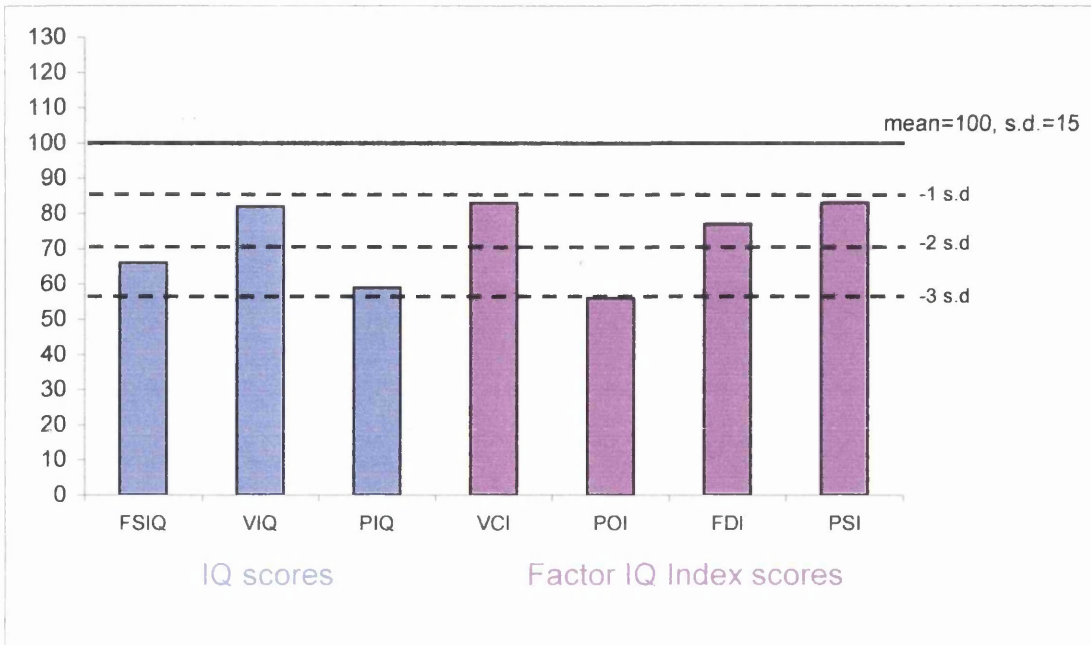
Figure 28. Executive Function scores for Mazes, Opposite World (SW and OW) and Walk Don't
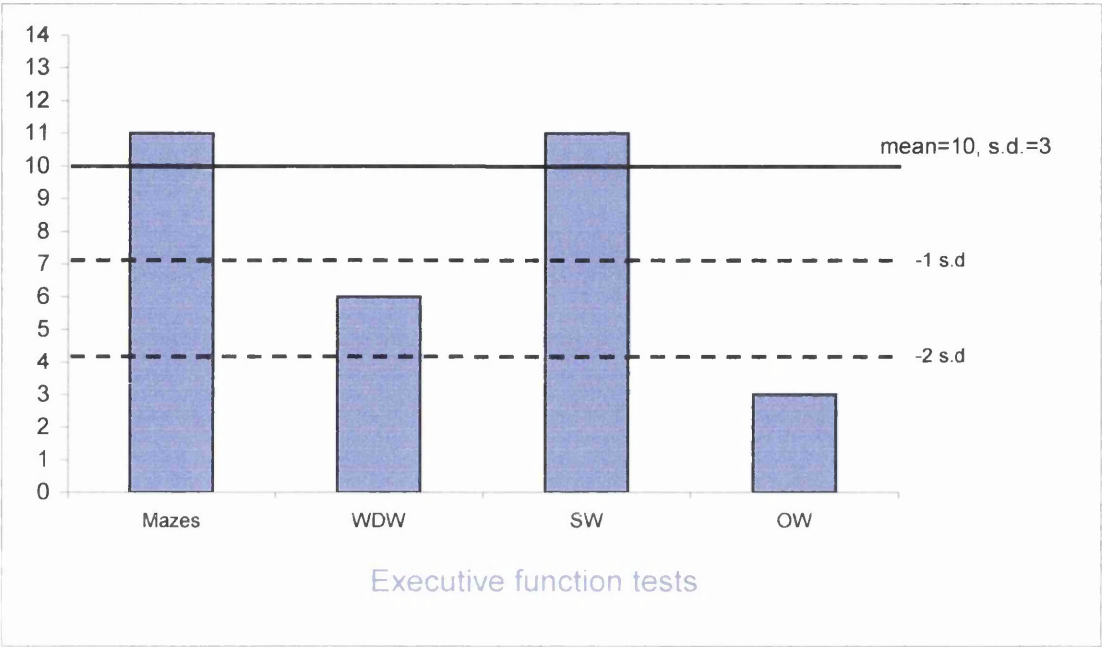
Walk (WDW) for Case 6.

Figure 29. Time taken to complete Trail Making Test Part A (TMTA) and Part B (TMTB) for
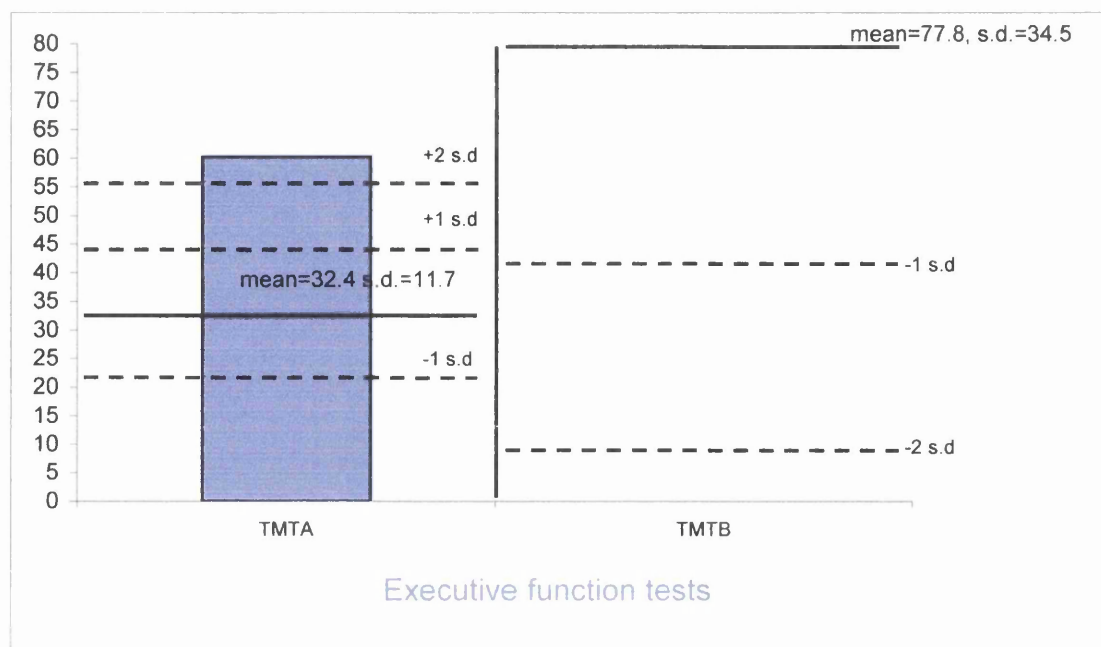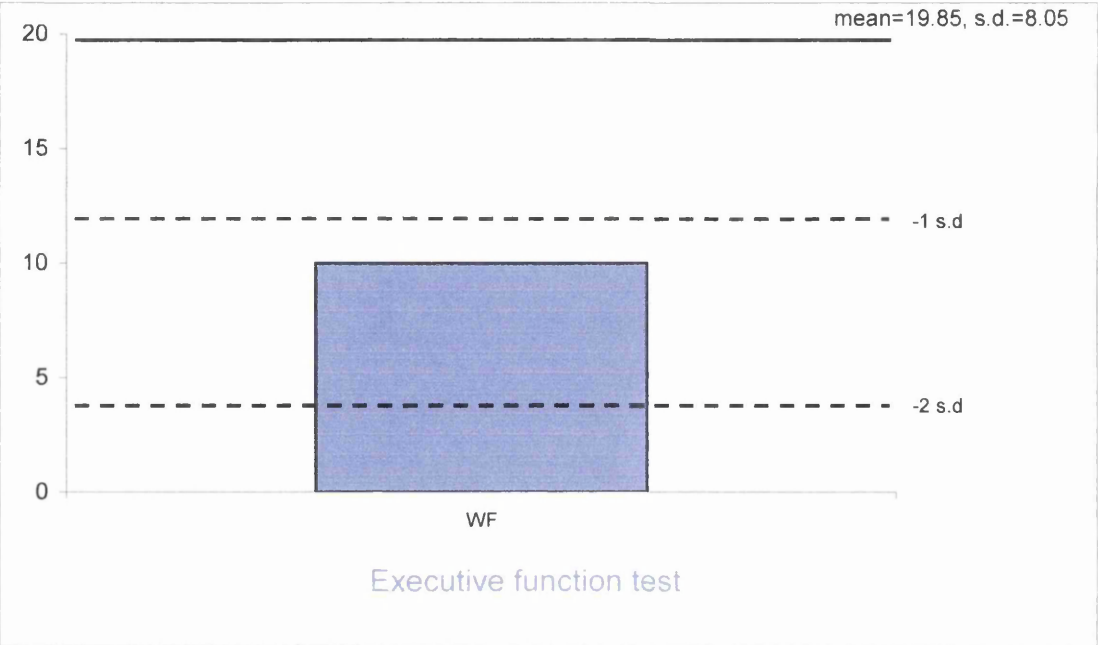
Case 6.

Figure 30. Word recall on Thurstone Word Fluency for Case 6.

Group Profiles

WISC

Figure 31 presents the FSIQ, VIQ and PIQ for each of the 6 cases. Only two children have

FSIQ's more than 1 s.d below the standardisation sample mean. Case 3 has an FSIQ score 1

s.d below the standardisation sample mean score and Case 6 has an FSIQ score 2 s.d below

the standardisation sample mean score, suggesting that for this group of children with SPD,

apart from Case 6, FSIQ appears to be intact. Only Case 6 has a VIQ 1 s.d below the

standardisation sample mean. This is not significantly impaired, suggesting that for this group

of children with SPD, VIQ appears to be intact. Two children have PIQ's below the

standardisation sample mean: Case 3 has a PIQ just over 1 s.d below the standardisation

sample mean and Case 6 has a PIQ nearly 3 s.d below the standardisation sample mean

suggesting that for this group of children with SPD, apart from Case 6, PIQ appears to be

intact. As can be seen in Figure 31 two children present with VIQ versus PIQ discrepancies.

Case 6 has a statistically significant discrepancy of 23 points at the .05 level in favour of

VIQ.Case 4 has a statistically significant discrepancy of 17 points at the .05 level in favour PIQ,

suggesting that with this group of children with SPD there appear to be no uniform VIQ versus

PIQ discrepancies. Case 3 does present with a VIQ versus PIQ discrepancy of 7 points but

this is not statistically significant.

Figure 31. WISC FSIQ, VIQ and PIQ's for each case of 6 SPD children.
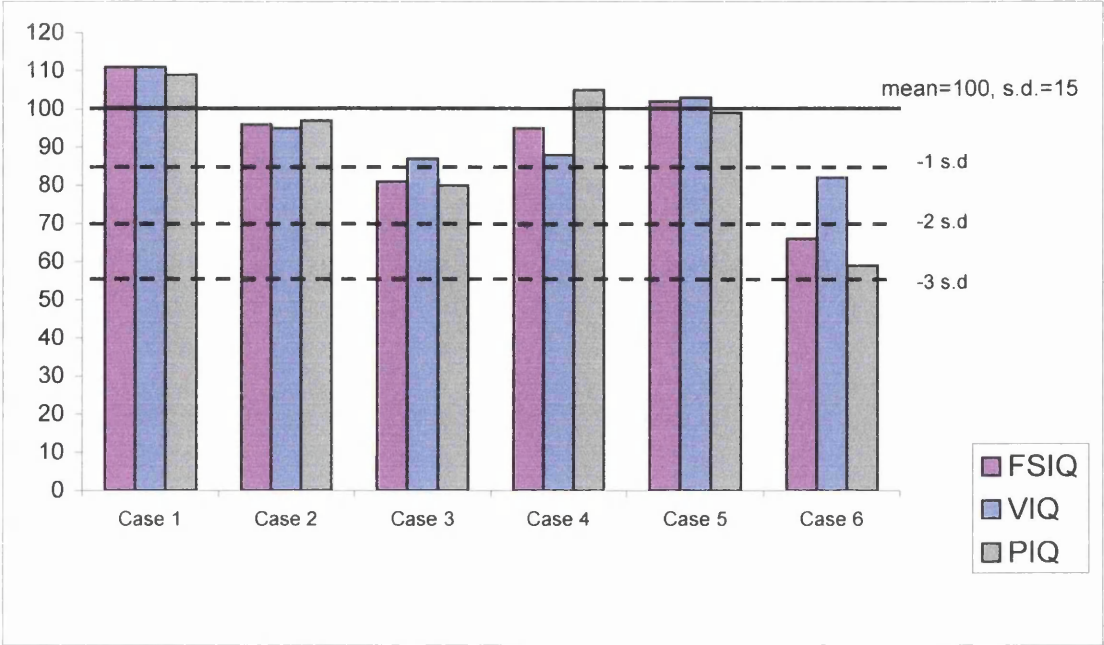
Figure 32 presents the four Factor Index, POI, FDI, PSI and VCI scores for each of the 6 cases. Only 1 child, Case 6, scores 2 s.d below the standardisation sample mean for the POI Factor Index score, suggesting significant perceptual difficulties. 3 children, Cases 4, 5 and 6 score just over 1 s.d below the standardisation sample mean for the FDI Factor Index score suggesting that for half of this group of children with SPD there is the possibility of very mild difficulties with the ability to sustain attention. Figure 32 also shows that for the PSI Factor Index score, none of the children present with difficulties with processing information quickly. Only Cases 3 and 6 have VCI scores that are 1 s.d below the standardisation sample mean, suggesting that none of the children have difficulties with verbal comprehension.

Figure 32. WISC age-scaled VCI, POI, FDI, and PSI Factor Index scores for each case.
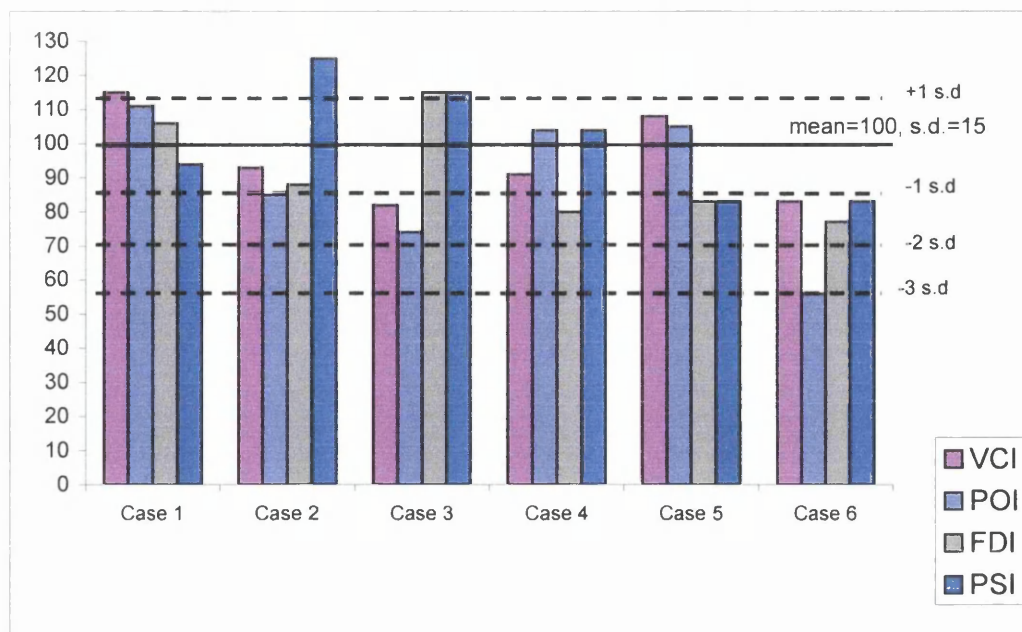
Executive Function Measures

Figure 33 presents the age-scaled Mazes scores for each of the 6 Cases. One child, Case 4

scores 1 s.d above the standardisation sample mean showing good ability at this executive

function measure of planning. Case 2's score is 2 s.d below the standardisation sample mean

score indicating impairment on the task and Case 5 has a score 1 s.d below the

standardisation sample mean suggesting that for this group of children with SPD, the executive

function of planning cannot be regarded as a core impairment.

Figure 33. Age-scaled Mazes scores for each Case.
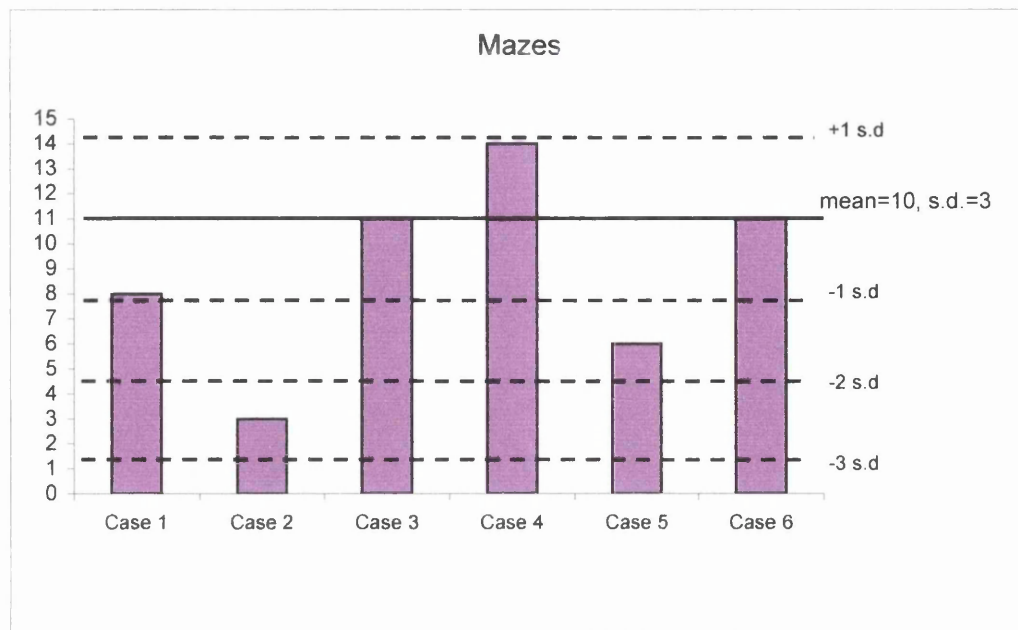
Figure 34 presents the age-scaled scores for the two parts of the Opposite World task

(Opposite World and Same World) for each of the 6 Cases. 3 of the children, Cases 1, 2 and 4

have scores on the Opposite World part of the test 1 s.d below the standardisation sample

mean and 2 children, Cases 5 and 6 have scores 2 s.d below the standardisation sample

mean suggesting that this group of children with SPD only two have difficulties with the

executive function measure of inhibition.

Figure 34. Age-scaled scores for the Opposite World test (Opposite World and Same World) for each child.
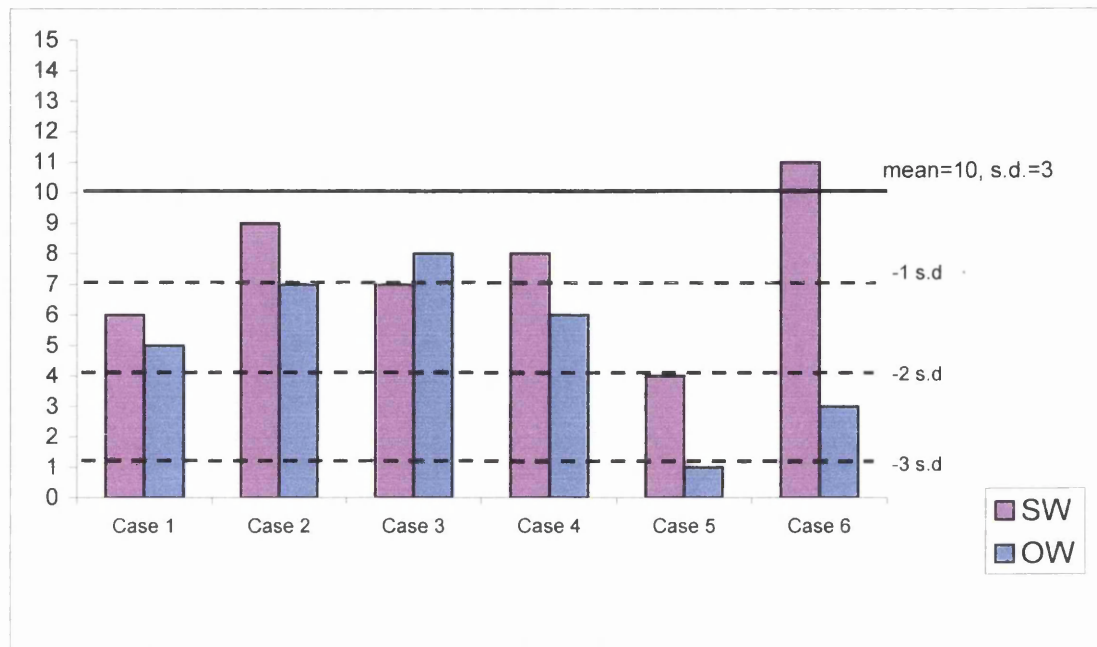
Figure 35 presents the scores for each Case for Part A and B of the Trail making Test converted to z scores. Case 6 could not complete the score suggesting some difficulty for this child, but not for the group as a whole.

Figure 35. Mean scores for Part A and B of the Trail Making Test for each Case converted to z scores.
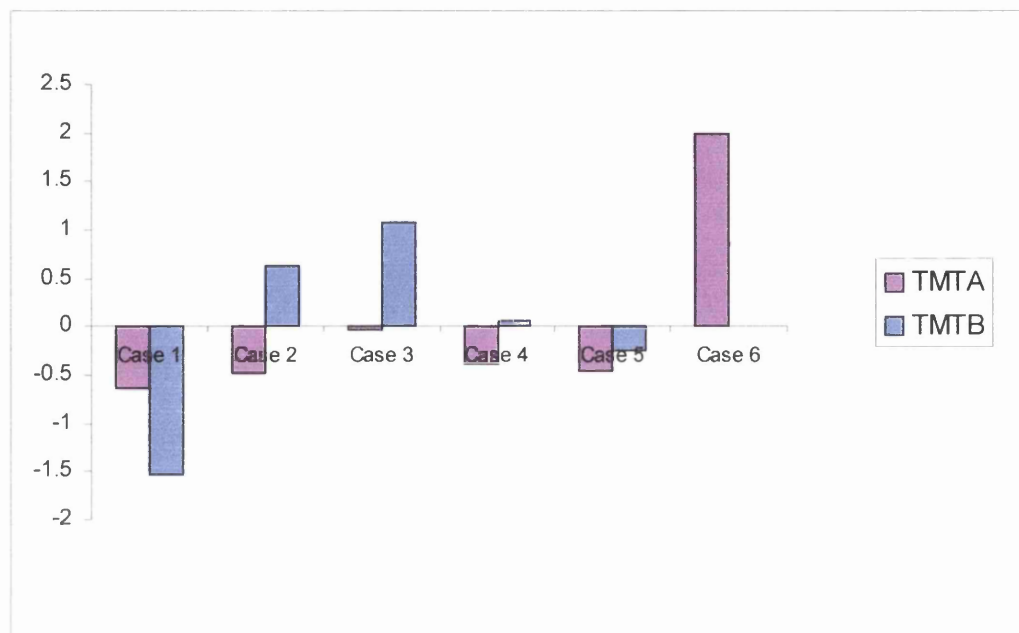
Figure 36 presents the age-scaled scores for the Walk Don't Walk test for each of the 6 children. Only 2 of the children, Cases 5 and 6 score 1 s.d or more below the standardisation sample mean suggesting that for this group of children with SPD, the executive function of sustained attention may be intact.

Figure 36. Age-scaled scores on the Walk Don't Walk test for each Case.
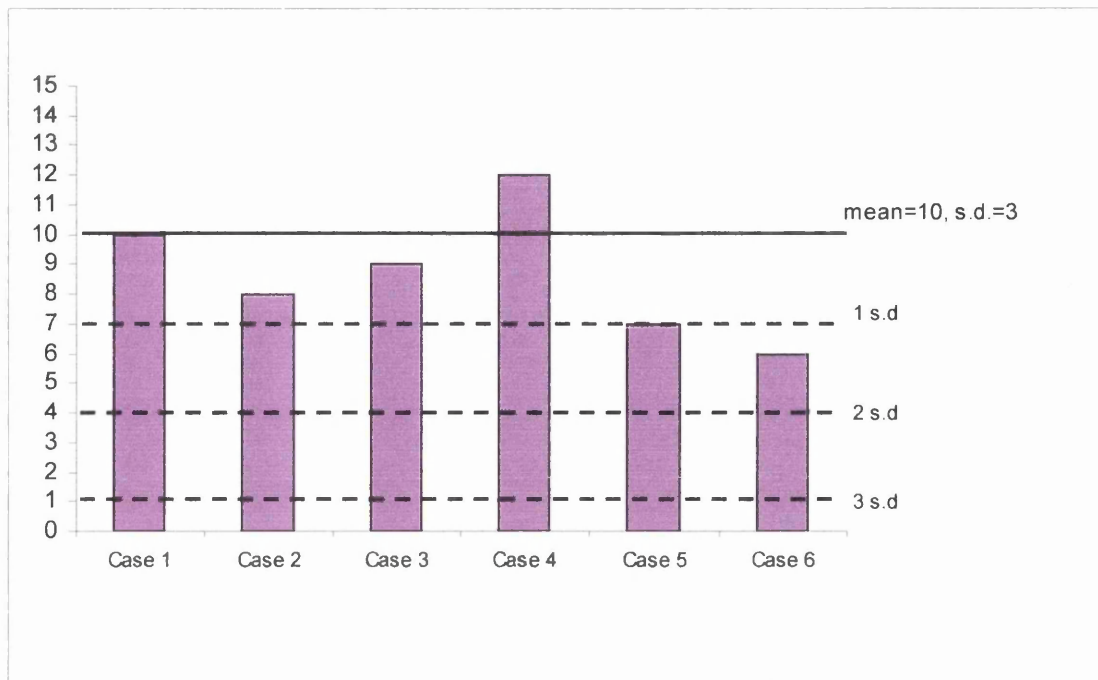
Figure 37 presents the number of words recalled for each of the 6 children on the Thurstone

Word Fluency test, which have been converted to z scores. Only 2 of the children, Cases 4

and 6, have scores which fall 1 s.d below the standardisation sample mean. Two other

children, Cases 1 and 3 have scores 1 and 2 s.d above the standardisation sample mean,

respectively. The other 2 children, Case 2 and 5 are within the mean range, suggesting that for

this group of children with SPD, this executive function of fluency is intact.

Figure 37. Scores for each SPD child on The Thurstone Word Fluency converted to z scores.

Summary of Tests the SPD Children Perform Poorly on Relative to the Standardisation Sample Mean

Figure 38 presents the WISC Factor Index, FSIQ, VIQ and PIQ scores, and the executive function scores, the children perform poorly on relative to the standardisation sample mean. The WISC subtests will be outlined further in the Discussion section below.

The large black circle contains the sample population (the 6 cases) and 4 circles representing the VCI, PSI, POI and FDI Factor Index's. The black circle marked POI, contains two smaller circles marked Case 3 and Case 6: they both perform poorly on the POI Factor Index relative to the standardisation sample mean. The coloured circles marked FDI, VCI and PSI do not contain any smaller circles as none of the 6 cases performed poorly on these Factor Index's relative to the standardisation sample mean. Cases 5, 2, and 6 contain those executive function tests and FSIQ and PIQ scores they perform poorly on relative to the standardisation sample mean. Case 2 performs poorly on the Mazes executive function task relative to the standardisation sample mean and Cases 2 and 6 perform poorly on the Opposite World task relative to the standardisation sample mean. Case 6 performs poorly on a number of tasks.

CHAPTER 4

DISCUSSION

The aim of this study was to describe in detail the neuropsychological profiles and deficits or anomalies present in a group of children and adolescents with a diagnosis of SPD. Specifically, it examined whether distinctive executive function deficits, Verbal Vs Performance discrepancies, WISC subtest strengths or weaknesses, or Factor Index score differences are evident in participants with this disorder. Six children who met diagnostic criteria for SPD were assessed on a battery of neuropsychological measures designed to evaluate IQ and executive function.

Controversy over whether to place SPD with the Schizophrenia Spectrum Disorders or with the Pervasive Developmental Disorders is documented in the research literature. Van der Gaag (1993) states that SPD can be hard to differentiate from other personality disorders and Asperger's syndrome. However, some genetic and language studies argue that it is possible to distinguish SPD from other disorders and place it on a continuum with schizophrenia. Diagnostic validity is strengthened if distinct neuropsychological profiles can be demonstrated. Studies have described particular IQ and executive function deficits in participants with schizophrenia and Asperger's, and in adult participants with SPD. However, there have been mixed results across studies and therefore a clear profile for each disorder is hard to delineate.

Figure 38. Summary of tests the 6 cases perform poorly relative to the standardisation sample mean.

POI=PERCEPTUAL ORGANISATION INDI
FDI=FREEDOM FROM DISTRACTIBILITY
PSI=PROCESSING SPEED INDEX
VCI=VERBAL COMPREHENSION INDEX

OP=OPPOSITE WORLD

M=MAZES

VIQ=VERBAL IQ

PIQ=PERFORMANCE IQ

WDW=WALKDONTWALK
TWF=TWORDFLUENCY
TMT=TRAILMAKINGTEST
FSIQ=FULLSCALEIQ
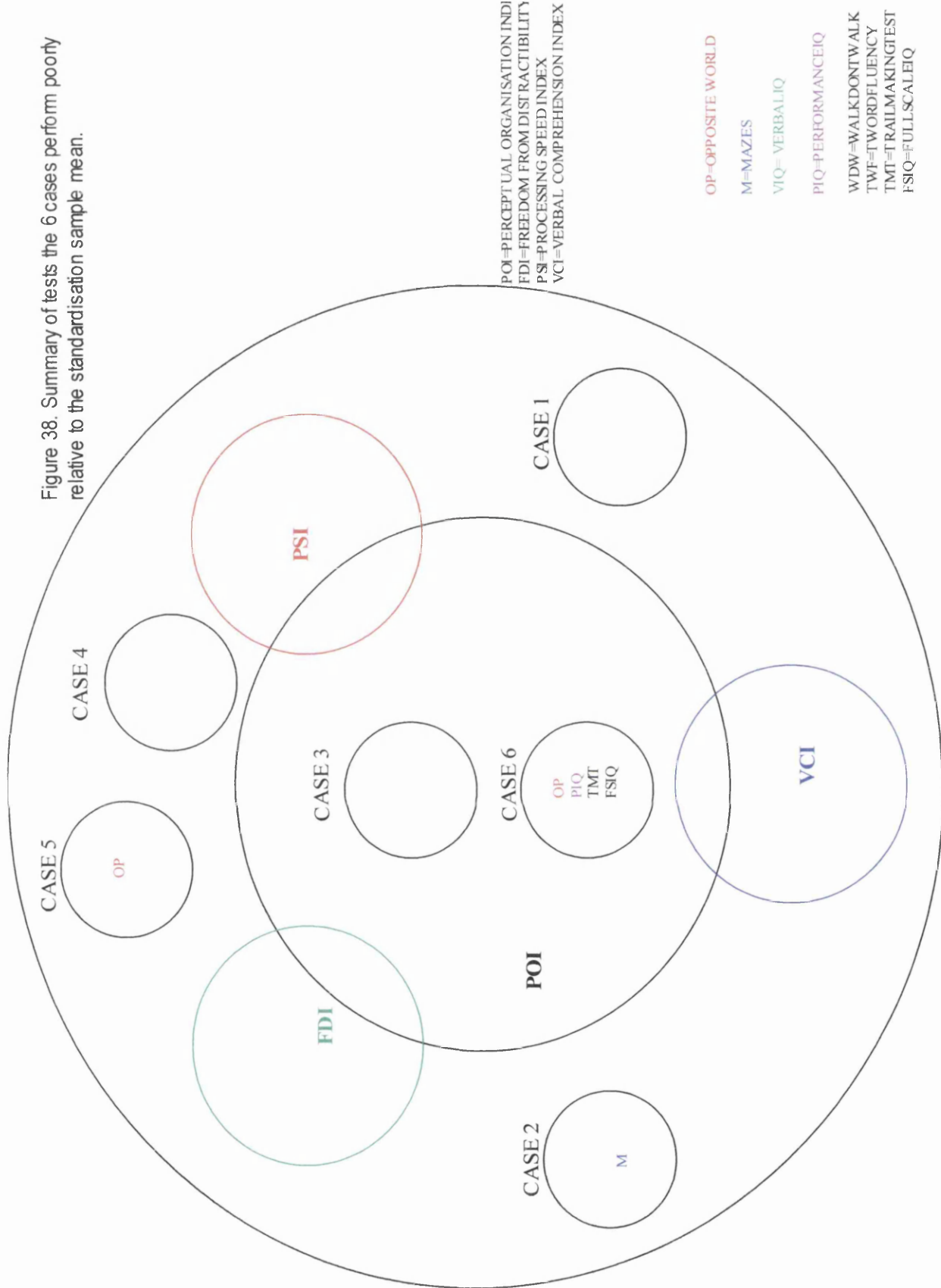
Nevertheless, if a profile of deficits could be described in children with SPD which were at all

similar to those found in adult and child participants with schizophrenia or adults with SPD and

different to those found in children with Asperger's, then this might contribute to the

differentiation of the diagnosis of SPD from the Pervasive Developmental Disorders. This

would therefore give support to the disorder being part of the Schizophrenia Spectrum

Disorders.

Specifically, the purpose of this study was to document any neuropsychological deficits that

would add to the nosological validity of the disorder.

In the next section summaries of the known WISC profiles of individuals with autism/Apergers,

schizophrenia and SPD will be discussed and compared with the WISC profiles of each SPD

Case, concluding with a SPD group summary that will be examined in light of the Hypothesis 2.

This format will then be followed for the executive function measures. Following this will be a

section on how these results support or do not support a neuropsychological profile of SPD

and how this profile does or does not support the diagnostic validity of the disorder in light of

Hypothesis 1. An exploration of how these results fit with the cognitive psychological theories

and supoport or discount Hypothesis 3 will come next, followed by a critique of the study, and

ending with the clinical implications of the results and a summary and conclusion.

Is SPD Related To The Schizophrenia Spectrum Of Disorders or The Pervasive Developmental Disorders?

IQ

As outlined above, research into the cognitive abilities of children and adults with autism and

Asperger syndrome using the WISC outline specific peaks and troughs on subtests, VIQ

versus PIQ differences, strengths and weaknesses, and certain factor profiles. Some studies

have demonstrated that children and adults with autism have a Verbal versus Performance IQ

discrepancy in favour of the Performance IQ scale, whilst Asperger's participants demonstrate

a Verbal versus Performance discrepancy in favour of the Verbal IQ scale. Specific WISC

subtest profiles have also been reported by researchers including for the Verbal scale, low

subtest scores for Comprehension and high subtest scores for Digit Span, and for the

Performance scale, low subtest scores for Picture Arrangement or Coding/Digit Symbol and

high subtest scores for Block Design. Recent research that adopts the factor analytic

methodology outlined by Kaufman (1990), also reports specific strengths and weaknesses on

the subtests associated with specific factor scales. Asperger's participants have demonstrated

good performance on the Verbal Comprehension Factor and poor performance on the

Perceptual Organisation, Processing Speed and Freedom from Distractibility Factors

For individuals with schizophrenia, a different, although not conclusive, WAIS or WISC profile

has been presented. As reported above, Peuskens et al. (1999), report that participants with

schizophrenia perform significantly worse on the WAIS-R subtests of Comprehension,

Arithmetic, Digit Symbol, Picture Completion, Picture Arrangement and Object Assembly and

consequently had lower scores on the POI Factor Index. Another study reveals WAIS

Vocabulary subtest as being significantly different from all of the other subtests for participants

with schizophrenia. However, as noted above there is a lack of studies that explore WAIS or

WISC subtest profiles in participants with schizophrenia and therefore comparisons are limited.

In addition, other research indicates lowered Full Scale IQ but a mixed profile of Verbal Vs

Performance discrepancies with either VIQ higher than PIQ or VIQ lower than PIQ for

participants with schizophrenia. Some studies also report better VIQ than PIQ for individuals

with paranoid schizophrenia, suggesting that sub-types within the Schizophrenia Spectrum

Disorder may have different neuropsychological profiles.

In children diagnosed with schizophrenia there has also been a mixed profile of reported IQs.

Some studies have described IQ's within the normal range, whilst others have reported

borderline IQ's. PIQ has been reported as higher than VIQ in children with schizophrenia with a

FSIQ higher than 75, and with children with schizophrenia with a FSIQ lower than 75 the reverse has been reported. It is also important to consider whether the VIQ versus PIQ discrepancies reported in schizophrenia and Asperger's/autism are an artefact of differing IQ levels rather than a disorder specific cognitive deficit. For example, the absence of the prototypic VIQ<PIQ in Siegel, Minshaw and Goldsteins study (1996) with participants with Asperger's could be explained by the fact that their eligibility criteria required participants demonstrate VIQ and FSIQ scores of at least 70 which may have eliminated the lower ability individuals with autism in whom the VIQ<PIQ has been shown to be found. However, some studies with participants with Aspegers/autism have required only Full Scale IQ be greater than 70 and have found a 14 point higher mean PIQ than VIQ (e.g. Asarnow et al., 1987), whilst other studies (e. g. Rumsey and Hamburger, 1990) found no VIQ-PQ differences in a sample of adults with autism who were required to have Verbal and Performance IQ scores above 80. Therefore, it remains unclear whether VIQ Versus PIQ discrepancies are an artefact of lowered or not; this issue will be discussed in relation to the SPD Cases who do present with VIQ versus PIQ discrepancies.

Due to the prevalence rates and the difficulties surrounding this diagnosis in children, there is scarce information on WISC subtest profiles in children reported with schizophrenia. Similarly in studes of children identified as having SPD, there have been few studies that have reported the WISC subtest profiles, but some studies have given an account of the FSIQ, VIQ and PIQ and Factor Index scores of these children but with varying evidence for and against VIQ Vs PIQ discrepancies. Caplan (1994) reports VCI and FDI Factor Index scores were significantly correlated with loose associations for children with SPD.

Comparing the WISC profiles of Case 1 with those presented above reveals a profile that does not fit with the prototypic profile of an individual with Asperger's/autism: he does not show any

peak or troughs on the WISC subtests of Comprehension, Block Design, Digit Span or Picture Arrangement, and does not show any VIQ vS PIQ discrepancies. However, there are some studies which suggest lower scores on the Factor Index scores on FDI, PSI and POI for individuals with Asperger's and Case 1 does show a lower PSI Factor Index score relative to his other scores, although it is within 1 s.d from the standardisation sample mean. Also, however, his profile does not fit with those profiles presented for children or adults with schizophrenia or with those presented for children or adults with SPD: he does not have any specific subtest discrepancies, apart from his lower WISC Mazes subtest score which will be discussed below in the executive function section, and he does not have any specific VIQ v PIQ discrepancies found in previous research with children with SPD.

Comparing the WISC profiles of Case 2 also reveals a profile that does not fit completely with either of the profiles presented above. She performs very well on the Coding subtest, which individuals with Asperger's do not prototypically perform well on, and she performs less well on the Digit Span subtest which individuals with Asperegers perform well on. Nevertheless, Case 2 performs less well on the Object Assembly subtest which has been reported as a test on which individuals with schizophrenia perform less well. Her IQ scores fall within the normal range and she does not show any specific VIQ v PIQ discrepancies. However, her Mazes subtest score is significantly lower than her other subtest scores and will be discussed below.

Case 3 reveals an interesting profile. Whilst the majority of his subtest scores fall within the normal range, a few do not. He performs well on the Digit Span and Symbol Search subtests: a high Digit Span score is prototypic of individuals with Asperger's. However, his other subtest scores do not follow the prototypic pattern, apart from Picture Arrangement which he does score lower on relative to other subtests: but this score falls within 1 s.d from the standardisation sample mean. He does not have any VIQ v PIQ discrepancies and his FSIQ falls within the normal range whilst his POI Factor Index score falls 1 s.d below the

standardisation sample mean: lower POI scores have been reported in individuals with Asperger's but also in individuals with schizophrenia.

Case 4 also shows a mixed profile. Most of his subtest scores fall within the normal range, but he shows relative strengths on the Picture Arrangement and Mazes subtest, which does not fit with either the Asperger's or schizophrenia or SPD profiles. However, he does show a statistically significant VIQ v PIQ discrepancy in favour of the PIQ, but this is not prototypic of an Aspeger's individual where the discrepancy would be the reverse. His FDI score suggest some mild difficulties; nevertheless low FDI scores are reported in individuals with SPD and with Asperger's.

Comparing the WISC profile of Case 5 of those presented above reveals a profile that does not fit with either. She performs relatively well on Comprehension and Picture Completion: Comprehension is a subtest that individuals with Asperger's and individuals with schizophrenia are reported to perform less well on. However, she does perform less well on the subtests Coding and Mazes, and Coding is one of the subtests that individuals with Asperger's perform less well on. She has no VIQ v PIQ discrepancies, but does show a relative weakness on her FDI Factor score, which has been shown in individuals with Asperger's and with schizophrenia. Lastly, comparing Case 6 with the profiles presented above reveals a mixed pattern. He scores particularly poorly on 3 subtests, Picture Arrangement, Block design and Object Assembly, where his scores fall below 3 s.d from the standardisation sample mean. Picture Arrangement subtest scores are typically low whilst Block Design subtest scores are typically high in individuals with Asperger's. Low Picture Arrangement scores are also reported in individuals with schizophrenia. His FSIQ and PIQ fall within the low range of ability, as does his POI score. Lower FSIQs have been reported in some individuals with schizophrenia. He also shows a VIQ v PIQ discrepancy in favour of VIQ, which fits the prototypic Aspger's profile.

The results suggest that none of the children with SPD described here show WISC subtest profiles which are similar to the prototypic WISC subtest profiles of individuals with Asperger's, or similar to the presented WISC subtest profiles of individuals with schizophrenia or SPD. However, as previously mentioned, there is not enough research in the Schizophrenia Spectrum of Disorders literature that can clearly delineate a WISC subtest profile as has been accomplished in the Pervasive Developmental Disorders literature. The scarcity of WISC subtest profiles in published research could be due to the fact that some research has not accounted for the heterogeneity of syndromes and symptom clusters within a schizophrenia diagnosis that might lead to different abilities on WISC subtest scores. Certainly, some very recent research has reported different neuropsychological abilities for individuals with negative, disorganised or psychotic symptoms (Basso et al., 1998). Nevertheless, the results could be due to the lack of validity of the category of SPD.

In addition to a comparison of the WISC subtest profiles of the six Cases with the presented Asperger's and schizophrenia/SPD profiles, a comparison of the VIQ-PIQ discrepancies also reveals that none of the children present with a prototypic profile of either disorder. Individuals with Asperger's typically show a VIQ –PIQ discrepancy in favour of the VIQ, whilst research in schizophrenia suggests differing profiles of VIQ-PIQ discrepancies. In fact only two of the six Cases showed a VIQ-PIQ discrepancy. One Case does have a discrepancy in favour of the VIQ, whilst the other Case has a discrepancy in favour of the PIQ, suggesting no uniform VIQ versus PIQ discrepancies for this group of children diagnosed with SPD. One other child did have a VIQ-PIQ discrepancy, but this was not statistically significant. Siegel et al. (1996) suggest that the higher FSIQ the less the VIQ-PIQ discrepancy and Rumsey and Hamburger (1990) report no VIQ-PIQ discrepancies when FSIQ is above 80. Of the two Cases presented here who have VIQ-PIQ discrepancies, one does have a lower FSIQ than the other participants and it is 2 s.d lower than the standardisation sample mean, whilst the other Case has a FSIQ within the normal range as do the remaining Cases. Therefore, it cannot be

clarified whether the lack of VIQ-PIQ discrepancies found in this group of children with SPD is due to their FSIQ ability, or whether the Case who does have a VIQ-PIQ discrepancy, does so because of his lowered FSIQ or because of a disorder specific deficit. Lastly, a comparison of the Factor Index scores for the six Cases with those reported in the literature for individuals with Asperger's or schizophrenia/ SPD also do not reveal any specific similarities. However, poor FDI and POI factor Index scores have been reported in some studies for both participants with Asperger's and with schizophrenia and some studies report poor VCI Factor Index scores for participants with SPD. Here, three of the children demonstrate POI Factor Index scores which are 1 s.d below the standardisation sample mean in two cases and 2 s.d below the standardisation sample mean in one case, indicating some level of difficulty. Another three of the children show FDI Factor Index scores which are also 1 s.d below the standardisation sample mean, again suggesting no or only very mild difficulties. Two of the children demonstrate PSI Factor Index scores which are 1 s.d from the standardisation sample mean again suggesting no or only very mild difficulties. Three of the children demonstrate no or very mild difficulties with verbal comprehension as their VCI scores are 1 s.d below the standardisation sample mean. In conclusion there appear to be no uniform profiles between the six SPD Cases on their WISC subtest scores or WISC IQ scores which can be conclusively described as similar to those profiles presented for either individuals with Aperger's or schizophrenia or SPD.

EXECUTIVE FUNCTION

As outlined above, there are numerous studies that document executive function deficits in both children and adults with a diagnosis from the Pervasive Spectrum of Disorders and from the Schizophrenia Spectrum of Disorders. Nevertheless, whilst there are numerous studies, there is no clear-cut executive function deficit profile for either disorder, particularly for diagnoses of the Schizophrenia Spectrum of Disorders. In summary, numerous studies report

set-shifting and planning difficulties for individuals with Asperger's. In addition some researchers have found that when the inhibitory motor mechanism of set-shifting is isolated from the flexibility element, participants with Asperger's were unimpaired on the inhibition task, suggesting that inhibition may be less affected than other executive functions. Adults with schizophrenia have been reported in a number of studies as being impaired on executive function measures of set-shifting, planning and fluency. However, very recent research has attempted to assess executive function in different symptom cluster groups of individuals with schizophrenia and have found that individuals with negative symptoms were impaired on the measures used to examine set-shifting and fluency, whereas individuals with disorganised and psychotic symptoms were not impaired. Individuals with early onset and adolescent schizophrenia have also been reported as having planning difficulties, but intact set-shifting and the ability to inhibit prepotent responses. Research indicates poor set-shifting, cognitive inhibition and sustained attention skills in adults with SPD.

This study examined the executive functions of planning, attention control/inhibition, set-shifting, sustained attention and fluency. Here, the performance of each Case on these executive functions will be addressed in relation to the profile discussed above.

Planning

This study used the Mazes subtest from the WISC to measure the planning ability of the six children with SPD. None of the children presented with profound difficulties on this task, except for Case 2, whose score was 2 s.d below the standardisation sample mean, suggesting some impairment on this ability. This does not fit with the suggested profiles for either Asperger's or adult or early onset schizophrenia where individuals with these diagnoses have been found to have impairments in the executive function of planning. However, there are no previous studies, which have examined this executive function in adults or children with SPD.

Attentional control/inhibition

Here, the Opposite World/Same World subtest from the TEA-Ch battery was used to measure attentional control/inhibition. For the Opposite World part of the test, Cases 1, 2, and 4 have scores that are at least 1s.d below the standardisation sample mean, and Cases 5 and 6 have scores that are 2 s.d below the standardisation sample mean suggesting that only two of the six children have difficulties with this task. Previous studies have suggested that this ability is intact in individuals with Asperger's and early onset schizophrenia, but recent studies have shown impairments in cognitive inhibition in adults with SPD.

Set-shifting

The Trail making Test Part A and B was used to measure set-shifting in this group of children. Case 6 was the only child who performed poorly on this test; in fact, he could not complete the test and therefore did not score any points. A number of reasons could account for the poor performance of Case 6; he may not have understood the task or he may have been too thought disordered at this particular point during the testing session. However, the results suggest that for this group of children set-shifting appears to be intact. This does not fit with the presented profiles of individuals with Asperger's, schizophrenia or SPD who have been shown to have set-shifting difficulties.

Sustained attention

The Walk Don't Walk subtest from the TEA-Ch battery was used to assess sustained attention in this group of children. Only Cases 5 and 6 score 1 s.d below the standardisation sample mean suggesting no impairment with this executive function for this group of children. Adults with SPD have been reported as having some difficulties with sustained attention, but individuals with Asperger's or schizophrenia have not.

163

<u>Fluency</u>

Here, The Thurstone Word Fluency was used to measure the executive function of fluency. Only Case 6 had a score that fell 2 s.d below the standardisation sample mean, suggesting that for this group of children, this executive function is intact. This does not fit with the profile of individuals with schizophrenia who have shown difficulties with this ability.

In summary, these results from the IQ and executive function tests indicate that the SPD children in this study do not show clear-cut neuropsychological profiles, which fit with those of individuals with Asperger's, or schizophrenia or with adults with SPD. The six children demonstrate little internal cohesion as a group in their performances on the measures used and therefore the data does not support the hypothesis that SPD is neuropsychologically related to the Schizophrenia Spectrum of Disorders or the Pervasive Developmental Disorders and as a result do not strengthen Hypothesis 2.

<u>Is SPD A Valid Diagnostic Category?</u>

The diagnostic validity of a disorder is strengthened if a specific deficit or pattern of deficits is evident on neuropsychological tests.

As previously stated, in order to meet diagnostic validity, SPD must meet a certain set of criteria as outlined by Robins and Guze (1970) and Rutter (1985). This study focuses on one of those criteria: the need to describe a battery of neuropsychological tests that the SPD children show strengths and weaknesses on. An illustration of the neuropsychological deficits, and comparison of these deficits with those of a Pervasive Development Disorder or

Schizophrenia Spectrum Disorder, would add to the clinical picture and the specification of diagnostic criteria.

Comparing the WISC subtest profiles of the six SPD children with those of individuals with Asperger's has been fairly straightforward as there are clear-cut WISC subtest profiles in the literature. However, given that there has been a mixed picture of FSIQ, VIQ, PIQ and Factor Index score profiles in the child SPD, Asperger's and schizophrenia literature, and in addition, a mixed picture of executive function profiles in the Asperger's, child and adult schizophrenia and adult SPD literature, this has added to the complexity of interpreting the IQ and executive function profiles of six SPD children and adolescents. Nevertheless, there are some very tentative conclusions that can be drawn from the results presented here relative to some of the other results presented in the research literature.

Firstly, as reported above there is no group profile for these six children, and secondly, they do not present with WISC subtest profiles which are similar to the protypic WISC subtest profiles of individuals with Asperger's, or similar to the presented WISC subtest profiles of individuals with schizophrenia or adults SPD. Thirdly, the VIQ-PIQ discrepancies of the six Children with SPD do not reveal a profile similar to individuals with Asperger's, schizophrenia or SPD: in fact only two of the children show a VIQ-PIQ discrepancy. Fourthly, the SPD group of children also do not demonstrate similar difficulties to one another, or to the other profiles presented on the Factor Index scores, and lastly, the same is true for the executive function measures. It can be concluded that the SPD group of children and adolescents are not neuropsychologically distinct, but not completely neuropsychologically different, from Asperger's, schizophrenia or adults with SPD. The SPD children showed differences and similarities on IQ and executive function deficits in relation to the known profiles of groups of Asperger's participants as well as with those of adults with SPD and schizophrenia. These results do not support the argument put forward by Cadenhead et al. (1999) who suggest that their participants with SPD

performed poorly on all of their cognitive measures. They suggest that the general

performance deficit in their non-psychotic SPD participants in their study support the notion

that cognitive deficits of schizophrenic-spectrum patients are pervasive, affecting multiple

levels of functioning. Whilst this study did not employ the specific measures used by

Cadenhead et al.'s study, or measure all of the same cognitive functions, this study did employ

a more detailed IQ assessment, using all of the WISC subtests, and, measured all of the

theoretically postulated executive functions and still did not find a uniform deficit across the six

children.

Therefore, the results do not support the hypothesis that SPD can be distinguished on the

basis of a clear neuropsychological profile and therefore the neuropsychological validity of

SPD can be questioned and Hypothesis 1 is not supported. Other arguments that might

account for the differences in performances within the SPD group of children can be

addressed. For example, Roth and Fonagy (1996) discuss the structure and the use of the

Diagnostic and Statistical Manual of Mental Disorders in both research and diagnosis and

suggest that its operationalism has a bias towards biological and behavioural orientations.

Therefore the validity of diagnostic categories is brought into question: a 'diagnosis' of SPD

may be representative of a mixture of symptoms that are not unified in any specific way. The

children in this study may have an overlap in presenting symptomatology and therefore appear

clinically similar, but they may not present with a unifying pattern of neuropsychological

deficits, as there is not a common underlying cognitive impairment. A diagnosis has the

propensity to generate what may appear to be a homogeneous group when in fact there may

be a widely etiologically heterogeneous group of individuals (Roth and Fonagy, 1996). For

example, the children in this study present with similar symptomatologies that may be due to

psychosocial factors and are not explainable within a neuropsychological framework.

Can SPD Be Accounted For Within A Cognitive Model?-Psychological Theories and the Results

Here, the psychological theories for autism/Asperger's and schizophrenia, in that order, will be reviewed in light of the neuropsychological results of the six children with SPD in an attempt to discount or support their hypotheses.

Theory of Mind

The theory of mind account of autism/Asperger's suggests that individuals with this disorder are unable to represent the mental states of themselves and others to predict behaviour in terms of these states. The theory of mind deficit can also account for the impairment of imagination which results in a lack of pretend play in individuals with autism/Asperger's. Whilst this part of the study did not collect data on this ability in the six children, the Registrars did collect information using the St.Mary's SPD semi-structured Interview and the K-SADS which suggests that for all of the children, bar one, the diagnostic criterion of odd beliefs/ magical thinking or bizarre fantasies is present. This would imply that for this group of children an impairment of imagination is not present, and therefore the results do not conclusively support a theory of mind account. However, it is difficult to know whether a differentiation has been made between normal childhood fantasy and 'odd beliefs' or 'magical thinking' within the measurement tools used, and whether these 'odd beliefs' or 'fantasies' could be viewed as delusional beliefs. If the content of the children's beliefs were indeed delusional, there is also research theory to support that a theory of mind is needed to hold a delusional belief (Frith, (1992).

Theory of Executive Dysfunction

Neuropsychological studies involving the brain and behaviour relationship have influenced a cognitive theory of autism/Asperger's based on a concept of executive dysfunction. As described previously planning and set-shifting, but not the inhibition component in set-shifting, are the executive dysfunctions most reported in studies for individuals with Asperger's. The six SPD children as a group did not demonstrate any executive dysfunctions. However, whilst these results do not fit with the profile outlined for autsim/Asperger's individuals, they do not rule out a theory of executive dysfunction for SPD as other executive function tests not used may demonstrate difficulties for children with SPD. Research has shown other developmental disorders to have executive function deficits; therefore a theory of executive dysfunction is not exclusive to autism/Asperger's.

Theory of Weak Central Coherence/Field Independence

The theory of weak central coherence suggests that individuals with autism/Asperger's show a reduction or absence of superior performance on processing meaningful or patterned information over random and meaningless stimuli. In fact individuals with autism/Asperger's have been reported as having similar recall for random word strings as they do for meaningful sentences (Tager-Flusberg, 1991). Also Shah and Frith (1993) suggest that the superior performance on the WISC subtest of Block Design of individuals with autsim /Asperger's is due to an advantage of segmenting the original design, or giving attention to parts of the whole, rather than the whole. The superior performance of participants with autism/Asperger's on the Block Design subtest is a robust profile that has been replicated in a number of studies. The six children in this study did not perform better, relative to their other subtest scores, or to the standardisation sample mean, on this WISC subtest. The theory of weak central coherence is

168

also likened to the cognitive style of field independence. The suggestion that cognitive style might influence social behaviour has led to the suggestion that field independents are likely to prefer nonsocial situations and distance themselves from others. All of the children in this study were rated positively on the diagnostic criteria of lack of close friends (other than first-degree relatives) and social anxiety. However, this social isolation and anxiety could be due to co-morbidity issues and not explainable within the theory of weak central coherence or field independence and therefore not supportive of a theory that would explain a Pervasive Developmental Disorder diagnosis. Alternatively, their social isolation and anxiety could be secondary to the particular difficulties they are experiencing, such as holding 'odd beliefs'. It could be combination of the children feeling isolated from other children because of their beliefs and that other children also perceive them as being different and therefore do not socialise with them and this causes further anxiety.

Theory of Metarepresentation

The theory of metarepresentation (Frith, 1992), as outlined above, attempts to explain the negative symptoms of schizophrenia as a deficit in willed action, leading to the person with schizophrenia being unable to generate behaviour of their own will, unable to suppress inappropriate behaviour, leading to perseverations and responses to irrelevant stimuli. These behaviours can be understood as a failure at the level of the SAS, and as core features of the 'dysexecutive syndrome'. Neuropsychological research studies offer evidence for this hypothesises, as impairments on a number of executive functions have been found in individuals with schizophrenia, including set-shifting, fluency and planning. Frith (1992) also links the theory of metarepresentation with that of theory of mind, suggesting that the negative

symptoms of schizophrenia are similar to those of autism and that these too can be explained by the lack of ability to mentalise or lack of metarepresentation. Research from some studies also suggests that participants with negative symptoms of schizophrenia also perform poorly on theory of mind tasks (Garety and Freeman, 1999); however, some schizophrenia sub-groups do not show theory of mind deficits, which implies that an integrative cognitive theory of metarepresentation for schizophrenia cannot account for all the deficits found in this disorder. For a diagnosis of SPD the symtoms must not be florid i.e, delusions or hallucinations, otherwise the diagnosis would cross over into the 'schizophrenia syndrome', however, the negative symtoms, such as social withdrawal and blunting, may be very pronounced as in negative schizophrenia. In this study the children present with the diagnostic criteria of inadequate rapport/restricted affect, social isolation, and social anxiety/hypersensitivity, which are similar to the negative features of schizophrenia. However, the children in this study do not present with any executive dysfunctions and therefore an executive dysfunction disorder accounted for within the cognitive model described by Frith cannot provide an account of SPD, and therefore Hypothesis 3 is not supported.

In summary, firstly, the results question the notion of the diagnostic validity of SPD: a clear-cut neuropsychological profile has not been delineated in this study, and, as discussed above, Rutter (1985) argues that in order to achieve diagnostic validity, a disorder must meet a certain set of criteria, including a description of the clinical picture which can be a correlated with neuropsychological results. Secondly, the results cannot conclude whether SPD is part of the Schizophrenia Spectrum of Disorders or the Pervasive Developmental Disorders as a clear-cut profile similar to either disorders was not found, and lastly, no conclusions can be drawn on which cognitive theories can provide an account for SPD as no specific anomalies were demonstrated by the six children.

Critique

This section will begin with a critique of the length of the testing sessions, test and measures used, comorbidity and diagnostic categories.

Length of Testing Sessions

Lengthy testing sessions can cause fatigue and this in turn can affect performance. Lezak (1995) comments that individuals who tire easily may not be able to maintain their usual performance level beyond two hours and this can be particularly true when testing children (Prifitera and Saklofske, 1998). The time it took for each participant to complete all of the measures varied, but generally it took between 2 and 3 hours. Breaks were offered half way through the testing sessions. Two of the children did not want to break and worked through the tests without stopping, whilst the other children had a short break. Therefore, because of the lengthy testing sessions, the results must be viewed with caution. However, for most of the children their scores on the IQ and executive function measures were within the normal range from the standardisation sample, apart from Case 6, who performed particularly poorly on a number of measures.

It is also argued that because of concentration difficulties, fatigue, or poor motivation, administration of all 11 WAIS-R subtests can alone take 2 or more hours to complete (Ryan and Rosenberg, 1984), and that a shortened version is preferable. Shortened versions of the WISC-R have been validated i.e., Ryan, Weilage and Spaulding (1999). However, this study chose to employ the complete range of subtests on the WISC as a full neuropsychological

profile was to be examined. Motivational difficulties, particularly in those with damage to the limbic system or prefrontal areas, can be common with participants who have brain damage, and can affect performance. Here, an attempt to engage the children, elicit cooperation and give them encouragement was made in an endeavour to maximise their performance. Also, the measures were counterbalanced to control for order effects due to fatigue.

As a number of executive functions were to be examined, as well as the complete WISC, this placed even more consideration on testing time. This therefore placed further constraint on the choice of executive function tests. The Trail Making Test was chosen, as it is very quick to administer, but it only has normative data rather than age-scaled scores; the same is true for the Thurstone Word fluency. The Mazes test was chosen as it is also quick and easy to administer, and is part of the WISC battery; however, reliability coefficients for the IQ and factor-based scales are generally greater than those for the individual subtests. Therefore greater confidence can be placed in the precision of an IQ or factor score than in the precision of a single subtest score. Alternatives to the WISC Mazes subtest are the Porteus Mazes or the Tower of London, but these are lengthier and do not provide age scaled scores.

Tests and Measures

All of the measures used had age scaled standardised scoring systems apart from the Thurstone Word fluency and the Trail Making Test Part A and B. These two have age and sex normative data for children, however; comparing within group differences is not as accurate or reliable as using age scaled standardised scores. Unfortunately, as noted earlier, there are insufficient standardised tests available for assessing the developing child (Beardsworth and Harding, 1996), and this also limited the choice from which to select the most appropriate executive function tests. Another limitation of The Thurtsone Word Fluency test is that it is a written test: the child writes down the words that come to mind. This for a child may add extra

difficulty, as they may also be thinking of how to spell the word and then may struggle to write and spell the word correctly. However, from the results it would appear that this group of children did not demonstrate any difficulties with this test.

The Opposite Worlds test has two tasks within it: one in the Same World, one in the Opposite World. However, the scoring system which converts the completion times into age scaled scores only allows for calculation of each of the two tasks separately. This means the researcher has two separate age scaled scores. The measure of inhibition, theoretically, should be calculated by subtracting the Same World completion time from the Opposite World completion time. This would control for the non-inhibitory aspects of the task, as the subtraction would produce an index of the cost of the cognitive reversal. Manly, Robertson, Anderson and Nimmo-Smith (1999), argue that from a psychometric view reliability of a measure is just as important as how useful it is in discriminating deficits in disorders. For the Opposite World test the correlation for the total time for the Same World and the total time for the Opposite World is very high (>.7). However, for the difference score, the retest correlation is exceptionally low- using the cost difference score considerably adds to the variance. Nevertheless, the counter argument to their justification for keeping the two components of the test separate is that there is a strong possibility that there is a severe fault with this particular measure and the results of this study might possibly support that argument. In other words the observed low scores could be an artefact of the unreliability of the measure. Therefore interpretation of the Opposite World age scaled score, as presented here, should be treated with caution.

This methodological problem also applies to the Trail Making Test. To examine the flexibility element of this test, that is the ability to switch mind set quickly, the researcher must subtract Part A from Part B, and the remaining score would then be the correct measure of this ability. Unfortunately, there were no available age normative data for children that had taken this

calculation into account and only comparisons of Part A and Part B separately were available to the researcher. Therefore, interpretation of the results of this test must be viewed with caution.

To explore executive functioning reliably using validated age–scaled tools has not been wholly possible here, but given the constraints of the tests available, a reasonably comprehensive theory -driven and age appropriate approach was attempted.

<u>Comorbidity</u>

It has been clarified elsewhere in the text that the six SPD children all scored positively on the diagnostic criteria of social anxiety on The St.Mary's semi-structured interview and on the K-SADS. In addition, the children also scored 17 and above on the total difficulties score on the parent-rated version of the SDQ. Scores of 17 and above for total difficulties fall into the 'abnormal range'. Also all except one of the children scored in the 'abnormal range' on the emotional symptom score on the parent-rated version of the SDQ. These results indicate that all of the children have emotional difficulties as well as their SPD diagnosis. Indeed, a number of the children also have comorbid diagnoses of anxiety disorder, depressive disorder, generalised anxiety disorder, or social anxiety disorder. The effects of anxiety and depression on test performance have been documented in many studies. Wolkowitz and Weingartner (1988) outline the theoretical mechanisms that might cause the cognitive deficits found in individuals with depression as being slowed sensorimotor functions, decreased sensitivity to reward or reinforcement, lowered motivation and increased arousal if there is also an anxiety disorder. Highly anxious participants may be slower completing tests, may have scrambled or blocked thoughts and memory failure (Buckelew and Hannay, 1986), and for people with depression, impairments in short-term recall and in learning for both verbal and visuo-spatial material have also been demonstrated (Richardson and Ruff, 1989). However, Donnelly, Murphy, Goodwin, and Waldman (1982) investigated the effects of clinical depression on

174

intellectual function using the WAIS. They found a limited relationship between intellectual function and clinical severity of depression when they measured and then re-tested 96 hospitalised participants with depression and found that the participants high average FSIQ scores remained relatively stable. Miller, Faustman, Moses and Cermansky (1992), after reviewing the depression literature, reports that cognition, as measured by an intelligence test was impaired in manic-depression as much as in schizophrenia. Cognitive impairment in the affective disorders remains obscured with both positive and negative findings. However, the results in this study could suggest that the children were affected by the anxiety of the test situation per se and not because of a 'disorder': the anxiety could be secondary to the other symptoms reported. Nevertheless, only one child was particularly impaired across most of the tests.

The literature also suggests an inverse relationship between intelligence and children's emotional and behavioural difficulties, but the exact nature and magnitude of this association also remains ambiguous. However, cognitive studies of children have highlighted that the presence of comorbid disorders, i.e., anxiety and depression, may impact on performance and compound the interpretation of results; intellectual deficits associated with a comorbid disorder may be incorrectly attributed to the primary diagnosis. For example, Farone, Biederman, Lehman, Spencer, Norman, Seidman, Kruas, Perin, Chen, and Tsuang (1993) administered the WISC-R to a group of children with ADHD and a normal group of children and found the children with ADHD had lower scores than the control group on all of the WISC subtests. More interestingly, when the researchers examined the effects of comorbid disorder on performance on the WISC in the children with ADHD, they found that ADHD with depression predicted higher scores than ADHD alone, whereas conduct and anxiety disorder predicted lower scores, suggesting that intellectual impairments were exacerbated by the presence of conduct and anxiety disorders. Other studies have attributed discrepancies between VIQ and PIQ favouring

175

VIQ as being attributed to depression (Mokros, Poznanski, and Merrick, 1989). In their investigation of the intellectual abilities of 300 children with emotional difficulties, Zimet, Farley, Shapiro-Adler, and Zimmerman (1994) reported that emotionally disturbed children performed significantly lower on the WISC-R than the standardisation sample. Therefore, it is hard to be certain that the results of the performances of the six children on the IQ and executive function tests are solely due to the neuropsychological deficits associated with a SPD or Schizophrenia Spectrum Disorder, or due to the secondary effects of the signs and symptoms present in the children.

However, 4 of the 6 children do perform poorly relative to the standardisation sample mean on a number of the tests and a range of factors could account for these individual fluctuations. Fatigue, due to the lengthy testing time could have caused concentration difficulties and therefore account for the scores of those children who had scores that were 2 s.d below the standardisation mean. Similarly, thought disorder could account for the performance of Case 6 who had depressed scores on a number of tests. Whilst not all of the childrens scores were in the impaired range, their comorbid anxiety and depression may have depressed their scores; infact they may have performed even better than they did do if there had been no comorbid presentation.

Diagnostic Categories

The question of whether diagnostic categories are useful was discussed earlier, supporting the need for correct diagnosis. Wolff (1998) advocates the importance of making the correct diagnosis for SPD children because their difficulties require different interventions than those of children whose difficulties arise from adverse life experiences. The diagnostic category approach also assists in defining the validity of a disorder. It is often argued that diagnostic labels stigmatise, and even obscure, the individual child's uniqueness (Wolff, 1995). However, attempting to understand the origins of a child's behavioural and emotional difficulties can be

176

far more important. Frith (1992) argues that researching the signs (behaviour) and symptoms (experience) of a disorder in order to explore the hypothetical cognitive processes that underlie these behaviours and mental experience is potentially more theoretically useful than 'diagnostic validity' research. Frith also comments that researching the reliability of identifying a disorder refers not to diagnosis but to classification, as diagnosis should tell us something about aetiology, which is almost impossible in schizophrenia research. Frith (1992) states that the nature of the signs and symptoms give clues to the common pathway in the brain which is functioning abnormally. Therefore, a more 'signs and symptoms' led approach may have been more appropriate. Here the results do not indicate a circumscribed subtle executive function deficit, and relative strengths and weaknesses on the WISC IQ and subtests do not fall into the very impaired range for most of the children, suggesting that not only has strengthening diagnostic validity for an SPD disorder not been possible, but that maybe that the diagnostic category is not valid, and that therefore a signs and symptoms led approach would be more appropriate for this group of children.

Future Research

The SPD research field is still in its infancy and still in pursuit of complete etiological models. Further research should include longitudinal follow-up studies to establish diagnostic stability and in light of the results presented here, it is important to consider whether the category has validity.

Some specific avenues are suggested by the present study. What is clear is that the group of SPD children who participated in this study had varying and different strengths and weaknesses that were both similar and different to those found in Asperger's, schizophrenia

and child and adult participants in other studies. Executive functions and learning systems are believed to be served by the frontolimbic circuitry, including specifically the prefrontal lobes (Stuss and Benson, 1986). There are several circuits connecting the prefrontal and limbic cortex and different deficits that would be expected from breakdowns at different points in the circuit (Frith and Done, 1988). However, it is an impossible task to delineate which circuitries are involved in the subtle anomalies presented here. A battery of executive function tests which have been validated with standardised age-scaled norms need to be developed to examine and articulate in detail the exact executive function anomalies to help conclusively neuropsychologically profile adults and children with a Schizophrenia Spectrum Disorder or with a Pervasive Developmental Disorder so that clearer comparisons can be made with children with SPD to assist in validating this diagnosis.

One of the first steps would be to conduct a larger study with a more appropriate comparison group, such as an Asperger's or children with schizophrenia group/s. Vargas (1998) found metabolic changes associated with adult schizophrenia in the frontal lobes of children with some or all of the symptoms of schizophrenia in a magnetic resonance spectroscopic study, supporting a neurodevelopmental theory for schizophrenia. Ancillary examinations should also be included in future SPD research, such as a computerised axial tomography (CAT) scan or a magnetic resonance imaging (MRI) scan, to complement neuropsychological investigations.

Caplan (1994) reported that children with schizophrenia and children with SPD have illogical thinking and loose associations irrespective of their full scale IQ scores and that their loose association scores correlated significantly with the WISC-R Freedom form Distractibility (FDI) and Verbal Comprehension (VCI) factor scores (Caplan et al., 1990c). Following on from the work of Caplan, a replication of her correlations would be of specific interest, particularly as the some of the Factor Index scores of this group of children demonstrated some relative weaknesses for the children. Caplan (1994) argues that her findings suggest that loose associations reflect specific, not global, cognitive deficits as loose association and illogical

thinking reflect different aspects of impaired attention/information processing in children with schizophrenia. Caplan also suggests that since illogical thinking and loose associations were not correlated (Caplan et al., 1990a), these findings also support the possibility that illogical thinking and loose associations could have different cognitive correlates. Further exploration of this hypothesis is suggested.

In summary, this study should be followed up with larger studies, using validated measures exploring further the signs and symptoms in children with SPD. Nevertheless, the very subtle difficulties were measured using a tool that may not be wholly reliable, therefore, further studies need to examine, using more reliable and valid measures, the executive function of attentional control/inhibition. If the other tools and measures in future studies find executive function deficits then this would be much stronger evidence for an executive function dysorder.

Clinical Implications

Although sample size limitations and the reliability of measures used require that these findings are viewed with caution, from a clinical viewpoint, these results underscore very subtle and different, neuropsychological anomalies found in some SPD children. If these results were replicated in further studies, using reliable and valid measures, then this would highlight the need for specific interventions within the educational system. Advocacy for a child with

"Constitutionally based specific developmental delays affecting educational

progress" (Wolff, 1995, pp.139)

would then be supported.

Instructional guidelines for children with attentional difficulties include developing attention and concentration skills by focusing on small meaningful units of instruction, and focusing on visual planning activities and improving scanning techniques. Benedict and Harris (1989)

demonstrate the utility of cognitive retraining procedures in the treatment of patients with schizophrenia. Their results suggest that repeated practice with videocomputer attention-training tasks can enhance reaction times in participants with schizophrenia. Cognitive - behavioural management has also been shown to be useful in the remedation of executive function difficulties. Lerner et al. (1995) demonstrated the usefulness of contingency-based programmes to address self-regulation and attentional problems children with ADHD. These approaches might match the needs of SPD children who demonstrate difficulties on attentional control tasks.

Diagnosis can be vital for a complete understanding of a clinical understanding, especially if it is a disorder that reflects a long lasting and constitutional, rather than environmental, difficulty (Wolff, 1991). Understanding the presentation of a child can guide practitioners to the best available resources for that diagnosis and child, including educational and psychological help. Whilst the results presented here do not demarcate distinct neuropsychological deficits which would assist the clinician making a clear cut diagnosis of SPD in children, they do contribute in guiding the researcher in examining further the neuropsychological profiles of a much larger sample of children diagnosed with SPD, and the clinician towards appropriate intervention strategies that might be employed for specific executive function deficits, and appropriate therapies that would address each child'd specific emotional symptomatology given their individual comorbidity.

SUMMARY AND CONCLUSIONS

This study provided a detailed neuropsychological assessment of a group of children and adolescents identified as having SPD. The results showed that none of the SPD children and adolescents had particular specific executive function deficits, but some of the children had individual weaknesses and strengths relative to their other scores on some WISC IQ and subtest scores. Two of the children showed Verbal and Performance IQ discrepancies. One of the children performed poorly on all of the tests: at the time of testing he was thought disordered. The neuropsychological profiles of the SPD group of children are not similar to profiles found in children and adults with Asperger's, and not clearly disimilar to profiles of adult schizophrenia and adult SPD. Therefore it cannot be concluded that SPD should be categorised with either the Schizophrenia Spectrum of Disorders or with the Pervasive Developmental Disorders, or that SPD is neuropsychologically valid and can be accounted for within a cognitive model, such as Frith's (1992). This study has contributed somewhat to the diagnostic and classification questions surrounding SPD, and has provided useful understanding of some of the individual specific neuropsychological difficulties that these six children with SPD have. Further studies are needed to strengthen evidence for this diagnostic category. If this is not pursued, the results presented here could suggest that the category is not valid. If further studies found specific deficits, using reliable and valid measures, this might guide the clinician to consider intervention strategies that could assist a child with SPD to achieve greater success in the core cognitive area in which s/he has difficulties.

References

Allen, H. A., Liddle, P. F., and Frith, S. D. (1993). Negative features, retrieval processes and verbal fluency in schizophrenia. British Journal of Psychiatry, 163, 769-775.

Aman, C. J., Roberts, R. J., and Pennington, B. F. (1998). A neuropsychological examination of the underlying deficit in ADHD: The frontal lobe vs. right parietal lobe theories. *Developmental Psychology, 6,* 204-228.

American Psychiatric Association. (1980). *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.) Washington, DC:Author.

American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) Washington, DC:Author.

Appellof, E. S., and Augustine, E. A. (1986). Prefrontal functions in juvenile delinquents. *Journal of Clinical and Experimental Neuropsychology, 7,* 604-620.

Asarnow. R. F, Asamen. J, Granholm. E and Sherman.T.(1994). Cognitive/neuropsychological studies of Children with a Schizophrenic Disorder. *Schizophrenia Bulletin, 20:* 647-669.

Asarnow, R. F., Tanguay, P. E., Bott, L., and Freeman, B. J. (1987). Patterns of intellectual functioning in non-retarded autistic and schizophrenic children. *Journal of Child Psychology and Psychiatry, 38,* 273-280.

Asperger, H. (1944). Die Autistischen Psyhcopathen im Kindesalter. *Archiv fur Psychiatries und Nerenkrankheiten, 117,* 76-136.

Asperger, H. (1979). Problems of infantile autism. *Communication, 13,* 45-52.

Baddeley, A. D. (1986). *Working Memory.* Oxford University Press:Oxford.

Bailey, A., Phillips, W., and Rutter, M. (1996). Autism: towards an intergration of clinical, genetic, neuropsychological and neurobilogical perspectives. *Journal of Child Psychology and Psychiatry, 37,* 1, 89-126.

Barker, C., Pistrang, N., and Elliot, R. (1994) *Research methods in clinical and counselling psychology.* Wiley.

Baron-Cohen, S., Allen, J., and Gillberg, C.(1992). Can autism be detected at 18 months? The needle, the haystack, and the CHAT. *British Journal of Psychiatry, 161,* 839-43.

Baron, M., Anis, L., and Gruen, R. (1981). The schedule for schizotypal personalities (SSP): a diagnostic interview for schizotypal features. *Psychiatry Research, 4,* 213-228.

Baron, M, Anis, L., and Gruen, R.(1983). Familial relatedness of schizophrenia and schizotypal states. *American Journal of Psychiatry, 140,* 1437-1442.

Baron-Cohen, S, Leslie, A . M., and Frith, U. (1985). Does the autistic child have a 'theory of mind'?, *Cognition, 21,* 37-46.

Bartlett, F. C. (1932). *Remembering: a study in experimental and social psychology.* Cambridge: Cambridge University Press.

Basso, M., Nasrallah, H., Olson, S. C., and Borstein, A. (1998). Neuropsychological correlates of negative, disorganised and psychotic symptoms in schizophrenia. *Schizophrenia Research, 31,* 99-111.

Beardsworth, E., and Harding, L. (1996) Developmental neruopsychology and the assessment of children. In L. Harding and J. Beech(Eds.), *Assessment in neuropsychology* (pp.17-45). Routledge.

Beatty, W. W., Jocie, Z., Monson, N., and Katzung, V. M. (1994). Problem solving by schizophrenic and schizoaffective patients on the Wisconsin and California card sorting tests. *Neuropsychology, 8,* 49-54.

Beech, A., Powell, T., McWilliam, J., and Claridge, G. (1989). Evidence of reduced cognitive inhibition in schizophrenia. *British Journal of Clinical Psychology, 28,* 109-116.

Benedict, R. H. B., and Harris, A. E. (1989). Remediation of attention deficits in chronic schizophrenics. *British Journal of Clinical Psychology, 28,* 187-188.

Bennetto, L., Pennington, B. F., and Rogers, S. J. (1996). Intact and impaired memory functions in autism. *Child Development, 67,* 1816-1835.

Berthier, M. L. (1995). Hypomania following bereavement in Asperger syndrome: A case study. *Neuropsychiatry, Neuropsychology, and Behavioural Neurology, 8,* 222-228.

Bishop, D. V. (1993). Annotation: Autism, executive functions, and theory of mind: A neuropsychological perspective. *Journal of Child Psychology and Psychiatry, 34,* 847-856.

Bowler, D. M. (1992). "Theory of Mind" in Asperger syndrome. *Journal of Child Psychology and Psychiatry, 33,* 877-893.

Boyle, M. (1993). *Schizophrenia: A scientific Delusion.* Routledge.

Boyle, M. (1996). The cognitive neuropsychology of schizophrenia. *British Journal of Psychology, 87,* 164-165.

Braff, D. L., Heaton, R., Kuck, J., Cullum, M., Moranville, J., Grant, I., and Zisook, S. (1991). The generalised pattern of neuropsychological deficits in outpatients with chronic schizophrenia with heterogeneous Wisconsin Card Sorting Test results. *Archives of General Psychiatry, 48,* 891-898.

Bruner, J. (1973). Organisation of early skilled action. *Child Development, 44,* 1-11.

Bryson, S. E., Wainwright-Sharp, J. A., and Smith, I. M. (1990). Autism: A developmental spatial neglect syndrome? In J.T . Enns (Ed.), *The development of attention: Research and theory* (pp. 405-427). New York: Elsevier.

Buckelew, S.P., and Hannay, H.J. (1986). Relationships among anxiety, defensiveness, sex, task difficulty, and performance on various neuropsychological tasks. *Perceptual and Motor Skills, 63,* 711-718.

Burgess, P. W., and Shallice, T. (1997). *The Brixton and Hayling Tests.* Flempton:Thames Valley Test company.

Cadenhead, K. S., Perry, W., Shafer, K., and Braff, D. (1999). Cognitive functions in schizotypal personality disorder. *Schizophrenia Research, 37,* 123-132.

Caplan, R. (1994). Communication deficits in childhood schizophrenia spectrum disorders. *Schizophrenia Bulletin, 20,* 671-683.

Caplan, R., Foy, J. G., Asarnow, R. F., and Sherman, T. L. (1990b). Cognition and formal thought disorder in schizophrenic and schizotypal children. *Journal of Psychiatry Research, 31,* 169-177.

Caplan, R., and Gutherie, D. (1992). Communication deficits in childhood schizotypal personality disorder. *Journal of Academic Child and Adolescent Psychiatry, 31,* 961-967.

Caplan, R., Gutherie, D., Fish, B., Tanguay, P. E., and David-Lando, G. (1989). The Kiddie Formal Thought Disorder Rating Scale(K-FTDS). Clinical assessment, reliability, and validity. *Journal of American Academic Child and Adolescent Psychiatry, 28,* 208-216.

Caplan, R., Gutherie, D., and Foy, J. F. (1992). Communication deficits and formal thought disorder in schizophrenic children. *Journal of American Academic Child Psychiatry, 31,* 151-159.

Caplan, R., Perdue, S., Tanguay, P. E., Fish, B. (1990a). Formal thought disorder in childhood onset schizophrenia and schizotypal personality disorder. *Journal of Child Psychology and Psychiatry, 31,* 1103-1114.

Caramazza, A. (1986). On drawing inferences about the structure of normal cognitive systems form the analysis of patterns of impaired performance: the case for single-patient studies. *Brain and Cognition, 5,* 41-66.

Case, R. (1985). *Intellectual development: Birth to adulthood.* Orlando, FL: Academic.

Castle, D. J., and Murray, R. M.(1991) Editorial: The neurodevelopmental basis of sex differences in schizophrenia. *Psychological Medicine, 21,* 565-575.

Cattell, R. B. (1971). *Abilities: The structure, growth and action .* New York: Houghton Mifflin.

Cattell, R. B., and Johnson, R. C. (1986). *Functional Psychological Testing.* New York: Bruner Mazel.

Charman, T., and Baron-Cohen, S. (1994). Another look at imitation in autism. *Developmental Psychopathology, 6, 403-13.*

Chelune, G. J., and Baer, R. L. (1986). Developmental norms for the Wisconsin Card Sorting Test. *Journal of Clinical and Experimental Neuropsychology, 8,* 219-228.

Chick, J., Waterhouse, L., and Wolff, S. (1979). Psychological constructing in schizoid children grown up. *British Journal of Psychiatry, 135,* 425-430.

Chugami, H. T., and Phelps, M. E. (1986). Maturational changes in cerebral function in infants determined by FDG positron emission tomography. *Science, 231,* 840-843.

Corcoran, R., Chaill, C., and Frith, C. D. (1997). The appreciation of visual jokes in people with schizophrenia: A study of 'mentalising; ability. *Schizophrenia Research, 24,* 319-327.

Corcoran, R., Mercer, G., and Frith, C.D. (1995). Schizophrenia, symtomatology and social inference: Investigating 'theory of mind' in people with schizophrenia. *Schizophrenia Research, 17,* 5-13.

Cornblatt, D. (1994). Continuous performance testing and schizophrenia. *Schizophrenia Bulletin, 20,* 62-86.

Crow, T. J., Ball, J., Bloom., S. R., Brown, R., Bruton, C. J., Colter, N., Frith, C. D., Johnstone, E. C., Owens, D. G. C., and Roberts, G. W. (1989). Schizophrenia as an anomaly of development of cerebral asymmetry: A post-mortem study and a proposal concerning the genetic basis of the disease. *Archives of General Psychiatry, 46,* 1145-1150.

Davies, N., Russell. A., Jones, P., and Murray, R. M. (1998). Which characteristics of schizophrenia predate psychosis? *Journal of Psychiatric Research, 32,* 121-131.

Denckla, M. B.(1985). Revised Neurological Examination for Subtle Signs. *Psychopharmacology Bulletin,Vol.21, No.4, 773-775.*

Dodge, K. (1980). Social Cognition and Children's Aggressive Behaviour. *Child Development, 51, 162-170.*

Done, D. J., Johnstone, E. C., Frith, C. D., Golding, J., and Shepherd, P. M. (1991). Complications of pregnancy and delivery in relation to psychosis in adult-life: Data from the British perinatal mortality survey sample. *British Medical Journal, 302,* 1576-1580.

Donnelly, E.F., Murphy, D.L., Goodwin, F.K., and Waldman, I.N.(1982). Intellectual function in primary affective disorder. *British Journal of Psychiatry, 10,* 633-636.

Doody, G. A., Gotz, M., Johnstone, E.C., Frith, C. D. and Cunningham Owens, D. G. (1998). Theory of mind and psychoses. *Psychological Medicine, 28,* 397-405.

Duncan, J. (1995). Attention, intelligence and frontal lobes. In: Gazzangia M.s (Ed.) The cognitive neurosciences. Cambridge (MA): MIT Press. (pp721-33).

Eggers, C. (1978). Cause and prognosis of childhood schizophrenia . *Journal of Autism and Childhood Schizophrenia, 8,* 21-35.

Ehlers, S., Nyden, A., Gillberg, C., Dahlgren, A., Dahlgren, S., Hjelmquist, E., and Oden, A. (1997). Journal of Child Psychology and Psychiatry, 38, 207-217.

Elliot, R., and Sahakian, B.J. (1995). The neuropsychology of schizophrenia: relations with clinical and neurobiological dimesions. *Psychological Medicine, 25,* 581-594.

Elliot, R., McKenna, PJ., Robbins, T.W., and Shakian, B. J. (1997). Specific neuropsychological deficits in in schizophrenic patients with preserved intellectual function. Cognitive Neuropsychiatry, 121, 347-362.

Evans, S. E., Chua, P.J., McKenna, and Wilson, B.A. (1997). Assessment of the dysexcutive syndrome in schizophrenia. *Psychological Medicine, 2,* 635-646.

Farone, S.V., Biederman, J., Lehman, B.K., Spencer, T., Norman, D., Seidman, L.J., Kraus, I., Perin, J., Chen, W.J., and Tsuang, M.T. (1993). Intellectual performance and school failure in children with attention deficit disorder and their siblings. *Journal of Abnormal psychology, 102,* 616-623.

Fennell. E.(1994). Issues in child Neuropsychological Assessment. In R. Vanderploeg (Ed). *Clinicians Guide to Neurpsychological Assessment.* (pp165-184.). Lawrence Erlbaum Associates.

Fine, J., Bartolucci, G., Szatmari, P., and Ginsberg, G. (1994). Cohesive discourse in pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 24,* 315-329.

Foerster, A., Lewis, S., and Owe, M. (1991). Premorbid adjustment and personality in psychosis. Effects of sex and diagnosis. *British Journal of Psychiatry, 158,* 171-176.

Fowles, D.C. (1992). Schizophrenia: Diathensis-stress revisited. *Annual Review of Psychology, 43,* 303-336.

Franke, P., Maier, W., Hardt, J., Frieboes, R., Lichtermann, D., and Hain, C. (1993). Assessment of frontal lobe functioning in schizophrenia and unipolar major depression. *Psychopathology, 26,* 76-84.

Freeman, B. J., Lucas, J. C., Forness, S. R., and Ritvo, E. R. (1985). Cognitive processing of high-functioning autistic children:comparing the K-ABC and the WISC-R. *Journal of Psychoeducational Assessment, 4,* 357-367.

Frith, C. D. (1979). Consciousness, information processing, and schizophrenia. *British Journal of Psychiatry, 153,* 437-443.

Frith, C. D. (1992). The Cognitive Neuropsychology of Schizophrenia. Lawrence Erlbaum Associates: Hove.

Frith, C. D., and Corcoran, R. (1996). Exploring 'theory of mind' in people with schizophrenia. *Psychological Medicine, 26,* 521-530.

Frith, C. D., and Done, D. J. (1988). Towards a neuropsychology of schizophrenia. *British Journal of Psychiatry, 134,* 225-235.

Frith, C.D., and U. Frith. (1991). Elective affinities in schizophrenia and childhood autism. In *Social psychiatry:theory, methodology and practice,* P.E.Bebbington (ed.), 65-8. New Brunswick, NJ:Transaction.

Frith, C. D., Leary, J., Cahill, C., and Johnstone, E. C. (1991b). Performance on psychological tests. Demongraphic and clinical correlates of the results of psychological tests. In E. C. Johnstone (Ed.), Disabilities and circumstances of schziophrenic patients: A follow-up study. *British Journal of Psychiatry, 159,* 13, 26-29.

Frith, U. (1989). Autism and "theory of mind". In C. Gillberg (Ed.*) Diagnosis and treatment of autism (pp. 33-52).* New York: Plenum Press.

Frith, U., and Happe, F. (1994). Autism: beyond "theory of mind". *Cognition, 30,* 115-132.

Frith, U., Morton, J., and Leslie, A. M. (1991). The cognitive basis of a bilogical disorder:autism. *Trends in the Neurosciences, 14,* 433-438.

Fuster, J.M. (1985). The prefrontal cortex, mediator of cross-temporal contingencies. *Human Neurobiology, 4,* 169-179.

Fuster, J.M .(1987). The prefrontal cortex. New York: Raven.

Garety, P.A., and Freeman, D.(1999). Cognitive approaches to delusions: A critical review of theories and evidence. *British Journal of Clinical Psychology, 38,* 113-154.

Gerstadt, C. L., Hong, Y. J., and Diamond, A. (1994). The relationship between cognition and action: Performance of children on a stroop-like day-night test. *Cognition, 53,* 129-153.

Ghaziuddin, M., Leininger, L., and Tsai, L. (1995). Brief report: Thought disorder in Asperger syndrome: Comparison with high-functioning autism. *Journal of Autism and Development Disorders, 25,* 311-317.

Gillberg, I. C., and Gillberg, C. (1989). Asperger syndrome -some epidemiological considerations: A research note. *Journal of Child Psychology and Psychiatry, 30,* 631-638.

Goodman, R. (1997). The Strengths and Difficulties Qustionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38,* 581-586.

Goldberg, T. E., Kelsoe, J. R., Weinberger, D. R., Pliskin, N. H., Kirwan, P. D., and Berman, K. F. (1988). Performance of schizophrenic patients on putative neuropsychological tests of frontal lobe function. *International Journal of Neuroscience, 42,* 51-58.

Gorenstein, E. E., Mammato, C. A. and Sandy, J. M. (1989). Performance of inattentive-overactive children on selected measures of prefrontal type function. *Journal of Clinical Psychology, 45,* 619-632.

Government Statistical Service. (1991). The Statistical Occupational Classification. *Social Classification and Coding Methodology,* 3, 12-53.

Green, W., Campbell, M., Hardesty, A., Grega, D., Padron-Gayol, M., Shell, J., and Erlenmeyer-Kimling, L. (1984). A comparison of schizophrenic and autistic children. *Journal of American Academy of Child Psychiatry, 23,* 399-409.

Green, L. E., Fein, D., Joy, S., and Waterhouse, L. (1995). Cognitive functioning in autism: An overview. In E. Shopler and G. B. Mesibove (Eds.), Learning and cognition in autism. New York and London: Plenum Press.

Gutkin, T. B. (1979). The WISC-R Verbal Comprehension, Perceptual Organisation, and Freedom from Distractibility deviation qoutients: Data for practitioners. *Psychology in the Schools, 16,* 153-156.

Gyns, J. A., and Willis, W. G. (1991). Validation of executive function tasks with young children. *Developmental Neuropsychology, 7(4),* 487-501.

Haith, M. M., Hazan, C., and Goodman, G. S. (1988). Expectation and anticipation of dynamic visual events by 3-5 month old babies. *Child Development, 59,* 467-479.

Hanes, K., Andrewes, D. G., Smith, D. J., and Pantellis, C. (1996). A brief assessment of executive control dysfunction : Discriminant vaidity and homogeneity of planning, set shift, and fluency measures. *Archives of Clinical Neuropsychology, 11,* 185-191.

Happe, F. (1994a). Wechsler IQ Profile and Theory of Mind in aurism: A Research Note. *Journal of Child Psychology and Psychiatry, Vol.35, 8,* 1461-1471.

Happe, F. (1994). Autism: an introduction to psychological theory. London:UCL Press.

Happe, F., and Frith, U. (1996). The neuropsychology of autism. *Brain, 119,* 1377-1400.

Heaton, R. K. (1981). *Wisconsin Card Sorting Test Manual.* Odessa, Fla.: Psychological Assessment Resources.

Hemsley, D. R.(1993). A Simple (Or Simplistic?) Cognitive Model for Schizophrenia. *Behavioural Research.Vol.31,No.7, 633-645.*

Hertzig, M., and Walker, H.(1975). Symptom fromation as an expression of disordered information processing in schizophrenic children. *Journal of Autism and Developmental Disorder, 5,* 13-24.

Hobson, R. P., Ouston, J., and Lee, A. (1988). Whats in a face? The case of autism. British *Journal of Psychology. 79,* 441-53.

Houghton, G., and Tipper, S. P. (1994). A model of inhibitory mechanisms in selective attention. In D. Dagenbach and T. H. Carr (Eds.), *Inhibitory processes in attention, memory, and language (pp.53-112).* San Diego: Academic Press.

Hughes, C., and Russell, J. (1993). Autistic children's difficulty with mental disengagement from an object: Its implications for theories of autism. *Developmental Psychology, 29,* 498-510.

Hughes, C., and Russell, J, and Robbins, T. W. (1994). Evidence for executive function in autism. *Neuropsychologia, 32,* 477-492.

Hutton, S. B., Puri, B. K., Duncan, L. J., Robbins, T. W., Bams, T. R. E., and Joyce, E. M. (1998). Executive function in first-episode schizophrenia. *Psychological Medicine, 28,* 463-473.

Ingraham, I. (1995). Family-genetic research and schizotypal personality. In A. Raine, T. Lencz, and S. A. Mednick (Eds). *Schizotypal Personality*(pp.19-42) Cambridge University Press.

Janowsky, J. S., Shimamura, A. P., and Squire, L. R. (1989). Source memory impairment in patients with frontal lobe lesions. *Neuropsychologica, 27,* 1043-1056.

Jaquet, L., Lancon, C., Auquier, P., Bougerol, T., and Scotto, J. C. (1997). Frontal neuropsychological impairments in 42 schizophrenic patients. *Encephale, 23,* 34-41.

Jones-Gotman, M., and Milner, B. (1977) Design fluency:The invention of nonsense drawings after focal cortical lesions. *Neuropsychologica, 15,* 653-674.

Kanner, L.(1972). *Child Psychiatry, 4th Edn. P. 211.* Thomas. Springfield.

Kaufman, A. (1990). Assessing adolescent and adult intelligence. Boston: Allyn and Baker.

Kaufman, A. (1994). *Intelligent testing with the WISC-III.* New York:Wiley.

Kendler,S. K. (1988). The genetics of schizphrenia. In M. T. Tsuang and J. C. Simpson(Eds.), *Handbook of Schizophrenia: Nosolgy, Epidemiology, and Genetics,* New York: Elsevier Science Publishers (pp. 437-462).

Kendler, K. S., and Gruenberg, A. M. (1984). An independent analysis of the Danish adoption study of schizophrenia. *Archives of General Psychiatry, 41,* 555-564.

Kendler, K. S., Gruenberg, A. M., and Strauss, J. S. (1981).An independent analysis of the Copenhagen sample of the Danish adoption study of schizophrenia. V: The relationship between childhood social withdrawal and adult schizophrenia. *Archives of General Psychiatry, 38,* 982-984.

Kety, S., Rosenthal, D., Wender, P. H, and Schulsinger, F.(1968). The types and prevalence of mental illness in the biological and adoptive families of adopted schizophrenics. In D. Rosenthal and S. S Key (Eds.), *The transmission of schizophrenia*(pp.345-362). Oxford: Pergamon Press.

Kety, S. S., Rosenthal, D., Wender, P. H.(1975). Mental illness in the biological and adoptive families of adopted individuals who have become schizophrenic: a preliminary report based on psychiatric interviews. In R. R. Fieve, D. Rosenthal and H. Brill(Eds.), *Genetic Research in Psychiatry* Baltimore: Johns Hopkins Press. (pp.147-165).

Kety, S. S., Wender, P. H., Jacobsen, B., Ingraham, L. J., Jansson, L., Faber, B, and Kinney, D. (1994). Mental illness in the biological and adoptive relatives of schizophrenic adoptees: Replication of the Copenhagen study in the rest of Denmark. *Archives of General Psychiatry, 51,* 442-455.

Kirk, U., and Kelly, M. A. (1986). Children's differential performance on selected dorsolateral prefrontal and posterior cortical functions: A developmental perspective . *Journal of Clinical and Experimental Neuropsychology, 7,* 604.

Klin, A., Volkmar, F. R., Sparrow, S. S., Cichetti, D. V., and Rourke, B. P. (1995). Validity and neuropsychological characterization of Asperger syndrome: Convergence with nonverbal learning disabilities syndrome. *Journal of Child Psychology and Psychiatry, 36,* 1127-1140.

Klosowska, D. (1976) Relation between ability to programme actions and location of brain damage. *Polish Psychological Bulletin, 7,* 245-255.

Kolb, B., and Wishaw, I. Q. (1985) *Fundamentals of Human Neuropsychology* (2nd ed.) New York:W.H. Freeman.

Kolvin.I. (1971). Studies in Child hood Psychosis: I. Diagnostic Criteria and Classification. *British Journal of Psychiatry,13, 381-384.*

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18,* 199-214.

Kydd, R. R., and Werry, J. S. (1982). Schizophrenia in children under sixteen years. *Journal of Autism and Developmental Disorders, 12,* 343-357.

Lendenweger, M. F., Cornblatt, B. A., and Putnick, M. (1991). Schizotypy and sustained attention . *Journal of Abnormal Psychology, 1,* 84-89.

Lerner, J. W., Lowenthal, B., and Lerner, S. R.(1995). Attention deficit disorders: Assessment and teaching. Pacific grove, CA: Brooks/Cole.

Levin, S., Yurgelin-Todd, D., and Craft, S. (1989). Contribution of clinical neuropsychology to the study of schizophrenia. *Journal of Abnormal Psychology, 98,* 341-356.

Levy, D. (1994). Eye tracking and schizophrenia. *Schizophrenia Bulletin, 20,* 47-62.

Lezak, M, D.(1995). *Neuropsychological Assessment, 3rd* edn, New York: Oxford University Press.

Lincoln, A. J., Allen, M., and Kilman, A. (1995). The assessment and interpretation of intelllectual abilities in people with autism. In E. Schopler and G. Mesibov (Eds), *Learning and cognition in autism*(pp.89-117). New York: Plenum Press.

Lincoln, A. J., Courchesne, E., Kilman, B. A., Elmasian, R., and Allen, M. (1988). A study of intellectual abilities in high-functioning people with autsim. *Journal of Autism and developmental Disorders, 18,* 50523.

Lincoln, A., Courchesne, E., Allen, M., Hanson, E., and Ene, M. (1998). Neurobiology of Asperger Syndrome: Seven Case Studies and Quantitative Magnetic Resonance Imaging Findings. In Shopler et al (Eds). *Asperger Syndrome or High-Functioning Autism?*Plenum Press, New York.

Luria, A. R. (1973). *The working brain.* New York: Basic Books.

Lyons, M. J., Merla, M. E., Young, L., and Kremen, W. S. (1991) Impaired neuropsychological functioning in symptomatic volunteers with schizotypy: Preliminary findings. *Biological Psychiatry, 30,* 424, 426.

McGhie, A., and Chapman, J. (1961). Disorders of attention and perception in early schizophrenia. *British Journal of Medical Psychology, 34,* 104115.

McLaren, J. (1989). *The development of selective and sustained attention in normal and attentionally disordered children.* Unpublished doctoral dissertation, Dalhouse University, Halifax, Nova Scotia.

Manly, T., Robertson, I.H., Anderson, V., and Nimmo-Smith, I. (1999). *The Test of Everyday Attention for children (TEA-Ch),*Thames Valley Test Company, Bury St. Edmunds.

Marjiviona, J., and Prior, M. (1995). Comparison of Asperger syndrome and high-functioning autistic children on a test of motor impairment. *Journal of Autism and developmental Disorders, 25,* 23-39.

Meehl, P. E. (1999). Toward an integrated theory of schizotaxia, schizotypy, and schizophrenia. *Journal of Personality Disorders, 4,* 1-99.

Meltzoff, A. N. (1988). Infant imitation and memory in nine months –olds in immediate and deferred tests. *Child Development, 59,* 217-25.

Meltzoff, A. N., and Gopnick, A. (1993). The role of imitation in understanding persons and developing a theory of mind. In: Baron-Cohen S. Tager-Flusberg H. Cohen D. (Eds). *Understanding other minds: perspective from autism.* Oxford: Oxford University Press(pp.335-66)

Mettler, F. A. (1949). *Selective partial ablation of the frontal cortex: a correlative study of the effects on human psychotic subjects.* New York: Hober.

Mettler, F. A. (1952*). Psychosurgical problems.* New York: Blakiston.

Miller, L.S., Faustman, W.O., Moses, J.A., and Csernansky, J.G.(1992). Evaluating cognitive impairment in depression with the Luria-Nebraska Neuropsychological Battery: Severity correlates and comparisons with nonpsychiatric controls. *Psychiatry Research, 37,* 219-227.

Miller, P. H., and Weiss, M. G. (1981). Children's attention allocation, understanding of attention, and performance on the incidental learning tasks. *Child Development, 52,* 1183-1190.

Milner, B. (1964). "Some effects of frontal lobectomy in man" in Warren and Akert (Eds.), *The frontal granular cortex and behaviour.* New York: McGraw-Hill.

Minshaw, N. J. , Goldstein, G., Muenz, L. R., and Payton, L. R. (1992). Neuropsychological functioning in nonmenatlly retarded autistic individuals. *Journal of Clinical and Experimental Neuropsychology, 14,* 749-761.

Mischel, W., and Patterson, C. J. (1979). Effective plans for self-control in children. In W. A. Collins (Ed.), *Minnesota symposia on child psychology* (Vol. 11, pp. 199-230). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Mokros, H.B., Poznanaski, E.O., Merrick, W.A. (1989). Depression and learning diabilities in children: A test of an hypothesis. *Journal of Leaning Disabilities, 22,* 230-233.

Morrison-Stewart, S.L., Williamson, P.C., Corning, W.C.,Kanuchen, S.P., Snow, W.G., Merskey, H. (1992). Fronatl and non-fronatl lobe neuropsychological test performance and clinical symtomatology in schizophrenia. *Psychological Medicine, 22,* 353-389.

Nagy, J., and Szatmari, P. (1986). A chart review of schizotypal personality disorders in children. *Journal of Autism and Developmental Disorders, 3,* 351-367.

Nestor, P. G., Shenton, M. E., Wible, C., Hokama, H., O'Donnell, B., Law, S., and McCarley, R. (1998). A neuropsychological analysis of schizophrenic thought disorder. *Schizophrenia Research, 29,* 217-225.

Norman, D. A., and Shallice, T. (1986). Attention to action:willed and automatic control of behaviour. *In Consciousness and self-regulation, 4, (*Eds).R.J Davidson, G.E. Schwartz and D. Shapiro, (pp.1-18.) Plenum {ress: New York.

Ott, S. L., Rock, D., ErlenmeyerKimling, L. (1998). The New York high-risk project: IQ-scatter as predictor of schizophrenia. *Schizophrenia Research, 29,* 1-2, pp.62-63.

Ozonoff, S. (1995a). Executive functions in autism. In E. Shopler aand G. B. Mesibov (Eds.), *Learning and cognition in autism* (pp.199-219). New York: Plenum Press.

Ozonoff, S. (1995b). Reliability and validity of the Wisconsin Card Sorting Test in studies of autism. *Neuropsychology, 9,* 491-500.

Ozonoff, S. (1998). Assessment and remediation of executive dysfunction in autism and Asperger Syndrome. In E.Schopler, G. Mesibov and L. Kunce(Eds.), *Asperger Syndrome or high-functioning Autism?(*pp. 263-284). Plenum Press. New York.

Ozonoff, S., and MCEwey, R. E. (1994). A longitudinal study of executive function and theory of mind development in autism. *Development and Psychopathology, 6,* 415-431.

Ozonoff, B.F., Pennington, S.J., and Rogers, S.J. (1990). Are there emotion perception deficits in young autistic children? *Journal Of Child Psychology and Psychiatry, 51,* 343-61.

Ozonoff, S., Rogers, S. J., and Pennington, B. F. (1991). Asperger syndrome;evidence of an empirical distinction from high-functioning autism. *Journal of Child and Psychology and Psychiatry, 32,* 1107-1122.

Ozonoff, S., Rogers, S. J., and Pennington, B. F. (1991a). Executive function deficits in high-functioning autistic individuals; Relationship to theory of mind. *Journal of Child Psychology and Psychiatry, 35,* 1015-1031.

Ozonoff, S., Rogers, S. J., and Pennington. B. F. (1991b). Asperger syndrome:Evidence of an empirical distinction from high-functioning autism. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 32,* 1107-1122.

Ozonoff, S., and Strayer, D. L. (1997). Inhibitory function in nonretarded children with autsim. *Journal of Autsim and Developmental Disorders, 27,* 59-77.

Ozonoff, S., Strayer, D.L., McMahon, W.M., and Filloux, F.(1994). Executive function abilities in autism and Tourette syndrome: An information processing approach. *Journal of Child Psyhcology and Psychiatry and Allied Disciplines, 35,* 1015-1032.

Pantelis, C., Barnes, T., Nelson, H., Tanner, S., Weatherley, L., Owen, A., and Robbins, T. (1997) Frontal-striatal cognitive deficits in patients with chronic schizophrenia. *Brain, 10,* 1823-1843.

Pennington, B. F., and Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry, Vol. 37,* No.1, 51-87.

Perecman, E. (1987). Consciousness and the meta-functions of the frontal lobes: Setting the stage. In E. Perecman(Ed.), *The frontal lobes revisited.* New York: IRBN.

Perner, J., Leekham, S., and Wimmer, H. (1987). Three-year olds difficulty with false belief. The case for a conceptual deficit. British *Journal of Developmental Psychology, 5,* 125-137.

Perner, J., Frith, U., Leslie, A.M. and Leekham, S.R. (1989). Exploration of the autistic child's theory of mind: Knowledge, belief and communication. *Child Development ,60,* 689-700.

Perret, E. (1974). The left frontal lobe of man and the suppression of verbal responses in verbal categorical behaviour. *Neuropsychologica, 12,* 323-330.

Peuskens, J., DeHert, M., Christiaens, V., Joos, S. (1999). Cognitive functoning in schizophrenia: Comparison of WAIS IQ of young schizophrenic patients and matched controls. *Schizophrenia Research,* Vol.36,1-3, 206.

Piaget, J. (1954). *The construction of reality in the child.* New York: Basic Books.

Porteus, S.D. (1965). *Porteus Maze Test: Fifty Years' Application,* Palo Alto, Calif.: Pacific

Prifitera, A., and Saklofske, D. (1998). WISC-III-Clinical Use and Interpretation. Academic Press.

Posner, M. I., and Peterson. S. E. (1990). The attention system of the human brain. *Annual Review of Neuroscience, 13,* 25-42.

Puig-Antich, J., and Chambers, W. (1978). *The Schedule for Affective Disorders and Schizophrenia for School-Age Children* (Kiddie-SADS). New York, NY: New York State Psychiatric Institute, 1978.

Purcell, D., Lewine, R., Caudle, J., and Price, L. (1997). Sex differences in Verbal IQ and Performance IQ discrepancies among patients with schizophrenia and normal volunteers. *Journal of Abnormal Psychology, 107,* 161-165.

Qiutkin, F., and Klien, D. F. (1969). Two behavioural syndromes in young adults related to possible minimal brain dysfunction. *Journal of Psychiatric Research, 7,* 131-142.

Raine, A., and Lencz, T. (1996). Conceptual and theoretical issues in schizotypal personality research. In A. Raine and T. Lencz (Eds.), *Schizotypal Personality* (pp.3-15). CambridgeUniversity Press.

Raine, A., Sheard, C., Reynolds, G. P., and Lencz, T. (1992b). Prefrontal structural and functional deficits associated with individual differences in schizotypal personality. *Schizophrenia Research, 7,* 237-247.

Rains, G., Dennis, S., Sauer, K., and Kant, C. (1995). Cognitive impairment with left fronto-temporal abnormality in schizophrenic patients. *Journal of Neurotherapy, 1,* 44-47.

Rakic, P., Bourgeois, J. P., Zecevic,, N., Eckenhoff, M. F., and Goldman-Rakic, P. S. (1986). Concurrent overproduction of synapses in divers regions of the primate cerebral cortex. *Science, 232,* 232-235.

Reitan, R. M. (1958). Validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and Motor Skills, 8,* 271-276.

Reitan, R. M., and Wolfson, D. (1993). The Halstead- Reitan Neuropsychological Test Battery, Theory and Clinical Interpretation. *Neuropsychology Press,* AZ.

Richards, P.M., and Ruff, R.M. (1989). Motivational effects on neuropsychological functioning: Coparison of depressed versus nondepressed individuals. *Journal of Consulting and Clinical Psychology, 57,* 396-402.

Rincover, A., and Ducharme, J. M. (1987). Variables influencing stimulus overslectivity and "tunnel vision" in developmentally delayed children. *Amercian Journal of Mental Deficiency, 91,* 422-430.

Robertson, I. H., Manly, T., Andrade, J., Baddeley, B. T., and Yiend, J. (1997). 'Oops!': Performance correlates of everday attentional failures in traumatic brain injured and normal subjects. *Neuropsychologica, 35,* 747-758.

Rogeness, G. (1985). Comparison of whole blood serotonin and platelet MAO in children with schizophrenia and major depressive disorder. *Biological Psychiatry, 20,* 270-275.

Rogers, S. J., and Pennington, B. F. (1991). A theoretical approach to the deficits in infantile autism. *Developmental Psychopathology, 3,* 137-62.

Roitman, S., Cornblatt, B., Bergman, A., and Obuchowski, M. (1997). "Attentional functioning in schizotypal personality disorder". *American Journal of Psychiatry, 8,* 1180.

Roth, A., and Fonagy, P.(1996). What works for whom: A critical review of psychotherapy research. The Guildford Press.

Rumsey, J. M. (1992). Neuropsychological studies of high-level autism. In E. Shopler and G. B. Mesibov (Eds.), *High –functioning individuals with autism* (pp.41-64). New York: Plenum Press.

Rumsey, J. M. and Hamburger, S. D. (1988). Neuropsychological findings in high-functioning men with infantile autism residual state. *Journal of Clinical and Experimental Neuropsychology, 10,* 201-221.

Rumsey, J. M. and Hamburger, S. D. (1990). Neuropsychological divergence of high-level autism and severe dyslexia. *Journal of Autism and Developmental Disorders, 20,* 155-168.

Rutter.M (1972). Childhood Schizophrenia Reconsidered. *Journal of Autism and Childhood Schizophrenia, 2:315-337.*

Rutter, M. (1985).Diagnosis and definition. In M. Rutterand L. Hersov (Eds.), *Child and Adolescent Psychiatry: Modern approaches (pp. 1-25).* Oxford: Blackwell Scientific.

Ryan, J. J., and Rosenberg, S. J. (1984). Administration time estimates for WAIS-R subtest and short forms in a clinical sample. *Journal of Psychoeducational Assessment, 2,* 125-129.

Ryan, J. J., Weilage, M. E., and Spaulding, W. D. (1999). Accuracy of the seven sub-tesy WAIS-R short from in chronic schizophrenia. Schizophrenia Research, 39, 79-83.

Sattler, J. M. (1988). *Assessment of children* (3rd edn). San Diego, CA: Jerome Sattler.

Schachar, R., and Logan, G. D. (1990). Impulsivity and inhibitory control in normal development and childhood psychopathology. *Developmenatl Psychology, 26,* 710-720.

Schonell, and Goodacre (1974). *The Psychology and Teaching of Reading, 5th ed, pp 216-17.* Oliver and Boyd.

Segalowitz, S. J., Unsal, A., and Dywan, J. (1992). CNV evidence for the distinctiveness of frontal and posterior neural processes in a traumatic brain-injured population. *Journal of Clinical and Experimental Neuropsychology, 14,* 545-565.

Seltzer, J., Conrad, C., and Cassens, G. (1997). *Schizophrenia Research, 23,* 131-138.

Shah, A., and Frith, U. (1993). Why do autistic individuals show superior performance on the Block Design task? *Journal of Child Psychology and Psychiatry, 34,* 1351-1364.

Shallice, T. (1979). Case study approach in neuropsychological research. *Journal of Clinical Neuropsychology, 1,* 183-211.

Shallice, T. (1982). Specific impairments of planning. *Philosophical Transactions of the Royal Society of London,* 298, 199-209.

Shallice, T.(1988). *From Neuropsychology to mental structures.* Cambridge: Cambridge University Press.

Shallice, T., Burgess, P. W., and Frith, C. D. (1991) Can the neuropsychological case-study approach be applied to schizophrenia? *Psychological Medicine, 21,* 661-673.

Siegel, D. J., Minshaw, N. J., and Golstein, G. (1996). Wechsler IQ Profiles in diagnosis of High-functioning autism. *Journal of Autism and Developmental Disorders, Vol.2,* 389-406.

Simmons, J .E. (1969). *Psychiatric Examination of Children,* Hogarth Press, London.

Spaulding, W., Garbib, C. P., and Dras, S. R. (1989)Cognitive abnormalities in schizophrenic patients and schiztypal cllege students. *Journal of Nervous and Mental Disease, 177,* 717-728.

Spitzer, R. L., Endicott, J., and Gibbon, M. (1979). Crossing the border into borderline personality and schizophrenia. *Archives of General Psychiatry, 36,* 1724-1736.

Spreen, O., and Strauss, E. (1991). *A compendium of neuropsychological tests.* New York: Oxford University Press.

Stevens. M., Crow. T. J., Bowman, M. J., and Coles, E. C. (1978). Age disorientation in schizophrenia: a constant prevalence of about 25% in a chronic mental hospital population? *British Journal of Psychiatry, 133,* 130-136.

Stuss, D.T. and Benson, D.F. (1986). *The frontal lobes.* New York: Raven Press.

Szatmari, P., Tuff, L., Finlayson, A., and Bartolucci, G. (1990). Asperger syndrome and autism: Neurocognitive aspects. *Journal of American Academy of Child and Adolescent Psychiatry, 29,* 130-139.

Tager-Flusberg, H. (1991). Semantic processing in the free recall of autistic children: further evidence for a cognitive deficit. *British Journal of Developmental Psychology, 9,* 417-30.

Tantam, D. (1986) Eccentricity and autism. Ph.D. thesis, University of London.

Tantam, D. (1991). Asperger Syndrome in adulthood. In U. Frith (Ed.). Autism and Asperger Syndrome (pp.147-183). Cambridge Cambridge University Press.

Taylor, L . B. (1979). Psychological assessment of neuropsychological patients. In T. Rasmussen and R. Marino (Eds.), *Functional neurosurgery.* New York: Raven Press.

Taylor, G. (1988). Learning disabilities. In E. J. Mash and L. G. Terdal, (Eds). *Behavioural assessment of childhood disorders,* Edition 2 (pp402-450). New York: Guildford Press.

Temple, C. M. (1997). Cognitive neuropsychology and its application to children. *Journal of Child Psychology and Psychiatry, 38,* 27-52.

Trestman, R., Keefe, R. S., Mitropoulou, V., Harvey, P. D.,deVager, M .L., Lees-Roitman, S., Davidson, M., Aronson, A., Silverman, J., and Siever, L. J. (1995). *Psychiatry Research, 59,* 127-136.

Van der Gaag, R. J. (1993).*Multiplex development disorder: An exploration of borderlines on the autistic spectrum.* M.D.thesis, University of Utrecht.

Volkmar. F.R and Cohen.D.J.(1991). Comorbid Association of Autism and Schizophrenia. *American Journal of Psychiatry, 148, 1705-1707.*

Volkmar. F.R.(1996). Childhood and Adolescent Psychosis: A Review of the Past 10 Years. *Journal of American Academic Child and Adolescent Psychiatry,35:843-851*
Walker, H., and Birch, H. G. (1974). Intellectual patterning in schizophrenic children. *Journal of Autism and Childhood Schizophrenia, 5,* 155-167.

Walker, H., and Bortner, M. (1975). Concept usage in schizophrenic children. *Journal of Autism and Childhood Schizophrenia, 5,* 155-167.

Waterhouse, L., and Fein, D. (1984). *Developmental trends in cognotive skills for children diagnosed as autistic and schizophrenic. Child Development, 55,* 236-248.

Wechsler, D. (1974). Manual for Wechsler Intelligence Scale for children revised. San Antonio: The Psychological Corporation.

Wechsler, D.(1992). Manual for Wechsler Intelligence Scale for children- third UK edition. Sidcup, Kent: The Psychological Corporation.

Welsh, M.C. (1991). Rule-guided behaviour and self-monitoring on the Tower of Hanoi disk transfer task. Cognitive Development, 6, 59-76.

Welsh, M. C., and Pennington, B. F. (1988). Assessing frontal lobe function in children: Views from developmental psychology. *Cognitive Development, 2,* 37-57.

Welsh, M. C., Pennington, B. F., and Groisser, D. B. (1991). A normative -developmental study of executive function: a window of prefrontal function in children. *Developmental Neuropsychology, 7(2),* 131-149.

Welsh, M. C., Pennington, B. F., Ozonoff, S., Rouse, B., and McCabe, E. R. B. (1990) Neuropsychology of early treated phenylketonuria: specific executive function deficits. Child Development, 61, 1697-1713.

Werry, J. (1992b). Child and adolescent (early onset) schizophrenia: a review in light of DSM-III-R. *Journal of Autism and Developmental Disorders, 22,* 601-624.

Werry.J (1996). Childhood Schizophrenia. In: *Psychoses and Pervasive Developmental Disorders in Childhood and Adolescence, Volkmar.F, ed. Washington, DC: American Psychiatric Press,pp1-56.*

White, S. H. (1970). Some general outlines of the matrix of development changes between five and seven. *Bulletin of the Orton Society, 20,* 41-57.

Wing, L. (1981). Asperger syndrome: a clinical account. *Psychological Medicine, 11,* 115-129.

Wing, L. (1988) The continuum of autistic characteristics. In E. Sahopler,and G. Mesibov (Eds.), *Diagnosis and Assessment in Autism* (pp.91-110). New York:Plenum.

Wing, L., and Gould, J. (1979). Severe impairment of social interaction and associated abnormalities in children: Epdemiology and classification. *Journal of Autism and Developmental Disorders, 9,* 11-29.

Witkin, H. A., and Goodenogh, D. R. (1977). Field depedence and interpersonal style. *Psychological Bulletin, 84,* 661-689.

Wolff, S. (1964). Schizoid personality disorder in childhood. Unpublished paper read at the Sixth International Congress of Psychotherapy, London, August, 1964.

Wolff, S. (1991). 'Schizoid personality in childhood and adult life. III: The childhood picture. *British Journal of Psychiatry, 159,* 629-635.

Wolff, S. (1991). 'Schizoid personality in childhood and adult life. I: The vagaries of diagnostic labelling. *British Journal of Psychiatry, 159,* 615-620.

Wolff, S. (1995). *Loners; The Life Path of Unusual Children.* Routledge.

Wolff, S. (1998). Schizoid Personality in Childhood. In: Schopler et al. (Eds). *Asperger Syndrome or High-Functioning Autism?* Plenum Press, New York.

198

Wolff, S., and Barlow, A. (1979). Schizoid personality in childhood: A comparative study of schizoid, autistic and normal children. *Journal of Child Psychology and Psychiatry, 20,* 29-46.

Wolff, S., and Chick, J. (1980). Schizoid personality in childhood: a controlled follow-up study. *Psychological Medicine, 10,* 85-100.

Wolff, S., and McGuire, R. J.(1995) Schizoid personality in girls: a follow-up-study-What are the links with Asperger syndrome? *Journal for Child and Psychology and Psychiatry, 36,* 793-817.

Wolff, S., Townsend, R., McGuire, R. J., and Weeks, D. J. (1991). 'Schizoid personality in childhood and adult life. II: Adult adjustment and the continuity with schizotypal personality disorder. *British Journal of Psychiatry, 159,* 620-629.

World Health Organisation (1992). *ICD: ICD-10 Classification of Mental health and Behavioural Disorders- Clinical Descriptions and Diagnosis Guidelines.* Geneva:WHO.

Yin,R. K.(1989). *Case study research: Design and Methods* (revised edn.). New bury Park, CA:

Yirmiya, N., and Sigman, M. (1991). High-functioning individuals with autism: Diagnosis, empirical findings, and theoretical issues. *Clinical Psychology Review, 11,* 669-683.

Zalewski, C., Johnson-Selfridge, M.T., Ohriner, S., Zarella, K., and Seltzer, J.C.(1998). A Review of Neuropsychological Differences between Paranoid and Nonparanoid Schziophrenia patients. *Schizophrenia Bulletin, 24,* 127-145.

Zimet, S.G., Farley, G.K., Shapiro-Adler, S., and Zimmerman, T.(1994). Intellectual competence of children who are beginning inpatient and day psychiatric treatment. *Journal of Clinical Psychology, 50,* 866-877.

APPENDICES

Appendix 1.

RESEARCH AND DEVELOPMENT OFFICE

(Mailbox 121) 2nd Floor, Mint Wing, St Mary's Hospital, Praed Street, London W2 1NY
Direct Line R&D: 0171-886 1330/2014 Ethics: 0171-886 6514 Fax: 0171-886 1529

8 September 1998

Lorraine Connolly
Department of Child & Adolescent Psychiatry
17 Paddington Green
London W2 1LQ

EC3398

Dear Lorraine Connolly

AM647   Amendment to **A study of the clinical features of children with schizotypal disorder.**

On behalf of St Mary's Local Research Ethics Committee, I am happy to approve amendment #5 to your project, attached to your correspondence of 8 September 1998.

The AM and R&D number above will be attached to all future amendments related to this project, so please quote both numbers if you contact this office about the project.

Yours sincerely

Elizabeth Breeze
Vice Chairman

The St Mary's NHS Trust comprises:
St Mary's Hospital, the Western Eye Hospital, and acute services at St Charles Hospital

200

Interview with child-St.Mary's SPD study (to used in conjunction with KSADS)

Scoring :
- 0 = no information
- 1 = subject has not had the experience
- 2 = subject has mild (e.g. infrequent, less than once a month) and brief (seconds to minutes) experiences
- 3 = subject has had moderate (e.g. frequent) and brief experiences, or infrequent experiences of long duration
- 4 = subject has had severe (e.g. frequent and of long duration) experiences

	0	1	2	3	4
1.Sometimes children see things that scare them e.g. ghosts or monsters. This may happen at night when they are alone and looking at wallpaper or at shadows. When they look closer there is nothing there. Has this ever happened to you?	( )	( )	( )	( )	( )
2. Do you ever see other strange things during the night or even during the day?	( )	( )	( )	( )	( )
3. Do you often hear crackling, knocking, or roaring noises or whispers - sounds that you know are not real?	( )	( )	( )	( )	( )
4. If you brush against something familiar, or are touched by a familiar object, such as a friend's tap on the shoulder, do you ever think that this is a different and strange experience?	( )	( )	( )	( )	( )
5. Does it ever have a special unrelated meaning for you?	( )	( )	( )	( )	( )
6. Do you ever have the sense that some person or force is around you, even though you cannot see anyone?	( )	( )	( )	( )	( )
7. Do you ever experience strange taste sensations when eating familiar foods?	( )	( )	( )	( )	( )
8. Have you ever felt, as if, your body or part of your body was unreal in any way?	( )	( )	( )	( )	( )

	0	1	2	3	4
9. Have you ever felt as if you were outside your own body?	( )	( )	( )	( )	( )
10. Have you ever felt that your body includes more than one person?	( )	( )	( )	( )	( )
11. Have you ever felt that you were a spectator of your own activities?	( )	( )	( )	( )	( )
12. Have you ever felt that there are gaps in your memory about events or people?	( )	( )	( )	( )	( )
13. Have things around you seemed unreal?	( )	( )	( )	( )	( )
14. Have you ever felt physically cut off from people, as if you were in a dream?	( )	( )	( )	( )	( )
15. Do objects at times seem strangely changed in proportion or size?	( )	( )	( )	( )	( )
16. Has a place that you have never been to ever looked very familiar?	( )	( )	( )	( )	( )
17. Or has a familiar place looked unfamiliar?	( )	( )	( )	( )	( )
18. Do you sometimes feel that your voice sounds unfamiliar?	( )	( )	( )	( )	( )
19. Do you feel unreal when you hear your name spoken?	( )	( )	( )	( )	( )
20. Have you ever felt that things were happening around you had a special meaning just for you, even though you knew that they didn't?	( )	( )	( )	( )	( )
21. Do other people give you messages ?	( )	( )	( )	( )	( )
22. Do you think that this was your imagination?	( )	( )	( )	( )	( )
23. Do half heard remarks seem to be referring to you?	( )	( )	( )	( )	( )

	0	1	2	3	4
24. Have you felt that conversations in public places (playground, street, bus) refer to you?	( )	( )	( )	( )	( )
25. Do you feel that people's eyes watch you, that you are given special attention by strangers?	( )	( )	( )	( )	( )
26. Do you think that this was your imagination?	( )	( )	( )	( )	( )
27. Do you often wonder whether people you know can really be trusted?	( )	( )	( )	( )	( )
28. Are you often afraid that you will be taken advantage of?	( )	( )	( )	( )	( )
29. Do you think a lot about other people's motives and the hidden meaning of their thoughts and actions?	( )	( )	( )	( )	( )
30. Do you often think people are criticising or finding fault with you?	( )	( )	( )	( )	( )
31. Are you easily critical of other people ?	( )	( )	( )	( )	( )
32. Do you tend to be envious?	( )	( )	( )	( )	( )
33. Do others accuse you of being jealous?	( )	( )	( )	( )	( )
34. Do you think that in order to protect yourself from others you have to go out of your way to take precautions?	( )	( )	( )	( )	( )
35. Do you ever feel that people are out to hurt or harm you?	( )	( )	( )	( )	( )
36. Do you feel that half-heard remarks made by other people seem to imply a threat against you?	( )	( )	( )	( )	( )
37. Do you believe that certain acts or movements can in some way lead to the fulfilment of certain wishes?	( )	( )	( )	( )	( )

	0	1	2	3	4
38. Or ward off evil forces?	( )	( )	( )	( )	( )
39. Or accomplish unusual deeds?	( )	( )	( )	( )	( )
40. Do you think that by merely thinking about an event in the outside world you can cause that event to happen?	( )	( )	( )	( )	( )
41. Do you believe in magic?	( )	( )	( )	( )	( )
42. Do you think that you can read people's minds in some special way?	( )	( )	( )	( )	( )
43. Have you had any experiences foretelling future events because you have special power of perception beyond the average person's ability to use his\her senses?	( )	( )	( )	( )	( )
44. Do you have a sixth sense?	( )	( )	( )	( )	( )
45. Do you prefer to be by yourself?	( )	( )	( )	( )	( )
46. Are you active in church or clubs, sports or any other groups?	( )	( )	( )	( )	( )
47. Do you have close friends outside of your immediate family?	( )	( )	( )	( )	( )
48. How often do you meet with people or do things with other kids?	( )	( )	( )	( )	( )
49. Do you usually avoid situations where you know you would be with other kids?	( )	( )	( )	( )	( )
50. Do you tend to be uncomfortable in social situations (e.g. before playtime) ?	( )	( )	( )	( )	( )
51. Do people sometimes tell you that you are very sensitive to comments or remarks made about you? Do you tend to be touchy?	( )	( )	( )	( )	( )
52. Do you feel hurt or angry when criticised?	( )	( )	( )	( )	( )

	0	1	2	3	4
53. Do you have any thoughts or pictures stuck in your mind? Can you give me an example? Probe for dysmorphophobic, sexual (if age appropriate) or aggressive contents.	( )	( )	( )	( )	( )
54. Do you try to make these thoughts or images go away?	( )	( )	( )	( )	( )

Scoring

1. Illusions :	Q.1 =	Q.3 =	Q.5 =	Q.7 =
	Q.2 =	Q.4 =	Q.6 =	

2. Depersonalisation/ Derealisation	Q.8 =	Q.10 =	Q.12 =	Q.14 =
	Q.9 =	Q.11 =	Q.13 =	Q.15 =
	Q.16 =	Q.18 =		
	Q.17 =	Q.19 =		

3. Ideas of reference	Q.20 =	Q.22 =	Q.24 =	Q.26 =
	Q.21 =	Q.23 =	Q.25 =	

4. Suspiciousness Paranoid Ideation	Q.27 =	Q.29 =	Q.31 =	Q.33 =
	Q.28 =	Q.30 =	Q.32 =	Q.34 =
	Q.35 =			
	Q.36 =			

5.Magical Thinking	Q.37 =	Q.39 =	Q.41 =	Q.43 =
	Q.38 =	Q.40 =	Q.42 =	Q.44 =

6.Social Isolation	Q.45 =	Q.47 =	Q.49 =
	Q.46 =	Q.48 =	

7.Undue Social Anxiety or Hypersensitivity to Real or Imagined Criticism	Q.50 =	Q.52 =
	Q.51 =	

8.Obsessional Ruminations	Q.53 =
	Q.54 =

Child's Social-Emotional Questionnaire for parents and teachers
SR August 1997

Name of child: Date of birth:
Name of respondent: Date:
(teacher or parent)

It would be most helpful if you would make an assessment as to
whether the child stands out as different from other children of
his/her age (please tick the box that applies most):

	No	Somewhat	Yes
1. feels that things happening around him has a special meaning just for him	( )	( )	( )
2. feels that half-heard remarks seem to be referring to him	( )	( )	( )
3. has felt that conversations in public places (e.g. playground, street) refers to him	( )	( )	( )
4. feels that other people's eyes watch him	( )	( )	( )
5. has difficulty in trusting other children or adults	( )	( )	( )
6. is afraid that he will be taken advantage of	( )	( )	( )
7. feels that other people are criticising him	( )	( )	( )
8. easily critical of other people	( )	( )	( )
9. tends to be an envious child	( )	( )	( )
10. do other children accuse him of being jealous	( )	( )	( )
11. feels that other people are out to hurt or harm him	( )	( )	( )
12. half heard remarks made by others seem to imply a threat against him/her	( )	( )	( )
13. believes in magic or special powers (more than other children)	( )	( )	( )
14. face often looks like a blank screen	( )	( )	( )
15. do you often have to ask the child to look at you when talking together	( )	( )	( )

	No	Somewhat	Yes
16. has a tendency to stare into space even when he is doing the talking	( )	( )	( )
17. has a monotonous tone of voice	( )	( )	( )
18. sometimes has a silly expression on his face even when talking about something serious or sad	( )	( )	( )
19. sometimes uses inappropriate emotional tone in speech (e.g. angry or worried tone of voice fro topic that would not normally be associated with this)	( )	( )	( )
20. gives too much minute, unnecessary detail when talking	( )	( )	( )
21. difficulty in reaching the point	( )	( )	( )
22. tends not to give enough information to be understood	( )	( )	( )
23. tends to speak in a vague manner	( )	( )	( )
24. tends to contradict himself/herself when talking	( )	( )	( )
25. tends to be too elaborate in use of metaphors	( )	( )	( )
26. uses words inappropriately or out of context	( )	( )	( )
27. prefers to be alone	( )	( )	( )
28. no close friends outside the family	( )	( )	( )
29. avoids situations where s/he knows s/he will be with other people	( )	( )	( )
30. tends to avoid clubs, sports or group activities	( )	( )	( )
31. tends to be uncomfortable in social situations	( )	( )	( )
32. very sensitive to comments or remarks made about him/her	( )	( )	( )
33. tends to be touchy	( )	( )	( )
34. sensitivity/anxiety does not diminish with continued exposure	( )	( )	( )

207

	No	Somewhat	Yes
35. sees things that others cannot see (e.g. ghosts)	( )	( )	( )
36. hears things that others cannot hear (e.g. voices)	( )	( )	( )
37. has beliefs that are out of context with other children (e.g. believes that s/he is possessed or controlled by demons)	( )	( )	( )

Please specify any other reasons for the child standing out as different from other children, other than the points covered above:

Thank you for completing this form

Strengths and Difficulties Questionnaire

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain or the item seems daft! Please give your answers on the basis of the child's behaviour over the last six months or this school year.

Child's Name .... Male/Female

Date of Birth ....

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	☐	☐	☐
Restless, overactive, cannot stay still for long	☐	☐	☐
Often complains of headaches, stomach-aches or sickness	☐	☐	☐
Shares readily with other children (treats, toys, pencils etc.)	☐	☐	☐
Often has temper tantrums or hot tempers	☐	☐	☐
Rather solitary, tends to play alone	☐	☐	☐
Generally obedient, usually does what adults request	☐	☐	☐
Many worries, often seems worried	☐	☐	☐
Helpful if someone is hurt, upset or feeling ill	☐	☐	☐
Constantly fidgeting or squirming	☐	☐	☐
Has at least one good friend	☐	☐	☐
Often fights with other children or bullies them	☐	☐	☐
Often unhappy, down-hearted or tearful	☐	☐	☐
Generally liked by other children	☐	☐	☐
Easily distracted, concentration wanders	☐	☐	☐
Nervous or clingy in new situations, easily loses confidence	☐	☐	☐
Kind to younger children	☐	☐	☐
Often lies or cheats	☐	☐	☐
Picked on or bullied by other children	☐	☐	☐
Often volunteers to help others (parents, teachers, other children)	☐	☐	☐
Thinks things out before acting	☐	☐	☐
Steals from home, school or elsewhere	☐	☐	☐
Gets on better with adults than with other children	☐	☐	☐
Many fears, easily scared	☐	☐	☐
Sees tasks through to the end, good attention span	☐	☐	☐

Do you have any other comments or concerns?

Please turn over - there are a few more questions on the other side

Overall, do you think that your child has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?

No	Yes - minor difficulties	Yes - definite difficulties	Yes - severe difficulties
☐	☐	☐	☐

If you have answered "Yes", please answer the following questions about these difficulties:

• How long have these difficulties been present?

Less than a month	1-5 months	6-12 months	Over a year
☐	☐	☐	☐

• Do the difficulties upset or distress your child?

Not at all	Only a little	Quite a lot	A great deal
☐	☐	☐	☐

• Do the difficulties interfere with your child's everyday life in the following areas?

	Not at all	Only a little	Quite a lot	A great deal
HOME LIFE	☐	☐	☐	☐
FRIENDSHIPS	☐	☐	☐	☐
CLASSROOM LEARNING	☐	☐	☐	☐
LEISURE ACTIVITIES	☐	☐	☐	☐

• Do the difficulties put a burden on you or the family as a whole?

Not at all	Only a little	Quite a lot	A great deal
☐	☐	☐	☐

Signature .... Date ....

Mother/Father/Other (please specify:)

Thank you very much for your help

Strengths and Difficulties Questionnaire

S[11-16]

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain or the item seems daft! Please give your answers on the basis of how things have been for you over the last six months.

Your Name .... Male/Female

Date of Birth ....

	Not True	Somewhat True	Certainly True
I try to be nice to other people. I care about their feelings	☐	☐	☐
I am restless, I cannot stay still for long	☐	☐	☐
I get a lot of headaches, stomach-aches or sickness	☐	☐	☐
I usually share with others (food, games, pens etc.)	☐	☐	☐
I get very angry and often lose my temper	☐	☐	☐
I am usually on my own. I generally play alone or keep to myself	☐	☐	☐
I usually do as I am told	☐	☐	☐
I worry a lot	☐	☐	☐
I am helpful if someone is hurt, upset or feeling ill	☐	☐	☐
I am constantly fidgeting or squirming	☐	☐	☐
I have one good friend or more	☐	☐	☐
I fight a lot. I can make other people do what I want	☐	☐	☐
I am often unhappy, down-hearted or tearful	☐	☐	☐
Other people my age generally like me	☐	☐	☐
I am easily distracted, I find it difficult to concentrate	☐	☐	☐
I am nervous in new situations. I easily lose confidence	☐	☐	☐
I am kind to younger children	☐	☐	☐
I am often accused of lying or cheating	☐	☐	☐
Other children or young people pick on me or bully me	☐	☐	☐
I often volunteer to help others (parents, teachers, children)	☐	☐	☐
I think before I do things	☐	☐	☐
I take things that are not mine from home, school or elsewhere	☐	☐	☐
I get on better with adults than with people my own age	☐	☐	☐
I have many fears, I am easily scared	☐	☐	☐
I finish the work I'm doing. My attention is good	☐	☐	☐

Do you have any other comments or concerns?

Please turn over - there are a few more questions on the other side

Appendix 5.

PRESENTATION ORDER OF TESTS FOR (CASE ASSIGNED TO THAT ORDER)

1. WISC, FLT1, FLT2, FLT3, FLT4, SCH.   (Case 1)

2. FLT3, SCH, WISC, FLT1, FLT2, FLT4.   (Case 2)

3. FLT2, FLT3, FLT4, SCH, WISC, FLT1.   (Case 3)

4. FLT4, WISC, FLT2, FLT1, SCH, FLT3.

5. FLT1, FLT4, SCH, WISC, FLT3, FLT2.

6. SCH, FLT2, FLT1, FLT4, SCH, WISC.   (Case 6)

7. WISC, FLT3, FLT4, SCH, FLT2, FLT1.

8. FLT3, WISC, SCH, FLT2, FLT4, SCH.

9. FLT4, SCH, WISC, FLT2, FLT1, FLT3.

10. FLT2, FLT1, SCH, WISC, FLT3, FLT4.   (Case 5)

11. SCH, FLT3, FLT1, FLT4, WISC, FLT2.

12. FLT1, WISC, FLT2, FLT3, FLT4, SCH.

13. FLT3, FLT2, FLT1, FLT4, SCH, WISC.

14. WISC, FLT4, FLT3, SCH, FLT2, FLT1.

15. FLT4, FLT2, WISC, SCH, FLT1, FLT3.   (Case 4)

WISC= Wechsler Intelligence Scales for Children
FLT1= Thurstone Word Fluency
FLT2= Trail Making Test
FLT3= Opposite Worlds
FLT4= Walk Don't Walk
SCH=Schonell

<u>Dear Parent/carer,</u>

I understand that you and your child have recently been very helpful in offering your time to participate in a study and have met with either Dr.Sion Roberts or Dr.Dawn Renfrew. Since then we have decided to include, as part of the study, a psychological assessment. I am wondering whether there would be any chance of you helping further by taking part in this final phase of the study. It would involve a number of language and memory tests and would take approximately 2 hours. The interview would take place at Paddington Green clinic or your home, which ever was most suitable to you.

Your participation in this part of the study would be entirely voluntary and would in no way affect the care that is provided for you. If you require further information Dr.Roberts or Dr.Renfrew will be happy to answer any questions. You will be contacted shortly to see if you'd like to participate.

Approval for this study has been given by St.Mary's Local Research Ethics Committee

Yours sincerely,

Lorraine Connolly
Clinical Psychologist in Training.

CONSENT FORM

AGREEEMENT TO PARTCIPATE IN RESEARCH PROJECT

I, (Your name)..

of, (Your address)..

agree to take part(or agree that my child/ward may take part) in this research project)

I confirm that the research has been explained to me. I understand that my consent is entirely voluntary, and that I may withdraw from this research at any time for any reason and this will not affect my medical care in any way.

Signed:...

Print name:...

Investigator's Statement :

I have explained the nature and demands of this research to the parent/carer and/or the subject.

Signature..

Date:...