READING DIFFICULTIES

AND PSYCHOSOCIAL PROBLEMS:

DOES SOCIAL INFORMATION PROCESSING

MODERATE THE LINK?

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Approval

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Abstract

Children with reading difficulties (RD) are also likely to experience psychosocial problems. However, a significant proportion (30-50%) are indistinguishable, in psychosocial terms, from their typically-achieving (TA) peers. The aim of the current study was to identify aspects of social information processing which serve a protective function for children with RD, in terms of their at-risk status for concomitant psychosocial problems. *Method:* The sample comprised 42 children (21 with RD, and 21 TA), aged 9-11 years, with 11 boys and 10 girls in each group. A multifactor procedure was used to classify children as RD, based on the inclusionary criteria of teacher selection, and reading achievement below the 25th percentile, as well as several exclusionary criteria. The reading subtests of the WIAT-II, and the KBIT-2 (non-verbal IQ) measures were used to identify the presence of RD according to these criteria. The dependent variable, behavioural symptoms, was assessed using the Strengths and Difficulties Questionnaire, which was rated by both parents and teachers. Children (RD and TA) completed measures of theory of mind, understanding emotions in facial expression and tone of voice, attachment style, and affective experience. *Results:* As expected, RD were correlated with increased levels of psychosocial problems, and poorer theory of mind skills predicted increased psychosocial problems. Consistent with hypotheses, emotion understanding, positive affect, and secure attachment, moderated the link between RD and psychosocial problems. That is, better emotion understanding, more positive affect, and secure attachment status, functioned as protective factors for children in the RD group, but not those in the TA group. *Conclusion:* The findings are discussed in relation to extant findings, as well as within a risk and protective framework. Finally, strengths and limitations of the current study are described, and implications for psychosocial interventions suggested.

Introduction

Children with learning disorders (LD) have difficulty acquiring basic academic skills (particularly reading) even though they receive appropriate instruction, and demonstrate seemingly adequate cognitive abilities, motivation, and effort. In spite of the relatively high prevalence of LD (up to 30% in children; see Deisinger, 2004), many aspects of their definition and identification are fraught with controversy. Even so, it is generally agreed that: (a) LD comprise a heterogenous group of disorders, (b) LD have their basis in neurological deficits, (c) LD involve psychological process disorders, (d) LD are associated with underachievement, (e) LD may be manifested in either spoken language, academic, or thinking disorders, (f) LD occur across the lifespan, and, (g) LD do not result from other conditions (see Deisinger, 2004; Kavale & Forness, 2000).

The direct and indirect effects of LD are often both long-term and wide-ranging, being associated with increased school drop-out rates (e.g., 40% in the United States; American Psychiatric Association; APA, 2000), and increased delinquency rates (e.g. Mishna,1996). Higher rates of unemployment (16.2% for adults with LD vs. 4.8% of non-LD adults) and greater dependence on government income support have also been reported in New Zealand (NZ; Chapman, Tunmer, & Allen, 2003).

Over 1000 studies have been published on LD during the last ten years, many of which have provided further confirmation of the relationship between LD and a range of adverse psychosocial outcomes. However, it remains the case that little is understood about the causal mechanisms underlying these outcomes (see Rutter & Maughan, 2005). Unlike the majority of studies which focus on various neurological, behavioural, cognitive, and social-emotional characteristics of children with LD that differentiate them from their typically achieving (TA) peers, the emphasis in the current study is on investigating the *nature* of the relationship between LD (particularly reading difficulties; RD), and psychosocial problems.

The following introduction is divided into four sections: (1) LD: Setting the Scene, (2) Reading Difficulties, (3) Reading Difficulties and Psychosocial Problems, (4) RD and Social Cognition, and (5) The Current Study. The first two sections contain background on the prevalence, definition, identification and classification of LD and RD, thereby providing an overview of the general context in which the current study is set. Next, an overview of findings concerning the relationship between RD and psychosocial problems is presented, together with a summary of the hypothesised causal directions of this relationship. Fourth, previous findings for individuals with RD in relation to aspects of social information processing (SIP), which comprise the variables of interest in the current study, are reviewed. Finally, the rationale for the current study and research hypotheses are presented.

Learning Disabilities: Setting the Scene

Although children with LD make up approximately half all the recipients of special education services in the United States, much controversy and debate still surrounds the definition, identification, and classification of LD (see Deisinger, 2004; Keogh, 2005; Lyon, Fletcher, & Barnes, 2003).

Definitions of LD

Several definitions of LD are currently in use, with the American legal definition contained in the Reauthorisation of the Individuals with Disabilities Education Improvement Act (IDEIA; 2004) the most widely cited. According to the IDEIA, LD refer to:

> a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest in an imperfect ability to listen, think, speak, read, write , spell, or to do mathematical calculations …

The IDEIA definition goes on to name specific disorders (such as dyslexia) included in the category of LD, and to list exclusionary criteria such as sensory impairment and low overall cognitive functioning (see D'Amato, Crepeau-Hobson, Huang, & Geil, 2005). Another commonly quoted definition is that proposed by the National Joint Committee on Learning Disabilities (NJCLD; see Deisinger, 2004; Elksnin & Elksnin, 2004; Rutter & Maughan, 2005). This definition differs in its inclusion of a social competence dimension, such that, "problems in self-regulatory behavior, social perception, and social interactions may exist with learning disabilities but do not by themselves constitute a learning disability" (NJCLD, 2001, p.31; see *Appendix A* for details).

An alternative conceptual definition of LD has recently been proposed by Rourke (2005). That is, "LD are specific patterns (sub-types) of neuropsychological assets and deficits that eventuate in specific patterns of formal (e.g., academic) and informal (e.g., social) learning assets and deficits. LD may also lead to specific patterns of psychosocial functioning" (p.111).

Regardless of which definition of LD is employed, consensus is emerging on several points. First, LD are real and distinct from other disorders; second, LD are related to specific neuropsychological processing deficits; and third, these processing deficits are qualitatively different from general cognitive delays or deficits (Keogh, 2005).

Prevalence of LD

Accurate prevalence figures are difficult to obtain, due to variability in the definition of LD used in different geographical locations, both within the US and elsewhere. However, an estimated prevalence rate of 4.43% of individuals aged from 6-21 years in the US was quoted by the Committee on the Prevention of Reading Difficulties in Young Children (CPRDYC, 1998), and of 5% by D'Amato, Crepeau-Hobson, Huang, and Geil (2005), and the APA (2000). There is a high growth rate in the identification of children with LD, with

an increase of over 200% since the LD category was introduced in the US in 1977 (see Vaughan, Linan-Thompson, & Hickman, 2003).

LD in New Zealand

Notably, LD are not recognised within the NZ education system, either currently or historically, and terms such as *learning disorder*, or *developmental dyslexia* are never officially used, although specialist service provision is made on the (ad hoc) basis of individual needs. Earlier efforts to have LD recognised as a special education category (in the 1980's) for intervention purposes, were not successful (see Chapman, 1992; Chapman, Tunmer, & Allen, 2003).[1] However, Chapman, St. George, and van Kraayenoord (1984), estimated a relatively high (in comparison to the US) prevalence rate of LD in NZ of 7.9%, in a large sample (N = 1220) of 11-year-olds, using a regression-based IQ-discrepancy approach (see below).

Categories of LD

LD are commonly divided into two categories, *verbal learning disabilities* (also known as *basic phonological processing difficulties*) and *non-verbal learning disabilities* (NLD). The majority of children with LD have verbal (mostly reading) difficulties, either in isolation, or in conjunction with difficulties in other academic areas. According to Rourke (2005) these two LD subtypes demonstrate distinct neuropsychological profiles.[2] Only a brief overview of NLD is provided here, as individuals with RD were the focus of the present study.

From a neuropsychological perspective, there is much evidence to suggest that NLD reflect right hemisphere brain disorders, with deficits primarily in visuospatial organisational functioning (see Moallef & Humphries, 2003; Worling, Humphries, &

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1 See Chapman, Tunmer, & Allen (2003) for a comprehensive historical overview of LD, and reading interventions in NZ.

2 Rourke and colleagues have identified several additional sub-types of LD, and these are described in detail elsewhere (e.g., Rourke, 2000). According to this perspective, children with RD demonstrate normal, or near normal, psychosocial adjustment, while children with NLD demonstrate increasingly serious psychosocial dysfunction over time.

Tannock, 1999). Children with NLD show deficits in three main areas: (1) motor skills (e.g., balance and coordination difficulties), (2) visual-spatial organisation (e.g., visual recall, spatial perception, and spelling difficulties), and (3) socially (e.g., difficulties understanding non-verbal communication and social interactions (see Elias, 2004). Although language abilities are often thought to be intact in NLD, deficits have been found in semantics, prosody, and pragmatics, with individuals with NLD also showing language delays and poorer verbal abstraction and inferencing abilities. For example, deficits have been found in language-related spatial and emotional inferencing abilities (for discussion see Worling, et al., 1999).

Classification rules have been established for differentiating between verbal and non-verbal LD, with validation based on measures of psychosocial adjustment. That is, children with verbal LD are said to display normal or near-normal psychosocial adjustment (and no increase in psychosocial problems with age), whereas those with NLD tend to have higher levels of psychosocial problems and these are developmentally dependent (particularly internalising problems; see Pelletier, Ahmad, & Rourke, 2001). Individuals with NLD are frequently diagnosed with hyperactivity or inattention problems during middle childhood, and tend to exhibit internalising symptoms (such as withdrawal, anxiety, and depression) in later childhood and early adolescence. Academically, individuals with NLD typically have strengths in reading and spelling, with deficits in mathematics. Socially, they demonstrate better use of verbal information in comparison to non-verbal social information. Thus, the presence of atypical behaviours and social skill deficits are thought to be characteristic of individuals with NLD (Rourke, 2005).

Classification and Identification of LD

Approaches to the identification of LD continue to be a subject of debate (see Lyon, Fletcher, & Barnes, 2003; Proctor & Prevatt, 2003), with one major criticism being the lack of congruence between the widely accepted definitions of LD (e.g., those of the

IDEIA and NJCLD) and the classification criteria which are used (see Johnson, Mellard, & Byrd, 2005). Overviews of the major approaches to the classification and identification of LD follow. First, the traditional *ability-achievement discrepancy* model is presented and the main criticisms of this approach outlined. Next, the more recently proposed, *response to intervention* model is described, and finally an integrated neuropsychological model.[3]

Ability-achievement discrepancy model. The ability-achievement discrepancy model represents the traditional approach to the identification of LD, and is based on the presence of a significant discrepancy between an individual's ability (usually determined by IQ) and their academic achievement. The ability-achievement discrepancy model is used in the Diagnostic and Statistical Manual of Mental Disorders, which defines *learning disorders*[4] in terms of achievement scores in reading, mathematics, or written expression, that are significantly below what is expected for age, amount of instruction, and level of intelligence (DSM-IV-TR; APA, 2000).

Adding to the complexity of classification and identification, IQ-achievement discrepancy scores are calculated in four ways: (1) using deviation from grade level, (2) using expectancy formulae, (3) using simple standard score differences, and (4) using regression-based differences. A range of measurement issues are associated with these discrepancy calculation methods, and these are not discussed here. However, while many researchers have expressed concern over the measurement issues associated with discrepancy scores (see Deisinger, 2004), some continue to support the use of the ability-achievement discrepancy approach (e.g. Rutter & Maughan, 2005).

Several conceptual issues, central to the larger controversy over the identification of LD, also surround the use of the ability-achievement discrepancy method (see D'Amato, et al., 2005). One of the main concerns is the high misidentification rate associated with this

3 For full discussion of the controversies surrounding LD definitions and classification issues, see Lyon, Fletcher, and Barnes (2003), Fletcher, Coulter, Reschly, and Vaughn (2004), and Kavale and Forness (2000).
4 *Learning disorders* being the correct term, although *learning disabilities* remains in common usage.

approach, with a tendency towards both *over-identification* of children with high IQs and average achievement (i.e., false positives), and *under-identification* of children with lower IQs and below-average achievement (i.e., false negatives; see Semrud-Clikeman, 2005; Vaughn, Linan-Thompson, & Hickman, 2003). Evidence for such identification problems comes from large-scale evaluations of LD populations, where only about 50% of the individuals classified as having LD demonstrate a significant ability-achievement discrepancy (see Kavale & Forness, 2000).

A further criticism of the IQ-discrepancy model is that it necessitates a *wait to fail* approach (due, in part, to the psychometric properties of the tests used), precluding the provision of effective early intervention at the first signs of learning difficulties (D'Amato, et al., 2005; Vaughn et al., 2003). Additional criticism surrounds IQ not being an indicator of potential ability, and discrepancy not being a valid marker for disability (see Vaughn, Linan-Thompson, & Hickman, 2003).

Taking all the conceptual and measurement concerns into consideration, many researchers (and some practitioners) are opposed to the continued use of the ability-achievement discrepancy model (e.g., Frances, et al., 2005; Naglieri, Salter, & Rojahn, 2005; Siegel & Smythe, 2005), and selection of participants for research is often based directly on reading scores rather than on discrepancy scores (e.g., Arnold et al., 2005). Overall, the prevailing view seems to be that an ability-achievement discrepancy is a necessary, but not sufficient, criterion for identifying LD, with many researchers arguing for greater use of inclusionary criteria (over the current reliance of exclusionary criteria), and acknowledgement of the role of contextual factors, such as the quality of instruction (e.g., Deisinger, 2004; Kavale & Forness, 2000).

Response to treatment/intervention model. The treatment validity or response to treatment/intervention model (RTI; Fuchs & Fuchs, 1998; Fuchs, Mock, Morgan, & Young, 2003) is an alternative approach to the identification of LD which, although it has

received much support (e.g., Fletcher et al., 2004), is also currently the subject of vigorous debate in the literature (see Deisinger 2004; Gresham, 2002).

Using the RTI approach, students with LD are identified on the basis of low achievement, the application of exclusionary criteria, and their subsequent response to appropriate intervention. Thus, students identified with LD using RTI, will be performing below the level of their classroom peers, and will also show a significantly slower rate of learning than their peers. Exclusionary criteria include the presence of intellectual disability, socio-economic disadvantage, and cultural or linguistic diversity (Vaughn et al., 2003).

In contrast to the discrepancy approach, an early intervention or, *treat-then-test* (rather than *test-then-treat*) procedure is applied under RTI. Instruction is matched to the academic needs of the students, and progress is regularly monitored. RTI uses a risk perspective to identify students *at-risk for LD*, provides immediate intervention, and then identifies those whose response to treatment remains low as having LD.

While it is widely accepted that RTI should be a component of the identification of LD, the RTI approach has been criticised on the basis that the focus is almost exclusively on RD (with other types of LD being largely ignored), and on children (rather than utilising a lifespan perspective; see Johnson et al., 2005). In a comprehensive discussion, Kavale, Holdnack, and Mostert (2005) argue against RTI, and cite additional reasons such as conflicts with current definitions of LD, and the potential for false positives and negatives in diagnosing LD using an RTI approach (see Keogh, 2005).

Alternative approaches. In response to alternatives to the ability-achievement discrepancy approach (such as RTI) being proposed, Scruggs and Mastropieri (2002) suggested guidelines for approaches designed to classify and identify LD. These included: (1) the need for the concept of *unexpected* low achievement to be retained, (2) the need to discriminate between individuals with LD and those with other disorders affecting

learning, (3) acknowledgement of the multifaceted nature of LD, and (4) recognition that LD persist across the lifespan. These guidelines are reflected in several recently proposed approaches for the identification of LD (e.g., Fletcher, Morris, & Lyon, 2003; Kavale et al., 2005; Semrud-Clikeman, 2005). These all focus on intra-individual discrepancies, the assessment of psychological processes, and the requirement for exclusionary criteria to be met. They also maintain that LD are qualitatively different from general low achievement, and that this is reflected in deficits in psychological processes (see Johnson et al., 2005).

The ecological neuropsychology model. A recent ecological neuropsychology model takes a strengths-based approach to LD, and focuses on the interactions between individuals and the social and environmental systems in which they function (D'Amato et al., 2005). In this model, biogenetic factors (e.g., processing efficiency), environmental factors (e.g., family support, opportunities to learn), and outcome behaviours (e.g., social behaviour and awareness, academic competency) are all seen as interacting with the characteristics of the individual (such as perceptions, affect, and problem-solving). Thus, the focus of this approach is on determining individual needs and strengths, so as to enable the design of interventions which are ecologically valid and evidence-based.

Similarly, Semrud-Clikeman (2005) has proposed an approach which combines RTI identification of LD with a neuropsychological framework. In view of these recent developments, it appears likely that future identification and classification of LD will include components of both RTI and neuropsychological assessment, as understanding of the nature of the specific psychological processing deficits associated with LD grows.

Reading Difficulties: Identification, Prevalence, and Aetiology

The majority of children identified with LD, an estimated 70-90%, have a primary deficit in reading (APA, 2000; Grigorenko, 2001; Kavale & Forness, 2000; Lerner, 2000; Shaywitz & Shaywitz, 2005). As the current study concerned an investigation of the nature

of the links between reading difficulties (RD) and psychosocial problems in children, the definitions, prevalence, and characteristics of RD are outlined next.

Definition of RD

A succinct definition of RD was provided by Shaywitz and Shaywitz (2004) when they stated that RD are, "characterised by an unexpected difficulty in reading in children and adults who otherwise possess the intelligence, motivation, and education necessary for developing accurate and fluent reading" (p. 8). The DSM-IV-TR definition of *reading disorder* includes two main criteria: (1) reading achievement (accuracy, speed, or comprehension as determined by individually administered, standardised tests) below that expected for age, ability (IQ), and education, and (2) reading problems which interfere with academic achievement or daily life (APA, 2000). In practical terms, the overall, defining feature of RD is an individual's failure to acquire, "rapid, context-free word identification skills" (Lovett, Steinbach, & Frijters, 2000, p.335).

Stability of RD

RD in childhood often persist into adolescence and early adulthood (e.g., Lyon et al., 2003; Prior, Smart, Sanson, & Oberklaid, 1999; Williams & McGee, 1996). For example, reading scores obtained during the first two years of school tend to correlate in the region of .6 with reading scores over time (see Fleming, Harachi, Cortes, Abbott, & Catalano, 2004; Wehby, Falk, Barton-Arwood, Lane, & Cooley, 2003) The stability of RD were also observed in the Isle of Wight longitudinal study, where half of the children identified with RD at the age of 10 still had RD at the age of 14 (see Maughan, 1995). Similarly, Smart, Prior, Sanson, and Oberklaid (2001) found that of a sample of children identified with RD at the age of 7-8, over half still had RD at age 13-14. Thus, RD tend to be stable over time, and represent a "persistent, chronic condition rather than a transient developmental lag' (Shaywitz & Shaywitz, 2005).

Classification and Identification of RD

The identification of RD tends to occur soon after formal reading instruction begins, with most children with RD having been diagnosed by the fourth grade in the US (by around 9 years). Two main types of RD have commonly been described in the literature. The first, *reading disability* (or *reading difficulties / specific reading difficulties* / *developmental dyslexia / specific reading retardation*) is viewed as being due to biological and genetic factors, and mainly affecting boys. The key criterion for the identification of this type of RD is an ability-achievement discrepancy (as described above), with identification based on a categorical approach (CPRDYC, 1998).

The second category of RD comprises poor readers who do not meet the discrepancy criterion, and have traditionally been categorised as being *garden-variety poor readers* or as exhibiting *general reading backwardness*. This category of RD is assumed to be due to factors such as low intelligence, lack of adequate instruction, and poor motivation. Early evidence for the existence of these two, qualitatively distinct, categories of RD came from Rutter and Yule's original (1975) findings from the Isle of Wight and London studies, in which a categorical distinction between the two groups of poor readers was supported. Thus, up until recently, the reading difficulties of an individual who was otherwise capable were thought to be qualitatively different from the reading difficulties of an individual with generally low academic achievement (CPRDYC, 1998; Snowling, 2002).

However, over the past decade, the lack of emergence of further data to support the supposed qualitative differences between the two RD subgroups (along with genetic data to the contrary, in support a similar base for both, see below) has led to the emergence of a dimensional view in which individuals with RD constitute the lower end, or *tail*, of normally distributed reading ability (see CPRDYC, 1998). Evidence for this dimensional view of RD has come from more recent epidemiological studies, as well as behavioural genetic studies in which no evidence for differing aetiologies has been found. For example,

in the Connecticut Longitudinal Study, 75% of the reading discrepant group (i.e., those identified with RD using the ability-achievement discrepancy criteria), also met criteria for low reading achievement (Shaywitz, Fletcher, & Shaywitz, 1996).

Thus, in practice, there is a great deal of overlap between individuals identified with RD using either the ability-achievement discrepancy or low achievement methods, with many studies finding few differences between poor readers who would have been assigned to different categories using the traditional approach. Moreover, any differences that have emerged tend to be not qualitative but related only to severity (see CPRDYC, 1998). Nevertheless, the identification of RD remains controversial, with some researchers (and professionals) of the view that RD merely represents the tail-end of normally distributed reading ability (i.e., low achievement), while others remain of the opinion that there are qualitative differences between children with RD and low-achieving readers (see Shaywitz, et al., 1996).

There is widespread agreement, however, that children with RD constitute a distinct group from those with lower overall cognitive functioning, and that both low achievement criteria (with reading level below that predicted by age, but not lower than the level predicted by ability), and discrepancy-based criteria should be used in the identification of RD. The current study takes a dimensional perspective of RD, and individuals with RD were identified using low reading achievement as the main criterion (although the multiple selection criteria are described in full below).

Prevalence of RD

As previously noted, RD are the most common type of LD, with estimated prevalence rates ranging between 3% and 17% in the United States, Britain, and NZ. Prevalence rates vary according to the definitional criteria used, with rates of between 3% and 7% when stringent criteria are applied (e.g.,reading scores two standard deviations below the mean) and 15-17% when less stringent criteria are applied (APA, 2000; CPRDYC, 1998; Muter,

2003; Shaywitz & Shaywitz, 2005). For example, a prevalence rate of 17.5% was obtained in the Connecticut longitudinal study using less stringent criteria (Shaywitz, et al, 1996). In practical terms classification as RD usually equates to a reading level 18-24 months below that of TA peers (Snowling, 2002). According to Torgesen (2000), even with appropriate early intervention, approximately 4-6% of children could still be expected to experience RD (i.e. reading achievement below the 30th percentile).

Prevalence of RD in NZ. Reported prevalence rates for RD in NZ are comparable to the US figures cited above. For example, an early study by Walsh (1979) found prevalence rates of 7.1% for reading comprehension difficulties, and 5.8% for word reading, using an IQ-discrepancy formula. Slightly lower prevalence rates of 1-3% were obtained in the Dunedin longitudinal study, using more stringent criteria (Silva et al, 1985), although rates of approximately 7% are more typically reported (see Chapman, 1992).

Extrapolating from data recently reported by Rutter and colleagues (2004), I have calculated that prevalence rates for RD in two NZ epidemiological studies (Dunedin and Christchurch) were 15% and 15.2% respectively (in line with previously cited similar longitudinal studies in the US). These NZ studies both contained equal numbers of boys and girls, and set the reading achievement score cut-off at the lowest 15% of the distribution. A similar prevalence rate is also found in data on participation in the *Reading Recovery* programme (an early intervention programme for children deemed to be at-risk for RD after one year in school). Reading Recovery data also show that 15% of 6-year olds participated in *Reading Recovery* in 2003, comprising 25% of all 6-year-old boys and 13% of all 6-year-old girls (N.Z. Ministry of Education, 2005).

Although NZ generally fares well in international comparisons of reading achievement, and was ranked fourth (behind Finland, the U.S., and Sweden), in a 1992 survey of 9-year-olds (Elley, 1993), it also demonstrates a relatively wide spread of reading scores in comparison to other countries. For example, in the PIRLS (Progress in International

Reading Literacy Study) study of Year 4 (Grade 5) children, NZ was ranked thirteenth out of 35 countries for reading comprehension (with England ranked third, Canada sixth, and the U.S. ninth), and 16% of NZ students' scores were in the bottom quartile, a percentage greater than that for 20 other countries (Mullis, Martin, Gonzalez, & Kennedy, 2003; Tunmer, Chapman, & Prochnow, 2004). It has been suggested that one reason for this seemingly large group of poor readers may be the use of a whole language approach to the teaching of reading in NZ. Similarly, Reading Recovery uses text-based (e.g., preceding passsage content, sentence context cues) over word-based strategies, and given the important role of phonological awareness in reading acquisition (see below) there is debate over the effectiveness of this programme for children with RD (see Tunmer et al., 2004).

Aetiology

RD are generally assumed to result from interactions between genetic and environmental influences, and for most individuals with RD the precise cause of their difficulties is not known (for a review see Gilger & Kaplan, 2001). Nevertheless, much progress has been made in regard to the aetiology of RD in recent years, and a brief outline of these known aetiological factors is presented below.

Genetic and shared environmental influences. It has long been observed that the prevalence of RD is higher in parents of children with RD than in the general population. The prevalence of RD in parents of children with RD is between 31% and 62%, compared to a prevalence rate of 5% to 10% in the general population (CPRDYC, 1998). For example, Scarborough (1998) estimated that 46% of fathers and 33% of mothers of children with RD, themselves had RD. Alternatively, approximately 25 - 50% of children who have a parent with RD (whether mother or father) have RD (Shaywitz & Shaywitz, 2005).

Thus, the claim that genetic influences are the main precursor to RD is now well-established (see Grigorenko, 2001; Galaburda, 2005; Harlaar, Spinath, Dale, & Plomin,

2005), with moderately high heritability estimates, ranging from .4 to.7 (Muter, 2003). Genetic influences have now been found for specific reading components such as phonological awareness, decoding, comprehension, spelling, orthographic knowledge, and rapid-visual naming (see Petrill, Deater-Deckard, Thompson, DeThorne, & Schatsneider, 2006). For example, specific locations on the short arms of chromosomes 2, 6, 15, and 18 have been identified for reading (e.g., phonological and orthographic skills), with replication of these findings across different laboratories (e.g., Fisher, et al., 2002; Grigorenko, Wood, Meyer, & Pauls, 2000; Knopik, et al., 2002). It has been proposed that some of these RD susceptibility genes may affect early neuronal migration to the cerebral cortex in the third trimester of pregnancy. For example, there is a known pathway between a particular gene mutation, abnormal cortical and thalamic development, and an auditory behaviour seen in some children with RD (see Galaburda, 2005). Results from a study of twins with a history of RD also confirmed the heritability of phonological decoding, orthographic choice, and rapid visual-naming abilities (Davis, et al., 2001). However, as previously mentioned, no evidence has been found for a differential genetic influence by gender, with males and females showing similar degrees of heritability for RD (e.g., Wadsworth & DeFries, 2005; Wadsworth, Knopik, & DeFries, 2000).

Almost all of the genetic studies on reading have been carried out with twins, and this has limited their ability to detect shared environmental influences (vs. genetic influences). However, a recently published study used a combined twin/adoption design to investigate shared environment effects, and found that these accounted for between 30% and 50% of reading variance (Petrill, et al., 2006). In this study, genetic influences were strongest for *process-based* reading measures, such as rapid naming, whereas shared environment influences were strongest for *content-based* measures, such as letter identification. Furthermore, several studies have found a pattern whereby shared environmental and genetic influences both have a moderate effect on reading in younger children, but the

effects of genetic influences on reading increase through middle childhood and into adolescence (see Petrill, et al., 2006).

Neuroanatomical factors. There are three main schools of thought with regard to the neuropsychological bases of RD. First, it is argued that RD occur due to *deficits* in the neural mechanisms required for reading, particularly areas in the left hemisphere such as the angular gyrus, with RD being analagous to acquired reading disorders. Second, it is claimed that neurological *disorganisation* prevents the acquisition of reading (e.g., deficits in phonological awareness). Finally, the third view claims that all the required brain regions are intact but that there is a *disconnection* syndrome affecting the links between these regions, and that this leads to RD (see Banich & Scalf, 2003).

While there is some evidence that the cerebellum is implicated in reading, with different areas of the cerebellum being activated during phonologic and semantic tasks (e.g., Fullbright, et al., 1999; Galaburda, 2005) two other regions are mainly involved with RD. The first of these is the left perisylvian region (the superior temporal gyrus and mid-temporal gyrus, commonly known as Broca's area), which is activated during phonological processing, particularly in articulating spoken words and in word-analysis (Noble & McCandliss, 2005; Shaywitz & Shaywitz, 2004).

The second is the left temporo-occipital region, in the posterior region of the brain, which is implicated in the automatic perception and processing of visually presented words (necessary for fluent reading). This brain region (including the fusiform gyrus) is also known as the *word form* area, and once a word is represented here, readers are able to recognise words instantly and effortlessly, with evidence that the more proficient a reader is, the more this area is activated.

Recent functional imaging studies have provided evidence that individuals with RD demonstrate different patterns of neural activation when reading than do normal readers (see Lyon, Fletcher, & Barnes, 2003; Papanicolaou, et al., 2003; Shaywitz, et al., 2002).

Specifically, children with RD show decreased activation in the left temporo-occipital region during reading tasks in comparison to controls (Noble & McCandliss, 2005; Shaywitz & Shaywitz, 2004). Increased activation of the inferior frontal gyrus has also been observed in some studies (e.g., Shaywitz, et al., 2002) leading to the hypothesis that some individuals with RD may develop a functional compensatory reading system in the anterior and right hemisphere brain regions, but that reading by these means remains effortful (see Shaywitz & Shaywitz, 2004). However, Noble and McCandliss (2005) advise cautious interpretation of these results, as activation in these areas may also be due to dysregulation of typical inhibition or lateralisation.

Other recent studies have demonstrated that the aberrant patterns of neural activation may return to normal following intensive phonological skills intervention, giving rise to optimism regarding the potential success of future interventions (Rourke, 2005; Shaywitz et al., 2002).

Neuropsychological factors. A range of possible neurocognitive bases of RD have been identified, and it is now thought that RD may represent a collection of syndromes rather than just one (Banich & Scalf, 2003). A recent comprehensive review of the neuropsychological correlates of RD (Semrud-Clikeman, 2005) includes the possible roles of speed of information processing, working memory, and executive functioning (in terms of self-monitoring of performance, and inhibiting responding to irrelevant stimuli). For example, working memory deficits have been implicated in RD, with individuals with RD rehearsing less, and performing poorly on verbal tasks requiring short-term retention of verbal information (e.g., Muter & Snowling, 1998). However, Swanson and Ashbaker (2000) demonstrated that the poorer word recognition and comprehension in children with RD reflected deficits in the central executive system, independent of deficits in the phonological loop (responsible for the temporary storage of verbal information).

Demographics and Environmental Risk Factors for RD

Gender. There is a widely held perception that the prevalence of RD is higher in boys than in girls, largely based on the knowledge that boys are more susceptible to developmental disorders than girls. Indeed, much of the evidence supports this view (e.g. Muter, 2003; Maughan, 1995; Rutter & Maughan, 2005). For example, examination of data from four large epidemiological studies by Rutter and colleagues (2004), showed the prevalence of RD to be higher in boys in all cases, with odds ratios ranging from 1.39 to 3.19. However, many studies have found no evidence of a gender difference in the prevalence of RD (see Lyon, Fletcher, & Barnes, 2003; Shaywitz, et al., 1996; Siegel & Smythe, 2005).

The most commonly proposed explanation for this discrepancy in findings relating to gender is that bias in school-identified and referred samples leads to the over-identification of boys (see Shaywitz & Shaywitz, 2005), with boys outnumbering girls by between 2:1 and 5:1 in referred RD samples (CPRDYC, 1998; Lerner, 2000). A NZ study also found that boys were twice as likely to be referred for remedial reading instruction as girls (Prochnow, Tunmer, Chapman, & Greaney, 2001). The DSM-IV-TR (APA, 2000) estimates that 60-80% of individuals with RD are male, but also notes the likelihood of referral bias due to the increased presence of psychosocial problems in boys.

A further explanation for the higher prevalence of RD observed in boys has been proposed by Share and Silva (2003). They suggest that boys are over-identified when the IQ-discrepancy method is used, due to predicted reading scores being overstated for boys, which in turn lead to inflated IQ-reading discrepancies. Share and Silva found that when reading scores were predicted separately for boys and girls (according to their separate distributions) the prevalence of severe underachievement was found to be equal in boys and girls. Thus, referral biases (due to increased levels of behaviour problems in boys), and

measurement issues, may both contribute to the perceived higher prevalence of RD in boys.

Socio-economic status (SES). Many researchers have found evidence of a direct link between low SES and RD, with children from low SES families tending to have poorer reading scores, together with more attention and behaviour problems (Carroll, Maughan, Goodman, & Meltzer, 2005; Fleming et al., 2004; Molfese, Modglin, & Molfese, 2004; Noble & McCandliss, 2005). Recent research has found evidence of an interaction effect whereby, at lower phonological processing ability levels (but not at higher levels), SES differences were influential. That is, children from high SES backgrounds were learning to read relatively well (in spite of having lower phonological processing abilities), whereas children from low SES backgrounds (with similar phonological processing abilities), were having difficulties learning to read. Thus, higher SES appeared to be functioning as a protective factor for children with poorer phonological processing (Noble & McCandliss, 2005).

However, others have not found any relationship between SES status and reading achievement (e.g., Smart et al., 2001; Wiener, 2002), and it is possible that factors associated with SES (such as the home literacy environment), rather than SES per se, may account for this apparent association (see Rashid, Morris, & Sevcik, 2005).

Home literacy environment. Findings with regard to the effects of the preschool home literacy environment (books in the home, shared reading etc.) on reading acquisition and later reading achievement are mixed. For example, a meta-analysis of reading studies found that the frequency of parent-child reading prior to school entry was predictive of both emergent literacy skills and later reading ability, with a lack of early reading experience a risk factor for poor reading achievement (Bus, van IJzendoorn, & Pellegrini, 1995). However, an earlier review of studies using parent-preschooler reading variables,

found only modest correlations with future reading difficulties (Scarborough & Dobrich, 1994).

While most studies into the effects of the home literacy environment have been conducted with preschool children, measures of the home environment have been related to reading achievement up to the age of 11 (e.g., Dubow & Ippolito, 1994). Interestingly, a longitudinal study by Molfese and colleagues (2003) found that preschool measures of the home environment predicted reading achievement in middle childhood, whereas concurrent measures of the home environment in middle childhood did not predict reading achievement. Generally however, the home literacy environment seems to have less of an effect on older readers than it does on early readers (see Petrill, et al., 2006).

A recent study with 6 to 9-year-old children with RD indicated that whereas *child* home literacy experiences contributed little to reading abilities, *parent* home literacy behaviours (e.g., parental reading behaviours) *were* linked to reading abilities in children, particularly reading comprehension and spelling (Rashid et al., 2005). Thus, it may be that the reading behaviour modeled by parents, and the home literacy environment, are more closely linked to reading achievement in the early school years.

Language development. RD reflect deficits within the language system, and delays in speech and language development are known precursors to RD (see Rutter & Maughan, 2005; Scarborough, 1990; Shaywitz & Shaywitz, 2004, 2005; Snowling, 2002). Between 40% and 75% of preschoolers with delayed language development go on to experience RD at school (CPRDYC, 1998), and this is particularly so if the child has displayed severe, broad, or persistent language deficits in the preschool years. For example, early language delay (at ages 3 and 5) has been associated with RD (as well as ADHD) and externalising behaviour problems at age 11 (see Pisecco, Baker, Silva, & Brooke, 2001), and both receptive and expressive language difficulties are associated with problems in learning to read (Semrud-Clikeman, 2005).

Predictors of RD at school entry are largely language-based, and include relatively lower skill levels in verbal memory (sentences and stories), receptive language (vocabulary, syntax), expressive language, object naming skills (speed and accuracy), phonological awareness, reading readiness, letter identification, and concepts of print (CPRDYC, 1998).

Core Deficits Associated with RD

Numerous cognitive and neuropsychological deficits are associated with RD, including deficits in short-term memory for verbally coded information, phonemic awareness, rapid serial naming, executive functions, processing speed, and auditory processing (Molfese, et al., 2003). However, there is consensus that phonological awareness and processing skills, and visual-naming speed are the two core deficits present in RD, and that both persist into adulthood (see Lovett et al., 2000).

Phonological awareness and processing. Phonological awareness and processing refers to the metalinguistic ability to, "reflect explicitly on the sound structure of spoken words" (Snowling 2002, p.725). The act of reading involves converting printed letters on a page into the phonetic code, and requires phonemic awareness, the ability to access the sounds of spoken language, and the ability to attribute meaning to these (Elias, 2004).

Deficits in phonological awareness and processing (e.g., differentiating sounds in words, blending sounds to create words) constitute the core linguistic deficit in RD, regardless of whether children are identified using the ability-achievement discrepancy model or the low achievement model (see Grigorenko, 2001; Keogh, 2005; Lovett et al., 2000; Pennington, Groisser, & Welsh, 1993; Noble & McCandliss, 2005; Semrud-Clikeman, 2005; Shaywitz, et al., 1996, 2005; Vellutino, Fletcher, Snowling, & Scanlon, 2004). For example, deficits in phonemic awareness were related to subsequent reading achievement in a study of children aged 5 to 8 years (Cardoso-Martins, & Pennington, 2004).

Most academic interventions for RD are based on the phonological awareness approach (see Wolf & Bowers, 2000), although there is debate over whether phonological awareness deficits are language-specific, or whether they reflect underlying perceptual processing deficits in auditory/temporal processing, or visual processing (see Banich & Scalf, 2003).

Visual-naming speed. The measurement of naming-speed derives from several neuropsychological studies conducted during the 1970's, in which a series of *rapid automised naming* (RAN) tests were developed (e.g., Denckla, & Rudel, 1974). RAN tasks typically require individuals to name a series of high frequency numbers, letters, colours, or objects, presented in random order, with the measure of interest being the total time taken to complete the task (see Vukovic & Siegel, 2006). Deficits in the ability to rapidly name visually presented material are commonly present in individuals with RD, even when familiar stimulus materials are used (e.g., Lovett, et al., 2000; Savage, et al., 2005). Both children and adults with RD are slower to retrieve verbal labels for visual stimuli, especially when these are serial and alphanumeric. For example, a study of third grade (Year 4) children found that poor readers were generally slower than good readers on a response time task (motor) and on a RAN task (object naming; Catts, Gillispie, Leonard, Kail, & Miller, 2002).

Whereas the central role of phonological awareness deficits in RD has wide acceptance, the role of visual-naming speed deficits remains controversial, with some researchers viewing visual-naming speed as a component of phonological processing ability, and others seeing the two as dissociable core deficits (see, Lovett et al., 2000).

Double-deficit perspective. The double-deficit hypothesis contends that RD are due to the presence of one, or both, of the two core deficits described above (i.e., phonological awareness and visual-naming speed deficits), and that the precursors for these specific deficits can be found in earlier speech and language development (see Wolf & Bowers, 2000). Thus, according to this perspective, RD results from, " problems in the ability to

represent, access, and manipulate individual speech sounds in words" and/or " difficulty in rapidly accessing and retrieving names for visual symbols", thereby giving rise to three RD subtypes (phonological deficit only, visual-naming speed deficit only, and a double-deficit; Lovett et al., 2000).

Evidence in support of this perspective, was reported by Lovett, and colleagues (2000) who found that of 140 individuals with RD (aged 7-13 years), 54% demonstrated a double deficit, 22% a phonological deficit only, and 24% a visual-naming speed deficit only, enabling classification of 84% of the total sample. Furthermore, in accordance with the double-deficit hypothesis, children in the double-deficit category had the most severe RD, whereas individuals with only a phonological deficit had moderate RD, and those with only rapid-naming deficits had the least reading impairment (Lovett, et al., 2000; Vukovic & Siegel, 2006).

However, a recent review article examined the evidence obtained for the double-deficit hypothesis so far, and concluded that: (1) although there are individuals who meet the double-deficit criteria, there is little evidence of the identification of individuals with a naming-speed only deficit, (2) naming-speed and phonological skills tend to be positively correlated, and interventions targeted at improving phonological awareness tend to also ameliorate naming-speed deficits (Vukovic & Siegel, 2006). Thus, it remains to be seen whether further evidence will be found in support of the double-deficit hypothesis, or whether, as many researchers believe, rapid-naming will be subsumed under the construct of phonological processing.

Co-morbidity with ADHD[5]

Although ADHD and RD are distinct disorders, they frequently co-occur, and RD are relatively common in children with attention problems (see CPRDYC, 1998; Tur-Kaspa, 2002a). Depending on the method of identification used, approximately 20-50% of

[5] The abbreviation ADHD is used here to refer to all sub-types, whether predominantly inattentive, hyperactive, or combined.

children with RD have co-morbid ADHD, while 35-50% exhibit attention problems (Gilger & Kaplan, 2001; Semrud-Clikeman, et al., 1992). Posited reasons for this overlap are that attention influences reading development per se (e.g., Lonigan, et al., 1999), or that attention mediates early links between behaviour and academic achievement (e.g., Arnold, 1997).

Pennington and colleagues (1993) suggested that ADHD may arise secondary to RD, based on their findings that children with RD primarily demonstrate phonological processing deficits, while children with ADHD primarily demonstrate executive functioning deficits, and children with RD/ADHD also demonstrate deficits only in phonological processing. School-age children with co-morbid RD/ADHD also tend to demonstrate higher levels of behaviour problems than individuals with RD only or ADHD only (e.g., Kral, Kibby, Johnson, & Hind, 2000).

There is accumulating evidence to the effect that individuals with RD/ADHD comprise a distinct sub-group with a shared genetic aetiology. For example, an investigation of the neuropsychological profiles of adolescents with RD, ADHD, and RD/ADHD, found that whereas both the RD groups demonstrated verbal working memory deficits and slower verbal retrieval speed, only individuals in the co-morbid RD/ADHD group were slower on the RAN tasks and showed slower reaction times. This challenged the notion that visual-naming speed deficits are specific to RD, and provided further evidence that RD/ADHD may constitute a specific sub-group with a unique cognitive profile (Rucklidge & Tannock, 2002).

In a similar vein, Willcutt, Pennnington, and DeFries (2000) investigated the aetiology of co-morbidity between RD and ADHD in 313 same sex twin pairs. They found that children with RD had significantly higher scores for both inattention and hyperactivity, but particularly inattention. Follow-up behaviour genetic analyses showed that RD and inattention demonstrated high bivariate heritability (95%), whereas RD and hyperactivity

did not (21%). Thus, RD and inattention seemed to have a shared genetic aetiology. A recent study also found shared genetic characteristics for individuals with RD/ADHD (on the ADRA2A gene), providing further support for this hypothesis (Stevenson, et al., 2005).

Children with ADHD were not included in the current study in order to avoid possible confounds due to behaviour symptoms being attributable to ADHD rather than RD per se.

Reading Difficulties and Psychosocial problems

The current study sought to identify variables which may influence the link between RD and psychosocial problems. The following section provides an overview of evidence of the relationship between RD and adverse pyschosocial outcomes, and outlines possible causal explanations for this relationship.

RD and Concurrent Psychosocial Problems

Children with RD are at-risk for psychosocial problems across age, ethnicity, settings, raters, and countries. Prevalence estimates for co-morbid psychosocial problems range from 38-75% (Bryan, 2005; Elias, 2004; Kavale & Forness, 1996; Kavale & Mostert, 2004), and the link between RD and psychosocial (behavioural, social, and emotional) problems in childhood has been repeatedly established in the literature (Pearl, 2002; Swanson & Malone, 1992; Wehby et al., 2003). Both RD and psychosocial problems are also strongly predictive of difficulties in adolescence (see Hinshaw, 1992; Maughan, 1995; Morrison & Cosden, 1997). The link between RD and psychosocial problems has been shown to be robust even when controlling for IQ and SES (e.g., Prior et al., 1999). For example, one study of high SES children with RD found they were more anxious, and less happy than controls, and there was evidence of these symptoms intensifying with age (Casey, Levy, Brown, & Brooks-Gunn, 1992).

Students with RD are at-risk in three main psychosocial domains: (a) beliefs and feelings about the self (e.g., self-concept, attributions, self-worth, loneliness, depression),

(b) socio-cognitive skills (e.g., social perception, social cognition, perspective taking, and communicative competence), and (c) interpersonal skills (e.g., developing and sustaining social relationships, adaptive behaviour, and classroom behaviour; Bryan, 2005).

RD have been linked with a range of specific social, emotional, and psychosocial problems, including low self-esteem, depression, anxiety, loneliness, and aggression (see Bender & Wall, 1994; Carroll et al., 2005; E. Nowicki, 2003; Gorman, 2001; Grigorenko, 2001; Maughan, 1995; Snowling 2002). Impulsivity, hyperactivity, and attention problems have also consistently been associated with RD (see Fleming et al., 2004), with scores on reading achievement tests in elementary school predictive of these behavioural symptoms. There is also a comprehensive body of research showing that social interaction problems are common in both children with RD and preschoolers at-risk for RD (see Most, Al-Yagon, Tur-Kaspa, & Margalit 2000; Bryan, 2005; Elksnin & Elksnin, 2004; Hinshaw, 1992; Lerner, 2000). Correspondingly, the academic deficiency most common in children with psychosocial problems is RD (Wehby et al., 2003). Shaywitz and colleagues (1996) found that children with RD and concomitant psychosocial problems were more likely to be identified as RD.

Teachers tend to rate students with RD as having lower social competence and more psychosocial problems than their TA peers (e.g., E. Nowicki, 2003; Pearl, 2002; Tur-Kaspa, 2002b). For example, in a study of Grade 4 and 5 boys with RD, teacher ratings of classroom behaviour (academic aptitude and social adaptation) were more negative for boys with RD than for TA controls (Kravetz, Faust, Lipshitz, & Shalhav, 1999). Boys with RD also displayed poorer interpersonal understanding, and this was negatively correlated with adaptive behaviour. However, the interpersonal task in this study was linguistically complex, and the inclusion of academic aptitude as part of the measure of classroom behaviour is likely to have inflated the findings, as it would be expected to correlate highly with RD.

The findings for links between psychosocial problems and RD have been repeated across measures and raters. Parents also report lower levels of social competence and more externalising and internalising behaviour problems in boys aged 6-11 years with RD (McConaughty & Ritter, 1985), and self-report measures from individuals with RD depict poorer behaviour and lower perceived school (social) status (Gans, Kenny, & Ghany, 2003).

However, findings from epidemiological studies, such as the Isle of Wight study, where almost half of the children with RD scored above the cut-off for antisocial behaviour (on teacher ratings), have frequently not been replicated in clinical studies (Hinshaw, 1992), and a few studies have not found a link between RD and psychosocial problems (e.g., Jorm, Share, Matthews, & Maclean, 1986; Lamm & Epstein, 2001). Smart, Sanson, and Prior (1996) found that RD remained stable over time in a sample of Grade 2 to 4 (Year 3-5) children, but with greater variability in behavioural status. In this large sample (N = 1205), both the *RD only* and the *control* groups displayed very low rates of behaviour problems (in comparison to the *behaviour problem* and *combined RD/behaviour problem* groups). However, as Smart and colleagues point out, the study did not include children with sub-clinical levels of behaviour problems, and inclusion of such children may have yielded different results. On the whole however, the research literature indicates a clear relationship between RD and concurrent psychosocial problems.

RD and Long-term / Future Psychosocial Outcomes

The links between RD and psychosocial outcomes tend to persist. Adolescents with RD display higher school drop-out rates, higher levels of inattention, and more delinquent behaviours (including violence and substance abuse) in comparison to controls (Arnold et al., 2005; Fleming, et al., 2004; Wehby, et al., 2003). For example, two-thirds of individuals with RD in a large epidemiological sample (the Isle of Wight study) were found to have records of juvenile delinquency (Maughan, Gray, & Rutter, 1985).

Furthermore, when RD are concomitant with psychosocial problems in childhood, the effect on later psychosocial adjustment is greater than if only psychosocial problems are present earlier (Wehby, et al., 2003).

Although few prospective longitudinal studies investigating the relationship between early RD and future psychosocial outcomes have been carried out, one such study found that RD in the early school years was associated with behaviour problems in adolescence, even when controlling for attention (Fleming, et al., 2004); and, in an early longitudinal study of 10-year old boys with RD, but no psychosocial problems, 40% had become delinquent by age 17 (see Hinshaw, 1992). In a similar vein, Palacios and Semrud-Clikeman (2005) recently found that psychosocial problems and RD both independently predicted psychosocial problems (and ADHD) in adolescence. It is clear that long-term adverse psychosocial outcomes are potentially associated with RD.

Gender and Psychosocial Outcomes

Although the evidence is equivocal, gender differences in the level and type of psychosocial problems experienced by children with RD have frequently been found. First, more boys than girls with RD appear to demonstrate psychosocial problems (e.g., Smart et al., 1996). Second, boys tend to exhibit more externalising behaviours compared to girls, who in turn tend to exhibit more internalising behaviours (e.g., Willcutt & Pennington, 2000). This pattern was found in a study of sixth to eighth-graders (Year 7-9) with RD, which found higher overall rates of emotional problems in comparison to TA peers, with boys scoring higher on externalising symptoms and girls higher on internalising symptoms (Martínez & Semrud-Clikeman, 2004). Lerner (2000), also notes that girls with RD tend to exhibit more social problems, whereas boys with LD tend to exhibit higher levels of aggression and poorer emotion regulation.

However, findings are mixed with regard to links between gender and psychosocial problems, and psychosocial problems did not vary by gender in another recent study of 9 -

15 year olds with RD (Carroll, et al., 2005). Studies of psychosocial problems and RD have typically used very uneven numbers of male and female participants (possibly due to the male bias in referred samples as described earlier), making it difficult to draw firm conclusions concerning variations in psychosocial outcomes as a function of gender.

Causal Explanations

Although a great deal of research has demonstrated an association between RD and psychosocial problems, little is known about the early development, underlying causal mechanisms, or the causal direction of this link (Hinshaw, 1992; Hughes, Dunn, & White, 1998; Hughes, White, Sharpen, & Dunn, 2000; Stevenson, 1996). However, these issues are now beginning to be addressed, with the increasing use of longitudinal research designs and multivariate statistical techniques. Several causal explanations have been posited, beginning with Rutter and Yule (1970), and subsequently reiterated and modified (Hinshaw, 1992; Martínez & Semrud-Clikeman, 2004), and these are outlined below.

Reading difficulties lead to psychosocial problems. The hypothesis that RD lead to psychosocial problems is also known as the *academic hypothesis*. That is, RD are thought to lead to psychosocial problems through the feelings of frustration and anger engendered by successive failure experiences in the learning environment. This view is based on the premise that poor readers become discouraged and begin to drift away from the pro-social influences of the school environment, thus placing them at significant risk for emotional and psychosocial problems (see Fleming 2004; Muter, 2003). As proposed by Stanovich (1986), it is hypothesised that once children begin to experience difficulties with reading acquisition, there is an accumulation of negative flow-on effects which influence general learning, motivation, and behaviour.

In support of this causal hypothesis, Stanton, Feehan, McGee, and Silva (1990) found that reading ability predicted psychosocial problems (hyperactivity, anti-social, and neurotic behaviours), in a large population sample of 11-year olds, after controlling for

family adversity, early problem behaviour (at 3 and 5 years), and school-age IQ. Like Rutter and Maughan (2005), Stanton and colleagues noted that further research was needed to investigate, " the mechanisms through which reading dysfunction results in behaviour problems" (p.516).

Further evidence of RD leading to psychosocial problems is shown in studies where academic improvements following interventions are linked to concomitant improvements in behaviour (e.g., Kellam, Ling, Merisca, Brown, & Ialongo, 1998), and where poor reading achievement in the early school years has been found to predict delinquency in adolescence (see Hinshaw 1992; Mishna, 1996).

Psychosocial problems lead to reading difficulties. This causal pathway is posited to occur through disruption of the normal learning process due to psychosocial problems. That is, psychosocial problems are thought to interfere with learning through decreasing opportunities for learning (and teaching) thereby increasing the likelihood of RD occurring (see Gorman, 2001).

Findings, such as those of Fergusson and Horwood (1992) that behaviours associated with ADHD predicted reading achievement by age 11, support this causal hypothesis. However, this interpretation of Fergusson and Horwood's findings may be queried on the grounds that ADHD encompasses cognitive as well as behavioural symptoms (and thus may well affect learning), and that there is a considerable overlap between ADHD and RD (potentially confounding the results). Further evidence for this causal hypothesis has been noted by Pisecco and colleagues (2001) who found that externalising behaviour at age 3 was associated with RD at age 11. Smart and colleagues (1996) also found children with RD had a higher incidence of behaviour problems as preschoolers, with 25% of boys who displayed behaviour problems at school entry going on to have RD, providing supporting evidence for this hypothesis. Spira, Bracken, and Fischel (2005) recently called for more research into the relationship between RD, social skills, and behaviour problems, based on

their findings that behaviour predicted academic improvement following the identification of RD.

Third variable hypothesis for RD and psychosocial problems. The third variable causal hypothesis proposes that an underlying variable(s) result in both RD and psychosocial problems. That is, common precursors cause the development of both RD and psychosocial problems. Attention deficits, hyperactivity, and low IQ have all been suggested as possible third variables. However, support for third variable hypotheses is minimal, with findings for the relationship between RD and psychosocial problems tending to hold up even when possible third variables, such as attention and IQ, are controlled for (see Bennett, Bendersky, & Lewis, 2005; Maughan, Pickles, Hagell, Rutter, & Yule, 1996).

Reciprocal hypothesis for RD and psychosocial problems. The reciprocal hypothesis posits that RD and psychosocial problems each lead to the other, creating a continuous, bi-directional pathway (see Hinshaw, 1992). Much support has been found for this general hypothesis, including a longitudinal study by Williams and McGee (1994) which confirmed complex bi-directional effects linking reading achievement and externalising behaviours, such that early RD (at 9 years) predicted later conduct disorder (at 15 years), and early antisocial behaviour predicted both later reading ability and delinquency.

In further support of this hypothesis, McGee, Williams, Share, Anderson, and Silva (1986) found that children with RD, aged 5 and 11, had more behaviour problems on school entry, and that these increased through the early years of schooling (especially hyperactivity). These findings suggest that certain psychosocial problems may predate RD, and that RD may in turn exacerbate extant psychosocial problems. Further evidence that RD may exacerbate psychosocial problems was found in a study of children with RD and RD/behaviour problems, in which the RD/behaviour problem group made significantly less progress on reading in comparison to the RD only group (Sanson, Prior, & Smart, 1996). Similar reciprocal effects for reading achievement and psychosocial problems/social

competence have been reported in numerous other studies (e.g., Fergusson & Lynskey, 1997; Welsh, Parke, Widaman, & O'Neil, 2001).

The Current Position. At the time of Hinshaw's major review of learning disabilities in 1992, the weight of evidence supported the hypothesis that RD lead to psychosocial problems. However, based on more recent findings, there seems little question that the relationship between RD and psychosocial problems is bi-directional. That is, RD predict psychosocial problems *and* psychosocial problems predict RD. Although the current study examines only the link from RD to psychosocial outcomes, the reciprocal path (from psychosocial problems back to RD) is acknowledged.

RD and Typical Psychosocial Functioning.

Having reviewed the literature regarding the relationship between RD and psychosocial problems, it is equally important to acknowledge that a sizeable number of children with RD are indistinguishable from their TA peers on measures of psychosocial adjustment. According to Greenham (1999), the majority of children with RD have typical psychosocial competence, with 33% experiencing some degree of difficulty (including sub-clinical levels) compared to just 10-15% of their TA peers.[6] Others have concurred that between 30-50% of children with LD *do not* experience significant difficulties with social interaction (Pearl, 2002; Wiener, 2002). For example, in a study of clinic-referred children with RD (aged 7-13 years), almost half displayed no, or minimal, psychosocial problems (Tsatsanis, Fuerst, & Rourke, 1997).

At present, the reasons that some children with RD do well psychosocially while others do not, remain largely unknown. The majority of studies have examined differences between children with and without RD, with few investigating individual differences within the RD population. The current study was directly concerned with this important question.

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[6] However, these figures may also be interpreted such that children with RD are twice as likely to display psychosocial problems as their peers.

Reading Difficulties and Social Information Processing

As established in the previous section, children with RD are at increased risk for adverse psychosocial outcomes. Much research in the area of RD has focused on identifying differences in social cognition abilities between children with and without RD, in attempts to explain the higher rates of psychosocial difficulties in children with RD. The basis for this line of research is that 'social cognitions constitute the mechanisms leading to social behaviours, that, in turn, form the bases of social adjustment" (Tur-Kaspa, 2002a, p.13). Numerous previous studies have confirmed the presence of social cognition deficits in children with RD (e.g., Gresham, Sugai, & Horner, 2001; Kuhne & Wiener, 2000).

The current study investigates the possible influences of selected aspects of social information processing on the relationship between RD and psychosocial problems. This section provides an overview of social information processing in relation to children with RD, and introduces the social cognition variables of interest in the current study, briefly reviewing the relevant findings for each.

Social Information Processing

Social cognition includes an individual's ability to accurately read and interpret both verbal and non-verbal social and emotional cues; the ability to discriminate between salient and irrelevant social and emotional information; knowledge of conventional social behaviours and consequences; and the ability to make correct attributions about another person's mental state (i.e., theory of mind or role-taking).

Crick and Dodge's (1994; Dodge, Laird, Lochman, & Zelli, 2002) social information processing (SIP) model integrates the various aspects of social cognition necessary for competent psychosocial functioning, and conceptualises the underlying processes involved in SIP. The specific SIP steps (which act in continual, dynamic interaction with each other) in this model include: (1) encoding social cues, (2) mentally representing social cues, (3)

associating cues with emotion states and goals, (4) accessing possible responses, (5) enacting responses, and (6) monitoring and evaluation of responses and decision-making.

In comparison with their TA peers, children with RD have been shown to have difficulties at each step of the SIP model (especially encoding social information, and generating responses; e.g., Tur-Kaspa & Bryan, 1993). According to the SIP model, if performance at any step is deficient, perhaps due to biases in perception, or inaccurate interpretation of social stimuli, this will result in some form of psychosocial problem in the future (Tur-Kaspa, 2002a).

The importance of emotion-related processes to SIP (and social cognition) were further emphasised by Lemerise and Arsenio (2000) in their revision of Crick and Dodge's (1994) largely cognition-related SIP model. Lemerise and Arsenion added several emotion-related factors to the SIP model (e.g., emotionality, emotion regulation, state emotions, emotion recognition, and empathic responsiveness), and noted the importance of individual differences in emotionality, and emotion regulation in particular, to effective SIP.

Overall, there is a growing awareness of the role of individual differences in the psychosocial functioning of children with RD, and the aim of the current study was to investigate these differences with regard to the following aspects of SIP: theory of mind (or perspective taking), emotion understanding, emotion experience, attachment style, and social attributional style. These are next addressed in turn.

Theory of Mind/Perspective Taking

Theory of mind or *perspective taking* refers to an individual's ability to infer the emotions, beliefs, motives, intentions, and thoughts of another person in a given situation; that is, the ability to interpret a situation from another's perspective. An awareness of false belief (that someone else can hold an incorrect belief about the true state of the world) emerges at approximately 3-4 years of age, and much research has been carried out in this area (see Flavell, 2000). However, researchers have only recently begun to explore theory

of mind development in children over the age of five years (see Dunn, 1999). Developmentally, it appears that most advanced theory of mind skills emerge between the ages of 9 and 11 years, with girls acquiring these skills earlier than boys. Examples of theory of mind skills that develop in middle childhood include understanding of the following: mistaken beliefs, biases and expectations; social deception; and mixed/ambivalent emotions (Stone, Baron-Cohen, & Knight, 1998).

Numerous studies have shown that school-age children with RD perform more poorly than their TA peers on a range of perspective-taking tasks (see Tur-Kaspa, 2002; Wong & Wong, 1980). For example, in a study of role-taking in 5- to 11-year-olds, individuals with RD performed more poorly than controls on cognitive (belief), affective (how someone in story will feel), and perceptual (what person in the picture is looking at) perspective-taking tasks (Dickstein & Warren, 1980). In another study, fifth-grade students with RD had difficulty taking others' perspectives, discerning motives, and reconciling different points of view (Ferretti, MacArthur, & Okolo, 2001). However, in one study of boys with RD, no link between psychosocial problems and perspective-taking abilities was found (Waterman, Sobesky, Silvern, Aoki, & McCaulay, 1981).

Deficits in theory of mind and perspective taking have also been linked to lower ratings of social competency (Bartsch and Estes, 1996; Pears & Fisher, 2005). For example, a range of theory of mind abilities (false belief, mistaken belief, unintended transfer, and transfer of caregiver) were correlated with parent and teacher ratings of social behaviour (such that higher levels of theory of mind abilities correlated with fewer social problems) in a young clinic-referred sample with attention and behaviour problems (Fahie & Symons, 2003). In a sample of preschool and kindergarten children, Capage and Watson (2001) found that theory of mind abilities were a better predictor of social competence than a traditional social information processing task, involving generating solutions to interpersonal problems.

While few studies have investigated links between theory of mind abilities and psychosocial functioning in older individuals, a similar pattern has been found with severe psychosocial problems being linked to poorer theory of mind skills in schizophrenic individuals (Brüne, 2005). Theory of mind abilities have also been linked to specific social competencies such as forming relationships with peers, and understanding of emotion (Dunn, 2000; Pons, Harris, & Doudin, 2002).

Perspective taking is central to the development of empathic awareness, itself an essential component of effective social communication and pro-social behaviour (Denham, 1998). Empathy involves perspective taking, and the ability to attribute thoughts and feelings to self and others. Understanding of other's mental states (i.e., perspective taking) and understanding of emotions are closely related. As stated by Wellman and Banerjee (1991), 'understanding the nature and causes of emotions is part and parcel of acquiring a theory of mind and understanding internal states of mind is part and parcel of acquiring an understanding of emotion.' (p.191). Thus, the next variable of interest in the current study is emotion understanding.

Emotion Understanding

In the field of emotional intelligence, the ability to perceive, understand, manage, and use emotional information (both self and other-referent) is crucial to the development of social competence (Salovey, Kokkonen, Lopes, & Mayer, 2004), and deficiencies in emotion perception interfere with the development of more complex coping skills such as emotion regulation (Salovey, Bedell, Detweiler, & Mayer, 2000). The importance of emotion understanding competencies to the successful development, interpretation, and maintenance of social interactions has been well established (e.g., Hubbard & Coie, 1994; Most & Greenbank, 2000; Nowicki & Duke, 2001; Oatley, 2004).

For example, (and in line with the SIP model) an individual with deficits in emotion understanding may mistakenly interpret others' actions as hostile, fail to adopt social goals,

readily call on aggressive solutions, and consider aggression to be an appropriate response (Dodge, et al., 2002). One of the main sources of difficulties with social relationships for children with RD has been identified as being the accurate recognition of emotions (Elias (2004).

Several studies have confirmed previous findings that children with RD have difficulties identifying both simple and complex emotions (e.g., Bauminger, Edelsztein, & Morash, 2005). Deficits in emotion understanding (both self and other referent) have also been associated with psychosocial problems in children with and without RD (e.g., Cook, Greenberg, & Kusche, 1994; Izard, Fine, Schultz, Ackerman, & Youngstrom, 2001). Conversely, children who are better at understanding emotions tend to have better social adjustment (see Schultz, Izard, Ackerman, & Youngstrom, 2001) and fewer psychosocial problems (e.g., Shields & Cicchetti, 2001).

Facial Expression (and Voice) Processing. The ability to accurately interpret affective meaning conveyed in facial expressions (and tone of voice) is considered a key social competency, which increases in importance as children grow older (Bridges & Grolnick, 1995; Nabuzoka & Smith, 1995; Rothman & Nowicki, 2004). Much research has been carried out on the developmental course of *facial expression processing* (FEP), and it is likely that neurological factors play an important role in the development of FEP early in life, with socialisation factors gradually taking precedence later on (see McClure, 2000).

Nonverbal understanding (such as FEP) enables accurate interpretations of situations and appropriate social behaviour, necessary for the facilitation, development, and maintenance of social relationships (Most & Greenbank, 2000; Nowicki & Duke, 1992, 1994). According to Nowicki and Duke (2001) non-verbal cues are sent and received with less conscious awareness than are verbal cues, and are more continuous, with errors more likely to result in negative social consequences than errors on verbal information.

By 7 to 8 years, most children can decode the meanings of facial expressions, understand situations that commonly elicit emotions, and apply emotion labels to experiences (Denham, 1998; Saarni, 1997). Between the ages of 3 and 10 years, children's emotional vocabulary becomes increasingly sophisticated, enabling identification of increasingly subtle expressions, including mixed and conflicting emotions, and an increased understanding of display rules (McClure, 2000; Rotenberg & Eisenberg, 1997).

Although girls are often reported to be significantly better than boys at FEP throughout childhood (see Bennett et al., 2005; McClure, 2000), several studies have not found evidence for gender differences (e.g., Dimitrovsky, Spector, Levy-Shiff, & Vakil, 1998; Holder & Kirkpatrick, 2001; Most & Greenback, 2000; Nowicki & Mitchell, 1998).

Children and adolescents with RD are consistently less accurate than controls on both FEP and voice processing tasks (e.g., Bryan, 1977; Gorman, 2001; Hall & Richmond, 1985; Holder & Kirkpatrick, 2001; Maheady & Sainato, 1986; Sprouse, Hall, Webster, & Bolen,1998). One study investigated FEP with three groups of children; those with NLD, those with RD, and those with both NLD and RD, as well as a control group (Dimitrovsky, et al., 1998). Their findings indicated decreased performance on emotion understanding for all three LD groups, but particularly for the NLD groups (with or without RD).

In addition, links between lower accuracy on FEP and higher rates of psychosocial problems (in children with RD) have also been found in some studies (e.g., Cooley & Triemer, 1992; Nabuzoka & Smith, 1995; Lancelot and Nowicki, 1997; Wiig & Harris, 1974). Less accurate face and voice processing has been correlated with lower academic achievement in preschool boys, with lower accuracy on low intensity emotions (expressed in adult faces and adult tone of voice) also related to a simple teacher-rated measure of social competence in a study by Nowicki and Mitchell (1998). In a similar study, boys who scored higher on emotion understanding were found to be more popular, and to have a more internal locus of control (Nowicki & Duke, 1992). Emotion recognition was found to

partially mediate the links between RD and teacher ratings of assertion and introversion in adolescents, while correlating negatively with teacher-rated social skills (Most & Greenbank, 2000). Thus, emotion understanding deficits have been found in children with RD, and decreased emotion understanding has been linked to psychosocial outcomes.

Emotion Experience

In addition to being able to understand emotion conveyed in facial expressions, children's own experiences of emotion and affective states also influence learning and behaviour. Our emotional system serves to focus attention, and organise memory, thereby enabling appropriate interpretations of, and responses to, social situations (Salovey et al., 2004). Emotions play an important role in motivating and directing behaviour, as well as in the development and regulation of social relationships (Denham, 1998; Oatley, 2004; Salovey, et al., 2000). Emotions "chart the course of moment-to-moment action as well as set the sails toward long-term achievements" (LeDoux, 1998, p.19). Thus, emotions influence the links between learning, cognitions, and behaviour in both the immediate and longer term (Bryan, 2005; Izard, Schultz, Fine, Youngstrom, & Ackerman, 1999/2000).

***Positive emotion*[7].** There is much evidence to show that positive affect increases access to memory, enhances information processing, and improves conflict resolution in both children and adults (Bryan, 2005; Bugental, et al., 1995; Isen, 2004; Tur-Kaspa, 2002a). There is evidence that positive affect facilitates both pro-social behaviour (e.g., helpfulness and generosity), and flexibility in social interaction, with children who display more positive affect being more well-liked by peers (Hubbard & Coie, 1994; Isen, 2004). Positive affect, both self- and externally-induced, is also associated with enhanced social cognition skills (e.g., increased solution generation, and positive interpretation of social scenarios) in individuals with LD (see Bryan & Burstein, 2000; Bryan, Sullivan-Burstein, & Mathur, 1998).

[7] The terms 'emotion' and 'affect' are used interchangeably for the purposes of this discussion.

Negative emotion. There is evidence that negative affect influences children's ability to learn about emotions by making them less able to process information, including emotional information (Eisenberg, Wentzel, & Harris, 1998; Izard, et al., 2001). In support of this notion, levels of anger and emotion knowledge have been found to be negatively correlated in young children (Denham, 1986).The potential influence of negative emotion on learning is particularly relevant for children with RD, who are likely to regularly experience increased levels of negative emotions (e.g., frustration, apprehension, confusion, and anger) in the classroom setting, which may then interfere with the learning process (Elias, 2004).

Furthermore, a relationship between high levels of negative affect and psychosocial problems (or decreased social competence) has consistently been found (e.g., Dadds, Sanders, Morrison, & Rebgetz, 1992; Eisenberg, Fabes, & Losoya, 1997; Eisenberg, et al., 2005; Lemerise & Dodge, 1993), although these studies did not include children with RD. For example, Eisenberg and Fabes (1995) found poor regulation and high levels of negative emotionality in young children were linked to problem behaviour, especially in boys.

Self-regulation of emotion. Emotion self-regulation involves the belief that emotions can be modified, and the ability to accurately monitor emotional states, and employ strategies to regulate emotions (see Salovey et al., 2000; Salovey et al., 2004). Emotional self-regulation involves initiating, maintaining, and modulating both positive and negative emotional experiences, and their expression, in appropriate ways, across a range of contexts (Bridges & Grolnick, 1995; Eisenberg et al., 1997; Saarni, 1997).

Individual differences in emotionality and self-regulation have been found to predict social functioning in 6-8 year olds, with well-regulated children likely to behave in more socially appropriate ways at school, as well as being relatively more popular, pro-social, and secure (Eisenberg, et al., 1997). Overall, moderate levels of arousal are associated with

positive affect, whereas extreme levels are associated with negative emotion and inattention (Schore, 1996). High emotionality and poor regulation, on the other hand, have been linked with increased risk for psychosocial problems, although there is no research on children with RD in this area (see Bryan, Burstein, & Ergul, 2004).

In middle childhood, there is a marked increase in children's capacity to integrate the complex social information which is involved in the emerging cognitive (rather than biological) regulation of affect (Bridges & Grolnick, 1995; Bugental et al., 1995). Children begin to acquire emotional self-control at this time, partially in response to the increasingly complex emotional demands placed on them during peer interactions. As children get older, the extent to which successful play requires the negotiation of conflict and the de-escalation of excitement (i.e., emotion regulation) increases (see Hubbard & Coie, 1994).

Attachment

According to attachment theory, early experiences shape the development of internal working models (IWMs), which in turn influence personality and behaviour on an on-going basis (see Bowlby 1973, 1982, 1988; Goldberg, 2004). Early attachment experiences influence later neurodevelopment, as well as affect regulation, behavioural regulation, and early representations (Laible & Thompson, 2000; Thompson & Raikes, 2003).

IWMs associated with attachment play an important role in the representation and interpretation of social experiences, and in this way may influence emotion understanding and other aspects of social information processing (Bugental et al., 1995; Dunn, 2004; Goldberg, 2004; Thompson & Raikes, 2003; Waters, Kondo-Ikemura, Posada, & Richters, 1991). For example, secure individuals tend to be more spontaneously expressive, as well as more accurate in reading emotions (Goldberg, 2004).

Concurrent links between attachment and theory of mind abilities have been found in young children. For example, secure preschoolers are more likely to pass false belief and

emotion tasks (Fonagy, Redfern, & Charman,1997). Along similar lines, Meins (1997) found that securely attached 4-year-olds were more likely to pass a false belief task than their insecurely attached peers, even when controlling for SES, language, and cognitive ability. Insecurely attached toddlers also expressed more shame than securely attached toddlers, and attributed more negative emotions to photos of other children and parents (see Denham 1998).

As research into attachment extends beyond the preschool years, possible links between insecure attachment, emotion regulation, and the development of psychosocial problems have been proposed (e.g., Bradley, 2000), and there is now a well-established path from infant attachment through to childhood emotion regulation (for a review see Goldberg, 2004). As children mature, attachment security increasingly becomes an attribute of the individual rather than of a specific relationship, as is the case in infancy (Thompson & Raikes, 2003).

There is evidence to suggest that insecure attachment in children is linked to poorer emotion knowledge and emotion regulation (see Goldberg, 2004; Mineka, Rafaeli, & Yovel, 2003), and conversely that secure attachment is linked to better performance on theory of mind tasks, and social competence (e.g. Fonagy et al., 1997; Meins, 1997; Meins, Fernyhough, Russell, & Clark-Carter, 1998). For example, secure attachment was found to mediate the relationship between *at-risk* status (for RD) and emotion regulation in 5-6 year old children, with boys more likely to have a secure attachment pattern than girls (Al-Yagon, 2003).

Of particular interest to the current study (where the presence of RD is considered to be a risk factor or stressor), is the notion that attachment styles represent behavioural patterns for managing stress, with insecure styles making individuals more vulnerable to stress, and secure patterns protecting against the negative effects of stress (Goldberg, 2004; Thompson & Raikes, 2003). In one of the first studies to apply such a risk and protection framework

to the study of attachment in children with RD, Al-Yagon and Mikulincer (2004a, 2004b) found secure attachment predicted more positive psychosocial outcomes.

Social Attributions

Causal attributions influence three important areas: (1) the expectation that a similar event will recur (stability), (2) the perception of locus of control (and hence controllability), and (3) affective responses to the event (which in turn help shape motivational bases for later behaviour; Thompson, 1989). Children's attributions play an important role in their coping, adjustment, and achievement, with negative experiences appearing to have more major consequences for adjustment and well-being when they also affect children's beliefs and attributions (Dweck & London, 2004).

Attributions are closely linked to emotions. For example, attributions of stability may lead to feelings of hopelessness, resignation, or hopefulness (i.e., emotions with a motivational role), and attributions concerning the degree of personal responsibility for events (i.e., locus of control) may lead to interpersonally evaluative emotions such as gratitude (for success events), or anger and self-pity (for failure events; Thompson, 1989). In addition, causal attributions for social events act as modifiers of individual's affective experiences; for example, experiencing pride if a goal was attained through ability or effort (an internal attribution), or anger if goal attainment was obstructed (an external attribution; Weiner, Graham, Stern, & Lawson, 1982).

One of the best predictors of children's performance in school is perceived control of events, including locus of control and causal attributions for academic success and failure (Skinner, Zimmer-Gembeck, & Connell, 1998). Children with RD tend to show an attributional pattern for academic outcomes whereby success is attributed to external causes, and failure is attributed to internal causes. However, findings are mixed, as Tabassam and Grainger (2002) found that children with RD took little credit for success,

and similarly were unlikely to think of failure as being due to lack of effort (i.e., they attributed both to external causes).

Few studies have investigated attributions for social (as opposed to academic) outcomes in children with LD (see Maughan, 1995; Tabassam & Grainger, 2002). However, Tur-Kaspa and Bryan (1993) used scenarios of six social situations, and asked children to rate a series of ten statements about each. As in the study by Tabassam and Grainger (2002), they found that children with RD attributed both success and failure to more external causes. Based on their findings, Tur-Kaspa and Bryan suggest attributions may influence children's choice of behaviour strategies, as individuals with RD and externalising behaviours are more likely to attribute social success to self (perhaps linked to higher self-esteem), than individuals with RD and no behaviour problems.

Using an open interview format, children with RD also attributed both positive and negative outcomes for a series of 12 social events to luck (i.e., externally) more frequently, and to interpersonal interaction less frequently than controls (Sobol, Earn, Bennett, & Humphries, 1983). However, findings have been mixed, with Jacobsen, Lowery, and DuCette (1986) reporting that boys with RD made internal attributions for success, and external attributions for failure, in both academic and social situations. Thus, children with RD have frequently been found to demonstrate different attributional patterns to those of their TA peers, tending to attribute both positive and negative outcomes of social events to external causes.

The Current Study

Purpose and Design

Many researchers have commented on the paucity of studies examining the links between emotion experience, emotion understanding, and psychosocial outcomes in children (e.g., D'Amato, et al., 2005; Dunn, 2003; Hubbard & Dearing , 2004; Spira et al.,

2005). The current correlational study explored these variables, in a sample of children with RD, using cross-sectional data from multiple sources (child, parent, and teacher report), which were analysed using multiple regression.

The need to investigate which individuals with RD are at-risk for psychosocial problems, and conversely which factors may serve protective functions for children with RD, has been articulated in several commentaries (see Kavale & Forness, 1996; Tur-Kaspa, 2002a). Taking these calls into consideration, the overarching aim of the current study was to examine the possible influences of several variables relating to SIP, on the relationship between RD and psychosocial problems. It was proposed that the selected aspects of SIP would fulfil a protective function, for children with RD as a risk factor, in terms of the psychosocial problems associated with this disorder. Specifically, the roles of competencies in emotion understanding, and theory of mind, as well as emotion experience (positive and negative affect, and emotion regulation), attachment style, and social attributions were examined within a risk and protective framework.

Risk and Protective Framework

The usual deficit-model (emphasising the deficits of individuals with RD in comparison to their TA peers) often precludes the investigation of skills and coping strategies that may facilitate positive outcomes for individuals. Accordingly, interactions that occur between individuals with RD, and the social systems in which they function, may be overlooked (see D'Amato, et al., 2005). The use of a risk and protective framework, on the other hand, facilitates the identification of factors (and specific competencies) which may protect individuals from the psychosocial problems that having RD places them at-risk for.

Protective factors. The term *protective factor* is used when a risk trajectory (e.g., RD to psychosocial problems) is altered in a positive direction (e.g., RD to normal psychosocial

functioning; see Rutter, 1990). [8] It is important to note that the effects of protective factors are indirect, and are only apparent through interactions with the risk variable (RD in the current study). Thus, protective factors serve to reduce the level of risk associated with the risk factor.

***Protective factors and RD* research.** As previously documented, it has been well-established that the presence of RD constitutes a substantive risk factor for psychosocial problems (for a review see Morrison & Cosden, 1997); and the importance of identifying protective factors influencing psychosocial outcomes in children with RD, has been commented on by several researchers in this area (e.g., Margalit, 2003; Pearl, 2002; Tur-Kaspa, 2002; Wiener, 2002, 2004; Wong, 2003). According to Wiener (2002), if risk factors were to be minimised and protective factors (such as social support) put in place, children with LD would be no more likely than their TA peers to have psychosocial problems.

The use of a risk and protective framework has been more apparent in recent studies of psychosocial outcomes in children with RD (e.g., Carroll, et al., 2005; Margalit, 2003; Martínez & Semrud-Clikeman, 2004; Miller, 2002; Wiener, 2002, 2004), with some promising results. For example, two studies have found secure attachment to be a protective factor (Al-Yagon, 2003; Morrison & Cosden, 1997); and seven protective factors were identified by Miller (2002) in university students with RD: (1) success experiences, (2) particular areas of strength, (3) self-determination, (4) distinctive turning points, (5) special friendships, (6) an encouraging teacher, and (7) self-acknowledgement of the RD. However, as no control group was included in this latter study it is difficult to determine whether these factors differentially impacted on students with RD (i.e. moderated the risk associated with RD, thereby fulfilling a protective function) or not.

[8] As opposed to the term *vulnerability factor* used when a previously positive trajectory is altered in a negative direction.

Nevertheless, the importance of identifying potential protective factors for children with RD is emphasised in the current research.

RD and Pro-social Behaviour

Consistent with a growing awareness of the need to study positive phenomena, (see Isen, 2004), a secondary objective of the current study was to explore whether any of the SIP variables under investigation were associated with pro-social behaviour. For example, previous studies have attempted to relate emotion knowledge to positive outcomes in middle childhood. However, a longitudinal study of low SES children by Izard and colleagues (1999/2000) found that emotion understanding in 7-year-olds predicted positive behaviour. In studies where pro-social behaviour has been measured, girls (both RD and TA) have demonstrated higher levels of pro-social behaviour (such as sharing and helping) than boys (see Crick & Dodge, 1994). Pro-social behaviour has also been found to positively correlate with reading ability (Adams, Snowling, Hennessy, & Kind, 1999). Thus, while making no specific predictions regarding levels of pro-social behaviour, the current study sought to explore any potential links between pro-social behaviour and the SIP variables under consideration.

Sampling Issues

In addition to the issues surrounding the definitions and conceptualisation of LD, several methodological issues relating to sample characteristics have been identified in the literature. For example, Martínez and Semrud-Clikeman (2004) noted that most RD samples are clinic-referred rather than community samples, implying that participants often have psychosocial problems of sufficient severity to require clinical intervention.

Also, few efforts have usually been made to limit the heterogeneity of the participants included in RD (or LD) samples, particularly relevant in view of the psychosocial problems associated with NLD, as previously noted (see Gorman, 2001; Hinshaw, 1992; Tsatsanis et al., 1997). Many studies have also included children with co-morbid ADHD in

their RD groups, without differentiating between those with RD alone and those with co-morbid RD/ADHD (see Greenham, 1999). As previously mentioned, both hyperactivity and attention problems are closely associated with psychosocial problems. Thus, by failing to differentiate between participants with RD only, and those with co-morbid RD/ADHD, confounds associated with the behavioural symptoms of ADHD may occur. Further concerns have been raised regarding the gender imbalance present in most studies (i.e., the predominance of male participants), with researchers often stating the need to redress this in order to investigate possible links between gender, RD, and psychosocial outcomes (see Morrison & Cosden, 1997; Tur-Kaspa, 2002).

Selection of participants for the current study. The current study dealt with these issues (as far as possible) by using a multi-faceted approach to the identification of children with RD (see below), excluding children with ADHD, using a non-referred school sample (with RD and TA children drawn from the same classes), and selecting equal numbers of male and female participants. Children aged between 9 and 11 years (Year 5 and 6) were selected for the following reasons. First, identification of RD is more reliable from the age of about 9 years (due in part to reliability issues around the use of standardised testing with younger children; see APA, 2000; D'Amato, et al., 2005; Smart et al., 1996). Second, a significant proportion of children with RD (41%) are aged between 6 and 11 years (Lerner, 2000). And third, middle childhood is the period when SIP, including the understanding of emotions, undergoes significant development and becomes critical for adaptive psychosocial functioning (Bauminger et al., 2005).

Identification of RD. The current study utilised the five-step multi-faceted approach to identification of RD proposed by Pereira-Laird, Deane, and Bunnell (1999). This model combines the application of ability-achievement discrepancy criteria, contextual factors, and exclusionary criteria. The specific criteria used in Pereira-Laird and colleagues' model are: (1) initial teacher recommendations (based on observed poor reading performance in

the classroom), (2) reading achievement score at or below the 25th percentile, (3) variable academic achievement (with achievement in some academic areas above the 30th percentile), (4) a set of exclusionary criteria (including neurological or attention deficits, emotional or psychosocial problems, sensory impairments, and English as a second language), and finally (5) an IQ of 85 or more (i.e., not more than one standard deviation below the mean). Discriminant function analysis in the study by Pereira- Laird and colleagues (1999) showed this approach correctly classified 95.1% of TA readers and 96.1% of students with RD.

Research Questions and Hypotheses

Based on prior research and theory previously discussed, it was expected that children with RD would perform less well on emotion understanding than those in the TA (control) group. However, no such direct relationship was predicted for the remaining variables in view of the somewhat equivocal nature of the prior findings for these (as previously discussed).

The novel research questions in the current study related to whether aspects of social information processing would moderate the expected relationship between RD and psychosocial problems, thus affording protection against the likelihood of psychosocial problems. As shown in *Figure 1*, it was hypothesised that each of the SIP competencies and characteristics would moderate the link between RD and psychosocial problems.

For the SIP variables to be considered protective factors, they should produce a statistical interaction between RD versus the TA (control) group, and each of the proposed moderating variables (with psychosocial problems as the dependent variable). To illustrate, for children with good emotion understanding there should be no difference in the level of psychosocial problems between children in the RD and TA groups. In contrast, for children with poor emotion understanding, those in the RD group should show much higher levels of psychosocial problems than those in the TA group.

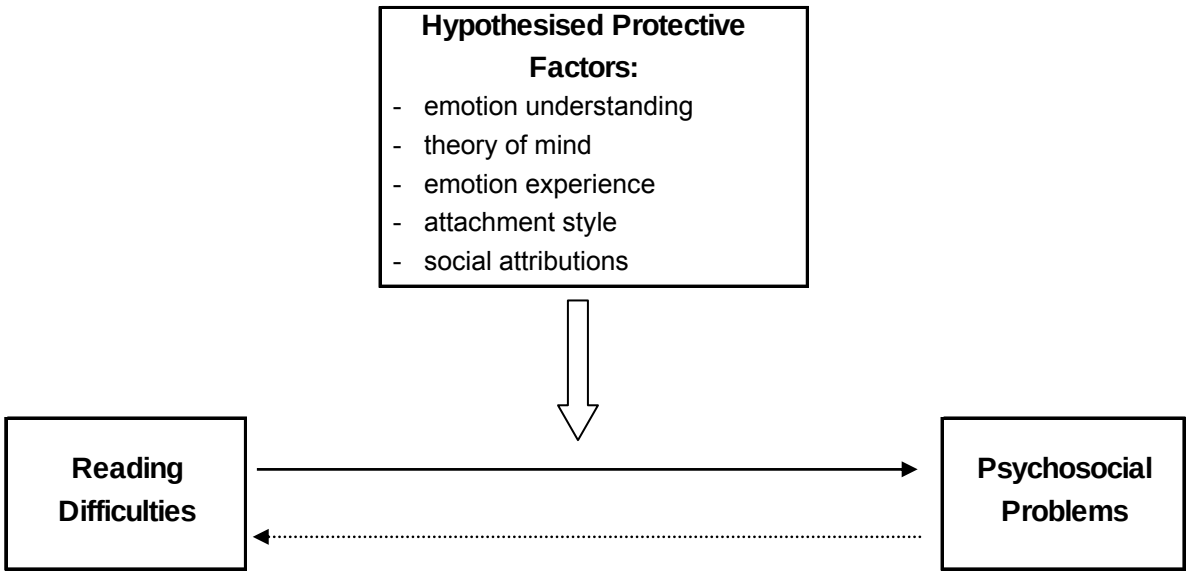


Figure 1. *Posited moderating model for the relationship between RD and psychosocial problems.*

General hypotheses. The moderating hypotheses which follow were based on the general hypotheses that:

1. In comparison to children in the TA (control) group, children with RD should generally demonstrate higher levels of psychosocial problems.
2. In comparison to children in the TA (control) group, children with RD should generally demonstrate lower levels of emotion understanding.

Moderating hypotheses. Based on the first general hypothesis, it was also hypothesised that the following variables would moderate the relationship between RD and psychosocial problems (as shown in *Figure 1*).

3. Emotion understanding; theory of mind; emotion experience; attachment style; and social attribution style.

Open questions. Additional questions concerning the following were left open:

4. Whether children in the RD group would demonstrate generally lower levels of pro-social behaviour.
5. Whether emotion understanding, theory of mind, emotion experience, attachment style; and social attribution style would predict pro-social behaviour, or moderate any potential relationship between RD and pro-social behaviour.

Method

In this section, sample characteristics of children, parents, and schools are presented, together with details of the selection procedures for participants in the reading difficulties (RD) and typically achieving (TA) groups. Next, the procedures for data collection and administration of the measures are described. Finally details, including psychometric properties, of the measures used are provided. These include well-established tools such as the reading composite subscale of the Wechsler Individual Achievement Test (WIAT-II); the Kaufman Brief Intelligence Test (KBIT-2); parent and teacher versions of the Strengths and Difficulties Questionnaire (SDQ), used to assess behavioural symptoms and pro-social behaviour; and the Diagnostic Analysis of Non-Verbal Accuracy (DANVA), used to measure emotion understanding; as well as newer measures such as the How I Feel Questionnaire (HIF), a self-report measure of emotion experience; the Peer-Social Attribution Scale (PASS) used to measure social attributions; the Child Attachment Classification Style Questionnaire (CASCQ) used to measure attachment style; and Faux Pas Stories used to measure of theory of mind.

Participants

Child Characteristics

Demographics. A community sample of 42 Year 5 and 6 children (equivalent to U.S. Grades 4 and 5) drawn from six primary schools in Christchurch, NZ was used in the current study, with 21 participants in each of the reading groups (TA and RD).

Participants ranged in age from 113.00 – 139.00 months (9 yrs 5 mths to 11 yrs 7 mths), with a mean of 124.50 months (10 yrs 5 months), and standard deviation of 6.7 months. Means and standard deviations for the RD and TA groups on age were 124.76 months (10 yrs 5 months; *sd* = 6.85 months) and 124.24 months (10 yrs 4 mths; *sd* = 6.71) respectively. There was no significant difference between the RD and TA groups for age,

t (40) = 2.50, *ns.* The sample comprised 52% male and 48% female participants (22 male, and 20 female), with 11 boys and 10 girls in each group.

Participants were of NZ European, Māori and Pacific Island ethnicity, with slightly more than two-thirds being NZ European, and slightly fewer than one-third Māori, with the ethnic breakdowns for both groups being very similar, as shown in *Table 1*. [9]

Table 1. **Ethnicity of participants in TA and TD groups.**

	TA group (*n* = 21)		**RD group** (*n* = 21)		**Combined** (*N* = 42)	
	%	No. of participants	%	No. of participants	%	No. of participants
Ethnicity						
NZ European	62	13	71	15	67	28
Māori	29	6	29	6	29	12
Pacific Island	10	2	0	0	5	2

Information pertaining to both past and current health status (in addition to other demographic information) was collected via the background information form completed by parents (see *Appendix B*) and school records. Details of pre- and peri-natal problems, ear infections, and current health status are shown in *Table 2*.

Almost half the total sample (48%) had been diagnosed with asthma and/or allergies, and three children had sustained mild head trauma in early childhood. No participants were on long-term medication (except as prescribed for asthma prevention and management). No significant differences were found for the RD and TA groups on any of the health variables: pre- and peri-natal problems, $\chi^2 = .404$, *ns.*; ear infections, $\chi^2 = 2.47$, *ns*.; current health problems, $\chi^2 = .382$, *ns*.

[9] 'Māori' includes children of both Māori/European, or Māori/Pacific Island ethnicity. 'Pacific Island' includes children of both Pacific Island only, and Pacific Island/European ethnicity.

With regard to hearing, one child in the RD group had a grommet inserted in one eardrum, and one other was reported to experience some difficulty hearing in noisy environments. All participants had normal or corrected vision (four participants wore prescription lenses).

Several children had a history of delayed language development (according to parental report), one in the TA group and five in the RD group, although the groups did not differ significantly in this respect, $\chi^2 = 3.11$, *ns*. All children spoke English as their first language, and none had been diagnosed with other developmental disorders (e.g., ADHD), or neurological conditions (e.g., epilepsy). Eight children had been diagnosed as having learning disabilities, representing 38% of the RD group.

Table 2. **Health characteristics of TA and RD participants.**

	TA group (*n* = 21)		**RD group** (*n* = 21)		**Combined** (*N* = 42)	
	%	*No. of participants*	%	*No. of participants*	%	*No. of participants*
Health Status						
Pre- and/or peri-natal problems *(including prematurity)*	33	7	43	9	38	16
History of ear Infections	29	6	52	11	41	17
Current health problems (*all asthma/ allergies)*	52	11	43	9	48	20

Selection of participants with reading difficulties. A frequency distribution matching procedure was used, in which selection of children for inclusion in the RD group was carried out first, followed by recruitment of the TA participants from the same classes, matched on age, gender, and (as far as possible) ethnicity.

As previously outlined, the five-step assessment model (based on the recommendations of Pereira-Laird et al., 1999) was used as the basis for identifying children with reading difficulties. The Pereira-Laird et al assessment model comprises: (1) initial identification by teachers, (2) administration of a standardised reading test, (3) demonstration of an inconsistent student achievement profile, (4) consideration of exclusionary factors, and (5) a verbal or non-verbal IQ score of at least 85. In line with this approach, teachers were initially asked to identify students with RD, based on their own observations of low reading achievement in the classroom.

Next, the Weschler Individual Achievement Test (WIAT-II) reading subtests (word reading, reading comprehension, and pseudoword reading) were administered to obtain a composite reading score for each of the children identified by their teachers as having RD. The cut-off point for inclusion in the RD group was a reading composite score at or below the 25th percentile (i.e., a standard score of 90). This is in line with numerous previous studies in which the 25th, or even 30th, percentile cut-off has been used (see Jacobsen et al., 1986; Prior et al., 1999; Rucklidge & Tannock, 2002: Torgesen, 2000; Wiener, & Schneider, 2002)[10].

Some children were excluded from the study due to teacher misclassification; that is, children were either selected for the RD group but turned out to have a composite reading score well above the 25th percentile cut-off point, or were selected for the TA group but turned out to have a composite reading score well below the 30th percentile cut-off point. After discussion with the teachers, it became apparent that these selections had often been made on the basis of behavioural characteristics rather than reading ability per se. That is, children who were in fact poor readers but displayed appropriate behaviour in class were perceived as being normally achieving and inappropriately recommended for the TA group

[10] In order to have a clear distinction between the reading groups, children with scores between the 25th and 30th percentiles were not included in either group.

(n = 2), while children who were in fact adequate readers but displayed inappropriate behaviour in class were perceived as having RD and consequently were recommended for the RD group (n = 6). Thus, it appeared that teacher recommendations were, in some cases, being made on the basis of *behavioural criteria* rather than *reading ability.* (Similarly, Shaywitz et al., 1996, found that children were more likely to be identified as having RD if they had behavioural problems; see also Kavale, Alper, & Purcell, 1981). As the dependent variable in the current study *was* behavioural symptoms, the decision was made to exclude children who had initially been misclassified in this way. In other words, to maintain consistency with the selection procedure, consistency between the teacher classification and the reading achievement score was required for inclusion in either the RD or the TA group (see Tur-Kaspa & Bryan, 1993).

The third criterion for RD selection was that students demonstrated an inconsistent achievement profile across their (school administered) Progressive Achievement Tests (PAT; usually administered in reading comprehension, listening comprehension, and mathematics) scores for the previous year, with a reading score below the 25th percentile and at least one score in the normal range (i.e., at least one PAT score at or above the 30th percentile). Students with at least one PAT score below the 25th percentile (low achievement) and one greater than or equal to the 30th percentile (normal achievement) were said to have an inconsistent achievement profile and included in the RD group [11]. This selection step was only carried out for 52% of the RD participants, as PAT scores were not available from all schools (see *Appendix C* for details). Efforts were made to ascertain the overall achievement levels of the remaining RD participants through discussion with teachers, to ensure all were achieving satisfactorily in at least one academic area, other than reading.

[11] The 30th percentile cut-off point represents .5 of a standard deviation below the mean, and is assumed to reflect normal achievement in a particular area.

In line with Pereira-Lairds and colleague's (1999) fourth criterion, participants were excluded from participating in the study if they had evidence of, or a history of, neurological abnormalities, sensory impairments, developmental disorders or disabilities (including ADHD), were on long-term medication for any behavioural / psychological symptoms or conditions, or were (either currently or within the previous year) receiving English as a Foreign Language tutoring in school. Information regarding these exclusionary factors was obtained from the background information form completed by parents (see *Appendix B*), and school principals and teachers.

Finally, participants in the RD group were required to obtain a minimum score of 85 on either the verbal or non-verbal IQ subscales, as measured by the Kaufman Brief Intelligence Test (KBIT-2), to ensure that reading difficulties were not simply due to the effects of low IQ. This criterion resulted in one participant being excluded from the study.

A further issue relating to IQ is determining which score should be used in statistical analyses. Although, the correlation between IQ and reading ability is not perfect, they are highly correlated at around .60 (Rutter & Maughan, 2005), with the correlation between *verbal* IQ and reading ability usually being higher than the correlation between *non-verbal* IQ and reading ability. Since it is very likely that poor reading impedes the development of verbal intelligence, and vice versa, most researchers choose to use either measures of non-verbal or fullscale IQ in their statistical analyses, and accordingly, non-verbal IQ was used in the current study.

Selection of TA participants. Teachers were asked to select a similar number of children (matched as closely as possible on gender and ethnicity) who were reading at or above their age level, and who met the same exclusionary criteria as were applied to participants in the RD group.

A WIAT-II reading composite score at or above the 30th percentile (representing a standard score of 92) was required for participants in the TA group, indicating that these

students were reading at a level at, or higher than, .5 of a standard deviation below the mean. This cut-off was proposed by Pereira-Laird and colleagues (1999). In many studies in which a TA reading group is used, it is either assumed that the reading abilities of these individuals are in the average range (based on instructions given to teachers) and no reading assessment is carried out (e.g., Gans et al., 2003; Kravetz et al., 1999; Tur-Kaspa, 2002), or a reading score at or above the mean is required, thereby excluding children who score slightly below the mean (e.g., Smart et al., 1996).

Parent characteristics

Parent characteristics regarding ethnicity, marital status, education level, and employment status are presented in *Table 3*. The mean parental age was 40.72 years for the RD group, and 39.14 years for the TA group. Approximately three-quarters of the parent respondents (comprising 40 mothers and 2 fathers) were NZ European, and one-quarter Māori, with no significant group (TA or RD) differences in ethnicity for parents, $\chi^2 = 1.22$, *ns*. Overall, almost half of the participants (children) in the study were living in single parent households, 52% of the TA group, and 33% of the RD group, $\chi^2 = 1.257$, *ns*.

As expected (given the heritability of RD), mothers in the RD group were more likely to have left school with no formal qualifications (40%) compared to mothers in the TA group (15%), and this difference was approaching significance, $\chi^2 = 3.45$, $p < .10$. However, over 50% of all mothers had obtained some kind of tertiary qualification (trade qualification, certificate, or degree), 57% of those in the TA group, and 45% of those in the RD group.

Information on employment status showed that 17% of the mothers in the total sample were in full-time employment, while 45% worked part-time, and 29% were receiving government income support. There were no significant differences in these figures across mothers of children in the TA and RD groups.

Table 3. **Maternal educational, marital, & employment status[12].**

	TA group (*n* = 21)		RD group (*n* = 21)[13]		Combined (*N* = 42)	
	%	*Number*	*%*	*Number*	*%*	*Number*
Ethnicity						
NZ European	67	14	76	16	71	30
Māori	29	6	24	5	26	11
Pacific Island	5	1	0	0	2	1
Marital Status						
Single	52	11	35	7	43	18
Partner/Married	48	10	65	13	55	23
Educational status						
No formal qualifications	15	3	40	8	27	11
Secondary school	29	6	15	3	22	9
Trade Cert. / Diploma	38	8	40	8	39	16
University Degree	19	4	5	1	12	5
Employment status						
Full time	19	4	15	3	17	7
Part time	43	9	50	10	46	19
Benefit[14]	28	6	30	6	30	12
Other (none or student)	10	2	5	1	7	3

Teacher and school characteristics

Decile rankings for participating schools ranged from 3 to 10 (*M* = 6), with Decile 1 schools drawing students from areas of greatest socio-economic disadvantage, and Decile 10 schools drawing students from areas of least socio-economic disadvantage.[15] Low decile schools (Decile 3) were attended by 28% of the participants, with 38% attending mid-decile schools (Deciles 5 & 7), and 34% attending high-decile schools (Deciles 8 &

[12] 95% of parent respondents were mothers, with 2 respondents being fathers (one in each reading group).
[13] Data are missing for one respondent (RD group) for marital, education, and employment status.
[14] Includes mothers who were both employed and receiving concurrent government income support.
[15] The level of government funding for NZ schools is determined by school decile rankings, a socio-economic indicator derived from five evenly weighted factors: household income, parental occupation, household crowding, parental educational qualifications, and income support (i.e., social welfare) (NZ Ministry of Education, 2005).

10). All schools were co-educational, and included one private Christian school and five regular state schools.[16] A total of 14 Year 5 and 6 teachers participated in the study, 3 male (21%) and 11 female (79%). See *Appendix C* for details of school deciles, teachers, and numbers of participants from each school.

Measures

A multi-method, multi-source approach combining child-, parent-, and teacher- report measures, and utilising a range of response formats (questionnaires, scales, standardised tests, and other measures) was implemented in the current study. Measures of four variable classes were obtained: (1) reading achievement (the main independent variable), (2) possible moderating variables related to social information processing (theory of mind, emotion understanding, social attributions, attachment style, and emotion experience), (3) control variables, IQ, SES, and gender, and (4) behavioural symptoms, the dependent variable.[17] Permission to use all measures was obtained from the respective authors prior to commencement of the research.

Demographics

Demographic and developmental background information was collected from parents (see *Appendix B*) regarding their own (maternal) age, ethnicity, education level, marital status, number of children, and occupation; and their child's developmental history, age, gender, ethnicity, and health status.[18]

Administration of Scales

All scales (HIF, CASCQ, and PASS-1) were administered according to similar procedures. As it was the first time most participants had experienced a Likert-scale

[16] All schools follow the same core NZ curriculum.
[17] The terms *behavioural symptoms* and *psychosocial problems* are used interchangeably, with *behavioural symptoms* being the term used in the Strengths and Difficulties Questionnaire.
[18] For one parent with literacy difficulties the background form was completed via interview with the author.

format, and as some also had RD, particular care was taken in administering these measures. The format of each scale was clearly explained and all response options were read aloud. To help familiarise participants with Likert response format, a non-related sample statement was given (in the form of *I like* …..and a food item) with participants asked to state their responses verbally. All scale items were then read aloud (in a neutral tone) and repeated on request.

Participants were reassured of the confidentiality of their responses (i.e., that no information would be communicated to their parents or teachers), and reminded of the need to attend and listen to each item closely. It was emphasised that there were no correct or incorrect answers to any of the scale items. The author scanned participants' responses during administration for any potential errors or omissions.[19] On completion of each scale participants were also asked to check their responses, providing another opportunity for any necessary self-corrections to be made.

Main Independent Variable

Reading achievement. The reading composite subtests of the Wechsler Individual Achievement Test, 2nd edition (WIAT-II; Psychological Corporation, 2001) were used to independently assess participants' current level of reading achievement. The precursor of the WIAT-II, the WIAT has previously been used in numerous studies (e.g., Martínez, & Semrud-Clikeman, 2004). Scores on three reading subtests, *word reading*, *reading comprehension*, and *pseudoword reading*, were combined (according to test instructions) to produce a composite reading score, which was then used (in conjunction with the

[19] Any errors were subtly pointed out, either by a general reminder to the group to check their papers, or by gesturing to the sheet of the individual concerned.

criteria previously described) to confirm reading group (RD or TA) assignment of participants.

The word reading subscale consists of a graded word list and assesses accuracy and automaticity of word recognition. Reading comprehension measures literal, inferential, and lexical comprehension; reading accuracy, fluency, and comprehension, and word recognition in context, and reading rate. In this section participants read a series of passages and sentences, and answer related content and comprehension questions. Pseudoword decoding measures phonological decoding and accuracy of word attack. Participants are required to apply their phonetic decoding skills by reading aloud a list of nonsense words with structures similar to the phonetic structure of real words (e.g. *unfrodding*).

The WIAT-II is a fully norm-referenced test with well-established reliability and validity in both normal and clinical populations, including children with RD. Split-half reliability coefficients for reading composite scores in children aged 9 -11 (comparable to the current sample) are between .98 - .99, and stability (test-retest reliability) coefficients are between .96 and .98 (WIAT-II Examiner's Manual, Psychological Corporation, 2001).

Reading subtests were administered in the same order with *word reading* first, followed by *reading comprehension*, and finally *pseudoword reading*, as per the instructions in the WIAT-II examiner's manual. Participants in the RD group took longer, on average, to read the passages, with a maximum time of 10 minutes (M = 4.5 minutes) compared to a maximum time of 6minutes (M = 3 minutes) for TA participants. The standard reversal procedure (to Grade 2) was implemented for 5 participants in the RD group. Based on chronological age, 45% (19) of participants were administered the Grade 4, and 43% (18) of participants the Grade 5 level of the reading subtests.

Social Information Processing Variables

Emotion understanding. The ability to accurately identify four basic emotions, through facial expressions and tone of voice, was assessed using the Diagnostic Analysis of Nonverbal Accuracy scale, 2nd edition (DANVA2; Nowicki & Duke, 1994). This measure has been used with a wide range of paediatric samples (including clinical samples) in several studies (e.g. Cooley & Triemer, 2002; Collins & Nowicki, 2001; Easter et al, 2005; Hall, Peterson, Webster, & Bolen, 1999; Petti, Voelker, Shore, & Hayman-Abello, 2003; Plesa-Skewerer, Faja, Schofield, Verbalis, & Tager-Flusberg, 2006; Solomon, Goodlin-Jones, & Anders, 2004; Stevens, Charman, & Blair, 2001; Strand & Nowicki, 1999).

The DANVA2 is a computer-based measure which tests identification of expressions of four emotions (happy, sad, angry, and fearful) enacted by adults and children, in a series of still photographs (faces) and audio segments (voices). There are four subtests: adult faces, child faces, adult voices, and child voices with six examples of each emotion, three high intensity and three low intensity, in each subscale.

Photographs in the faces subtests are displayed on screen for two seconds (the default setting) and participants are required to click on the emotion label below the photograph (happy, sad, angry, or fearful) that matches the model's expression. In the voice subtests, a neutral sentence, *I'm going out of the room now, but I'll be back later* (Maitland, 1978), is spoken in various tones, each reflecting one of the target emotions, at high or low intensity. Auditory stimuli are presented with a 4-second delay between the response and presentation of the next stimulus. Participants are required to click on the emotion label which matches the tone of voice expressed in the stimulus sentence. A *repeat* button is available for the voice, but not the face, subscales. Emotion labels (for all subtests) are visible on screen during presentation of each stimulus, and for four seconds after stimulus offset. The DANVA2 automatically records participants' scores, and these were

subsequently transferred to the main SPSS data set[20]. The number of correct responses was added for each subscale, and the four subscale scores added to produce the overall *emotion understanding* score used in the statistical analyses.

All of the DANVA2 subscales have demonstrated good internal consistency across numerous studies, with participants from a range of ages, cultural backgrounds, intellectual abilities, and levels of psychological adjustment (Nowicki, 2004). The *adult faces* subscale has yielded good internal consistency ($\alpha = .71$), test-retest reliability, and convergent and discriminant validity, in a range of samples, including those of similar ages to participants in the current study (i.e., fifth grade students; Nowicki, 2004; Nowicki & Carlton, 1993). The adult voices subscale yielded an alpha coefficient of .70 in fifth grade children (Collins, 1996), while the child voices subscale yielded a coefficient alpha of .76 with a sample of 10-year-old children (Nowicki, 2004). Accuracy scores on the DANVA2 subscales do not correlate with measures of IQ (showing discriminative validity) and demonstrate good test-retest reliability (see Nowicki, 2004).

The DANVA2 assessment of emotion understanding was administered individually, using the DANVA2 Multimedia System v2.0 software, on an HP invent notebook computer, with an attached mouse (child size), and a Compaq nx 5000 monitor (with 30cm x 23 cm screen, resolution of 1024 x 768 pixels, and 32bit colour), and built-in speakers. Lighting conditions and speaker volume were adjusted in accordance with participants' individual preferences.

To avoid potential confounds due to reading ability, participants were asked to read the four emotion labels out loud on the first item. If the first subtest administered was a faces subtest (subtests were administered in counterbalanced order), participants were asked to give a verbal response (which was recorded by the author), and then to read each of the emotion labels. If these were all correct they were then asked to click on their response

[20] Participants' responses were also scored manually as a backup measure.

(being reminded of this if necessary) and given instructions to continue, with a reminder to ask if they forgot what any of the emotion labels were at any time (two or three participants did do this). Participants were also asked to verbalise their first few responses (in addition to clicking on them) so the researcher could check for consistency between their intended and actual responses. If the first subtest administered was for voices, the above procedure was followed except that the repeat button was used on the first item, once the participant's ability to read the emotion labels had been established. Participants were also reassured that the next stimulus would not occur until they had responded, to preclude any feelings of time pressure. Participants were instructed to watch/listen carefully and were asked if they were ready before starting each subtest. Using the described procedures, all participants were able to complete the DANVA2.

Theory of mind. Theory of mind skills were assessed using the Faux Pas Stories measure (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999; Stone et al., 1998). A *faux pas* is said to have occurred when someone says something they should not have said, without understanding that they have done so. Understanding and recognition of *faux pas* is thought to develop between the ages of 9 and 11 (see Stone et al., 1998), and involves both a cognitive component (understanding of the fact that someone has said something they should not have), and an empathic understanding component (the effect that this may have on the person to whom it was said). Previous research using the Faux Pas Stories has found evidence of a gender difference, with girls performing well by age 9 and boys by age 11 (Stone et al., 1998).

Faux Pas Stories comprises ten brief (3 - 4 sentence) stories in which one of the characters makes a *faux pas*. Participants are asked to respond to questions requiring them first to determine whether a *faux pas* has occurred, second, to identify the actual *faux pas* made, third, to answer a comprehension question, and finally, to answer a related theory of mind question (see *Appendix D1* for details of Faux Pas Stories and sample questions).

Baron-Cohen and colleagues' (1999) questions and scoring system were used, such that a score of 1 was given if all four questions pertaining to each story (determination of *faux pas* occurrence, identification of *faux pas*, story comprehension, and theory of mind) were answered correctly, and a score of 0 was given if *any* of the four questions were answered incorrectly. If the first question (determining whether a *faux pas* had occurred) was answered incorrectly, the follow- up question (identifying what the person said that they should not have) was not asked, but the comprehension and theory of mind questions were given as usual.

Seven of the original Faux Pas Stories (Baron-Cohen et al., 1999) were used, with some minor wording modifications. For example, "*who'd like a cup of tea ?"* was changed to "*would anyone like a biscuit ?"* to make the story more age-appropriate for participants in the current study. Stories were read in their entirety by a male narrator, and recorded onto a Sony EF60 audio cassette tape which was played back to each participant on a portable tape player (Sony cassette-corder) placed on the table in front of them. Participants were given the following instructions: "*Now I want you to listen to some stories. These stories are short, so you need to listen very carefully. I'm going to ask you some questions afterwards. OK, are you ready?"*

The Faux Pas Stories measure has been used to assess higher order theory of mind skills in several previous studies, although none with RD participants (e.g. Dolan & Fullam, 2004; Gregory et al., 2002; Milders, Fuchs & Crawford, 2003). Although no published information on internal reliability is available, Faux Pas Stories has demonstrated good construct validity as an advanced theory of mind test (Baron-Cohen et al., 1999).

Emotion experience. The 'How I Feel' questionnaire (HIF; Walden, Harris, & Catron, 2003) was used to assess participants' self-reported experience of positive and negative emotional arousal, and their perceived ability to control or regulate their emotions.

The HIF consists of 30 items relating to the frequency, intensity, and perceived control of five emotions (happy, sad, angry, excited, and scared). For example: *I was happy very often* - positive subscale (frequency); *When I felt sad my sad feelings were very strong* – negative subscale (intensity); and, *When I felt scared, I could control or change how scared I felt* - control subscale. Items include both positive (happiness and excitement) and negative (fear, anger, and sadness) emotions, enabling separate measures of positive and negative arousal to be obtained, as well as a measure of perceived emotion control (see *Appendix D2*).

This measure was administered orally (for all participants) in small groups of two to four, with participants circling their responses on a 5-point Likert scale (1 *not true at all* – 5 *very true*). Participants were instructed to listen carefully then decide how true each statement was for them, and circle the appropriate number. An additional prompt, in the form of - *how true is that for you?,* was occasionally given after item statements to help participants remain focused on the requirements of the task. Scores for each domain were obtained by simply adding the responses in each subscale to arrive at separate totals for positive emotion, negative emotion, and emotion control.

Participants were asked to think about how they had felt over the previous *three months,* which was then anchored to a specific point such as *this term* or *since the beginning of the holidays*, depending on when participants were assessed. Walden and colleagues' original scale items were used, with one modification in which the word *angry* was substituted for *mad* throughout (e.g., *I was angry very often*).

The HIF has excellent reliability and validity, with reported mean Cronbach's alphas of .87 for positive emotion, .89 for negative emotion, and .85 for emotion control (Walden et al., 2003), although being a new measure, it has yet to be used in any published studies.

Attachment Style. The Child Attachment Style Classification Questionnaire (CASCQ; Finzi, Har-Even, Weizman, Tyano, & Shnit, 1996; Finzi, Cohen, Sapir, & Weizman, 2000)

provides a measure of attachment style in school-age children, and comprises 15 items tapping into secure, avoidant, and anxious/ambivalent attachment styles. For example, *I make friends with other children easily* (secure); *It's hard for me to trust others completely* (avoidant); and, *I'm sometimes afraid that no-one really loves me* (anxious-ambivalent; for details see *Appendix D3*). A 5-point Likert scale with anchors of 1 - *almost always not true*, and 5 – *almost always true* was used.

The CASCQ has been found to have good reliability and to be a valid measure of attachment in children (including those with LD) aged 6-12 years (Al-Yagon & Mikulincer, 2004a,b). Finzi and colleagues (2000) reported good internal reliability with Cronbach's alphas of between .69 and .81 for all three subscales.

Social attributions. The Peer-Social Attributional Style Scale (PASS-1; Toner & Munro, 1996; Toner & Heaven, 2005) is a measure of the social attributional style of preadolescents. Still a relatively new measure, the PASS-1 has been used in a study of socially withdrawn children (Wichmann, Coplan, & Daniels, 2004).

The PASS-1 comprises 12 social scenarios, 6 of which have a positive (accepting) outcome and 6 of which have a negative (rejecting) outcome. Participants are asked to imagine themselves in the scenario being described, and to respond to three probes designed to ascertain the internality, stability, and globality of their social causal attributions. Ten scenarios from Toner and Munro's (1996) version of the PASS-1 were used in the current study. Positive and negative scenarios were alternated, and were the same for both genders, except that gender terms were changed to match that of the participants in each group (see *Appendix D4* for scenarios and response sheets).

The PASS-1 was administered in groups of two to four participants (of the same sex as far as possible). In line with Toner and Heaven (2005), responses were made on a 5-point Likert scale with the following anchors: 1 - *all because of other reasons*, 5 – *all because of something about me* (locus); 1 – *just that day*, 5 – *all year, permanently* (stability); 1 – *it*

wouldn't affect anything else I do, 5 – *it would affect everything I do* (globality). The wording of the responses was adapted slightly in consideration of the age of the participants (9-11 years).

Participants' responses were summed, yielding six attributional subscales, and three composite attributional variables: (1) generality positive (stability and globality of positive events), (2) generality negative (stability and globality of negative events), and (3) the locus composite. In the current study, the locus composite total was indicative of the presence of a self-serving bias (locus composite = internality of positive events + externality of negative events). Good internal consistencies for locus composite (α = .69), generality positive (α = .88), and generality negative scores (α = .84) have been reported for the PASS-1 (Toner & Heaven, 2005).

Dependent Variable

Behavioural symptoms. The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is a brief screening measure of psychopathology (behavioural symptoms) and pro-social behaviour, and has been used with children and adolescents in numerous studies (e.g., Adams et al., 1999; Carroll et al., 2005; Conti-Ramsden, & Botting, 2004; Emerson, 2005; Hughes et al., 1998; Ripley, & Yuill, 2005).

The SDQ comprises thirty items, with five items relating to each domain: hyperactivity (e.g. *constantly fidgeting or squirming*), conduct symptoms (e.g. *often loses temper*), emotional symptoms (e.g. *often unhappy, depressed, or tearful*), peer problems (e.g. *picked on or bullied by other children*) and pro-social behaviour (e.g. *kind to younger children*). A 3-point Likert scale is used for all items: 0 – *not true*, 1 – *somewhat true*, and 2 – *certainly true* for all items.

The extended version of the SDQ (used in the current study) has an additional set of questions addressing the impact of any behavioural difficulties that are present. Parents and teachers completed impact ratings for six supplementary questions regarding, a) the

severity of the child's difficulties (learning, behaviour, or concentration), b) the length of time the child has been experiencing these difficulties, c) the degree to which these difficulties upset the child, d) interfere with his/her peer relationships, e) interfere with classroom learning, and f) cause the parent/teacher stress.

Both the parent and teacher versions of the SDQ were completed for each participant in the current study, with the behavioural symptoms total (the sum of hyperactivity, conduct symptoms, emotional symptoms, and peer problem scores) being the dependent variable (i.e., psychosocial problems), and scores for pro-social behaviour and impact ratings considered separately. The behavioural symptom and pro-social items are identical in the parent and teacher versions of the SDQ, with differences only occurring in the contexts (e.g. parent/teacher, family/class) of the impact rating items.

The SDQ has been shown to have good convergent validity with the longer and more comprehensive Child Behavior Checklist (Achenbach, 1991; see Goodman & Scott, 1999; Klasen et al., 2000), and its validity has been demonstrated across a range of both community and clinical samples in several countries (e.g. Goodman, Ford, Simmons, Gatward, & Meltzer, 2003; Muris, Meesters, & van den Berg, 2003; Smedje, Broman, Hetta, & von Knorring, 1999).

The excellent psychometric properties of the SDQ were recently confirmed by Hawes and Dadds (2004) in a large Australian sample (N = 1359), and normative data for an Australian sample has also recently been reported (Mellor, 2005). These Australian studies have particular relevance for the current study because of the cultural and linguistic similarities between the Australian and NZ populations.

Goodman (2001) confirmed the five factor structure of the SDQ (hyperactivity, conduct symptoms, emotional symptoms, peer problems, and pro-social behaviour) and reported good test-retest reliability (r = .80 for teachers, and r = .72, for parents, for total behavioural difficulties over six months) and internal reliability coefficients for a

community sample of 7,313 children aged 5 -15 years (Cronbach's alphas for teacher ratings: hyperactivity, α = . 88 conduct symptoms, α = .74 ; emotional symptoms, α = .78; peer problems, α = .70, total behavioural symptoms, α = .87, and pro-social behaviour, α = .84). Parent and teacher ratings also correlated positively, $r = .46$, $p < .001$ for total behavioural difficulties in Goodman's study.

Control Variable

IQ. The Kaufman Brief Intelligence Test, 2nd Edition (KBIT-2; Kaufman & Kaufman, 2004) was used to assess verbal, non-verbal, and composite IQ, as required for selection purposes (participants were required to have either a verbal or non-verbal score of 85 or higher), and to enable IQ to be controlled for in statistical analyses. The KBIT-2 (and its predecessor the KBIT) have been used to assess intelligence in numerous studies (e.g. Levy, Smith, & Tager-Flusberg, 2003; Salekin, Neumann, Leistico, & Zalot, 2004; Stevens, Quittner, Zuckerman, & Moore, 2002).

The KBIT-2 comprises three subtests, two verbal (verbal knowledge and riddles) and one non-verbal (matrices). Verbal knowledge has 60 items in which the participant is asked to indicate which picture (from a choice of four) best illustrates the meaning of a given word, or shows the answer to a question. Both receptive vocabulary and general knowledge are assessed by this subscale. In the current study one of the verbal knowledge items was omitted (Item 38: an important event from the Civil Rights movement), as it was not culturally appropriate for a NZ sample[21].

The riddles subtest has 48 items that measure verbal comprehension, reasoning, and vocabulary knowledge. In this subtest the participant responds verbally to questions asked by the examiner. Some minor modifications to the wording used in this subtest were made in accordance with NZ English. For example, *sea water* was substituted for *ocean water* in item 17; *rubber* and *eraser* were both accepted as correct for item 19; *hairdresser* was

[21] On a very few occasions, Item 54 (Seward's folly) was also omitted as it was based on North American geography. However, few participants reached this level in the verbal knowledge subtest.

substituted for *barber* in item 22, and *candy bar* (item 30) was explained when necessary (without mentioning any of the correct responses).

The matrices subtest has 46 items, in which the participant is required to complete a visual analogy (e.g., carrot goes with rabbit, bone goes with dog), or to complete a 2 X 2 or 3 X 3 matrix. The response format is multiple choice and items require non-verbal reasoning and flexibility in applying problem-solving strategies.

The KBIT-2 has demonstrated excellent reliability and validity with internal consistency coefficients of .81- .93 (for verbal, non-verbal and composite scores) for participants in the norm sample aged 9 -11 years (comparable to the current study), and test-retest correlations of .76 - .88 for the same age group (Kaufman & Kaufman, 2004).

Procedure

Data Collection

All primary school principals in the metropolitan Christchurch area were contacted by telephone, and/or email and invited to participate in the study. Initially, four principals consented, with principals of two further schools consenting later in the year – one of the initial schools when re-contacted, and one private school that had not initially been approached.

Arrangements were made to meet with interested principals, at which time the aims and requirements of the study were discussed and they were given a formal letter and an information pack. A meeting with teachers also took place and following this, all parents of Year 5 and 6 children were sent a preliminary consent form, allowing teachers to release information in the form of nominations for the reading difficulties (RD) and TA groups to the author. Teachers were appraised of the exclusions and asked to nominate students with RD in their class, together with a similar number of matched TA students.

At this point a parent information pack was sent home with the nominated children. This contained parent and child information sheets and consent forms, as well as the SDQ (parent form), and background information form. On return of the completed parent packs, arrangements were made to administer the measures to participants, and for teachers to complete the teacher version of the SDQ (for details of the data collection procedure, see *Appendix E1*).

Consent and Reimbursement

The aims of the study were clearly laid out at all levels of participation, school, parent, and child (for information sheets and consent forms, see *Appendices E2,E3, & E4*). Care was taken to obtain informed consent from children by providing them with a separate information sheet, which parents were requested to read to them. All of the teachers and children approached agreed to participate, but two parents declined to give their consent. Data was collected throughout the second, third, and fourth terms of the school year, finishing in early December.[22] However, almost all of the individual participants completed the required measures during sessions held within a two day period.

Separate written consent was obtained from all school principals, chairs of school boards of trustees, teachers, parents, and children. Participants were compensated for their time as follows. Parents each received a $1 instant lottery card, and participated in a draw for one $70 shopping mall voucher. Teachers each received a $10 petrol voucher, and children each received a certificate and participated in a draw for a $50 bookshop voucher (one per school).

Administration of Measures

All measures were administered by the author during regular school hours, in a quiet, self-contained, space (e.g., resource room, empty classroom, library) in each school. Prior to commencement of data collection, a mini-pilot was undertaken with one child (female,

[22] Ethics approval was obtained at the end of the first school term.

nine years old, TA) to test administration of the measures (particularly time taken) and the appropriateness of their use with the proposed age group. Feedback from the mini-pilot was good and resulted in some minor alterations to instructions being made to improve clarity.

Participants were seen individually for some measures (WIAT-II, KBIT-2, DANVA2, and Faux Pas Stories) and in small groups of two to four for others (CASCQ, HIF, and PASS-1). Measures were administered in two blocks (as shown in *Table 4*), with the WIAT-II (reading assessment) always administered first, and the DANVA2 (emotion understanding) last. Other than these first and last measures, other measures were administered according to availability of participants, and with the aim of varying the type of responses required for tasks completed in the same session. Participants were never required to complete more than two measures in a single session, to avoid potential problems with fatigue and/or attention.[23] The total time taken for each participant to complete the seven measures was approximately two hours.

Table 4. **Administration details and response formats for measures.**

	Time Taken	**Setting**	**Response Mode / Format**
Block 1:			
WIAT-II (reading)	20 -30 mins	Individual	Oral responses
CASCQ (attachment)	10-15 mins	Group	Likert scale (written)
Faux Pas Stories (theory of mind)	15 mins	Individual	Oral responses
HIF (emotions)	15-20 mins	Group	Likert scale (written)
Block 2:			
PASS-1 (attributions)	20-30 mins	Group	Likert scale (written)
KBIT-2 (IQ)	25-30 mins	Individual	Oral responses

[23] One participant completed all measures on his own at a later date (approximately six months on) due to a bereavement in the family at the time testing was originally scheduled.

DANVA (emotion understanding)	20 mins	Individual	Computer-based, mouse click responses

Results

In this section, preliminary analyses and descriptive results are presented, followed by the main statistical analyses relating directly to the research hypotheses. The statistical analyses are presented in the following order: first, the expected relationship between reading difficulties and behavioural symptoms; second, possible predictors of behavioural symptoms in children with reading difficulties; and third, possible moderators of the relationship between reading difficulties and behavioural symptoms, the main focus of the study. A correlational approach (multiple regression with moderating analyses) was employed (rather than the MANOVA equivalent) due to the continuous nature of several of the variables, and the need to preserve as much information from the data as possible, considering the relatively low sample size.

Preliminary Analyses

Data Screening

Missing data. There were no missing data for any of the participants on any of the predictor variables, or on the dependent variable (behavioural symptoms).

Outliers. The data were checked for outliers (see *Appendix F* for boxplots and analyses), with none found on the measures of non-verbal IQ (KBIT-2), reading (WIAT-II), or theory of mind (Faux Pas Stories). Several outliers (7 in all, and mostly univariate) were identified on other predictor variables, one each for emotion understanding (DANVA2), parental ratings of pro-social behaviour (SDQ), peer-social attributions (PASS-1), and attachment (CASCQ), and three on emotional experience (HIF). However, re-analysis of the data established that none of these outliers were due to errors (in either scale completion or data input) or unduly influenced the results of the study (according to trimmed means), and so all data were retained for the following statistical analyses.

Distributions. As expected, composite reading scores (WIAT-II) were bi-modal, and no data transformations were necessary for any variables (for distributions of variables, see *Appendix G*). Predictor and dependent variables were all approximately normally distributed (see *Table 5*), with all skewness and kurtosis statistics in the acceptable range of between 0 and ±2 (Heppner & Heppner, 2004).

Behavioural Symptoms and Demographic Variables

Teacher and parent ratings for behavioural symptoms (SDQ) were significantly correlated, $r = .48$, $p < .001$; thus a combined parent and teacher SDQ score was used for all statistical analyses. [24] Participants' behavioural symptoms scores, the dependent variable, did not vary significantly as a function of either child or maternal demographic

[24] Parent and teacher ratings of pro-social behaviour on the SDQ were also combined into a single score for data analytic purposes, $r = .31$, $p < .05$; as were parent and teacher impact ratings, $r = .51$, $p < .001$.

variables, including child ethnicity, age, gender, health status, and number of children in the family (with correlations of between .12 - .19); and maternal ethnicity, age, education, marital status, and occupation (with correlations of between .02 - .26; see *Appendix H1*).

Internal Consistency of Scales

Internal reliabilities were calculated for each of the variables, as shown in *Table 5*. Items with no variance (i.e., 100% correct) were not included in the reliability analyses, and items with negative item-total correlations were removed from all subsequent statistical analyses. A total of twelve items were removed from The Diagnostic Analysis of Non-Verbal Accuracy (DANVA2; adult faces subscale – two items, adult voices subscale – six items, child faces subscale – three items, and child voices subscale – one item), leaving a total of 84 items which yielded mean Cronbach's alphas, across the four subscales, of .64 (child faces, .57; adult faces, .63; child voices, .67; and, adult voices, .69) respectively.

Table 5. **Distributions and reliability coefficients for non-verbal IQ, composite reading, behavioural symptoms, pro-social behaviour, emotion understanding, theory of mind, emotion experience, peer-social attributions, and attachment.**

	Minimum & Maximum	Median	*M* (*N* = 42)	*SD*	Skewness	Kurtosis	Cronbach's alpha
KBIT-2							
Non-verbal IQ	66 - 130	103.00	101.45	14.79	-.29	-.31	n/a
WIAT-II							
Composite reading	58 - 124	91.50	94.67	18.22	-.06	-1.25	n/a
SDQ							
Behaviour symptoms	.50 - 20.50	8.00	8.75	5.50	.40	-.10	.74
Impact Ratings	0 - 15	1.75	3.96	4.63	.73	-.84	n/a
Pro-social behaviour	3.50-10.00	8.00	7.79	1.59	-.60	.16	.75
DANVA 2 (%)							.64
Emotion understanding	48 - 86	75.45	73.46	8.89	-.79	.72	(.57 -. 69)
Faux Pas Stories							
Theory of mind	1 – 7	5.00	4.67	1.82	-.68	-.33	.67
HIF							
Positive emotion	1.00 - 4.88	3.63	3.52	.82	-.85	.76	.86
Negative emotion	1.42 - 4.42	2.29	2.42	.66	.98	.93	.82
Emotion control	1.60 – 4.50	3.70	3.53	.68	-.94	.75	.79

PASS-1							
Locus composite	4.5 –10.00	7.00	6.83	1.09	.32	.66	.32
Generality positive	2.80-8.00	5.20	5.11	1.20	.29	-.32	.63
Generality negative	2.40-9.00	4.80	5.13	1.44	.86	.51	.79
CASCQ							
Secure	2.40 - 4.80	3.50	3.64	.67	.07	-.94	.59
Avoidant	1.40 - 4.20	2.80	2.79	.66	-.05	-.67	.38
Anxious-ambivalent	1.50 - 5.00	2.50	2.57	.79	.64	.62	.59
(Avoidance)[25]	-16 - -8	-4.00	-4.26	5.20	-.19	.04	n/a

Note: KBIT-2 = Kaufman Brief Intelligence Test, 2nd Edition, **WIAT-II** = Wechsler Individual Achievement Test, 2nd Edition, **SDQ** = Strengths and Difficulties Questionnaire (with *low* pro-social scores indicating difficulties), **DANVA 2** = Diagnostic Assessment of Nonverbal Accuracy, **HIF** = How I Feel Questionnaire, **PASS** = Peer-Social Attribution Scale**, CASCQ** = Child Attachment Style Classification Questionnaire.

One item was removed from the Child Attachment Style Classification Questionnaire (CACSQ; anxious-ambivalent subscale) and the Peer-Social Attribution Scale (PASS-1) respectively. All items from the Strengths and Difficulties Questionnaire (SDQ; behavioural symptoms and pro-social behaviour), the How I Feel (HIF) emotion scale, and Faux Pas Stories (theory of mind), were retained (for details of reliability analyses, see *Appendices I1 & I2).* Reliability analyses were not carried out for the standardised measures of non-verbal IQ (KBIT-2) and reading ability (WIAT-II).

Most Cronbach's alphas were close to the .7 level, considered acceptable in social science research (Heppner & Heppner, 2004). However, Cronbach's alphas ranged from .32 to .86, with the lowest internal consistency coefficients being found for the measures of attachment (CASCQ; α = .38 - .59 across the subscales), and peer-social attributions (PASS-1; α = .32 - .79 across the composite variables).

Intercorrelations Among Predictor Variables

Correlations among the predictor variables (excluding reading group) are shown in *Table 6.* In accordance with previous findings (Walden et al., 2003), positive emotion

[25] Avoidant minus secure score - two attachment dimensions were used in later analyses – anxious/ambivalence and avoidance.

scores correlated with perceived emotion control (HIF), such that higher scores on positive emotion were associated with higher perceived emotion control, $r = .38$, $p < .05$. Positive emotion also correlated with the secure subscale of the CASCQ, $r = .53$, $p < .001$, with higher positive emotion scores linked to higher secure scores, as were higher levels of emotion control, $r = .37$, $p < .05$, and generality positive attributions (PASS-1, generality positive – comprising stability and globality scores), $r = .38$, $p < .05$.

An unexpected result was found for generality positive attributions (PASS-1), in that more stable, global attributions for positive social situations involving peers were associated with significantly *lower* scores for pro-social behaviour (SDQ), $r = -.32$, $p < .05$, as was the presence of self-serving bias, $r = -.40$, $p < .01$. The presence of self-serving bias (PASS-1) also correlated negatively with anxious-ambivalence (CASCQ) and this was approaching significance, $r = -.28$, $p < .10$. Self-serving bias was strongly positively correlated with combined (parent and teacher) impact ratings of behavioural symptoms, $r = .55$, $p < .001$, and negatively with pro-social behaviour, $r = -.54$, $p < .001$. As reported previously (Toner & Heaven, 2005), the locus composite, generality positive, and generality negative social attribution variables all correlated highly with each other ($r = .89$ - $.93$, $p < .001$). However, as none of the attribution variables correlated with reading difficulties (the main independent variable) or behavioural symptoms (the dependent variable), no further steps were taken to modify the attributional variables for further analysis.

Negative emotion (HIF) was negatively correlated with pro-social behaviour ($r = -.35$, $p < .05$) with higher levels of negative emotion linked to lower pro-social behaviour scores, and positively correlated with anxious-ambivalence scores ($r = .36$, $p < .05$), with higher levels of reported negative emotion correlating with higher scores on the anxious-ambivalence subscale. The anxious-ambivalent and avoidant subscales were also

significantly correlated, $r = .32$, $p < .05$ (although CASCQ data were analysed in the form described below).

In line with previous research, CASCQ attachment data were combined in two ways during all subsequent analyses. First, using *secure* versus *insecure* categories, whereby participants were classified as *secure* if their secure total was higher than both their anxious-ambivalent and avoidant totals, and as *insecure* if either their anxious-ambivalent or avoidant total was equal to or higher than their secure total (see Al-Yagon & Mikulincer, 2004a,b). Second, data were reduced to create two attachment dimensions - *anxious-ambivalence* and *avoidance* (avoidant score minus secure score) (see Finzi et al., 2000; Fraley & Spieker, 2003). Importantly, these two attachment dimensions, anxious-ambivalence and avoidance were *not* significantly correlated, $r = .25$, *ns*.

Table 6. **Intercorrelations for emotion understanding, emotion experience, theory of mind, peer-social attributions, attachment, and pro-social behaviour.**

(*N* = 42)	1	2	3	4	5	6	7	8	9	10	11
DANVA2											
1. Emotion understanding	-										
HIF											
2. Pos. Emotion	.16	-									
3. Neg. Emotion	-.26	.11	-								
4. Emotion Control	-.14	**.38***	-.05	-							
Faux Pas Stories											
5. Theory of Mind	.20	.06	-.26	.24	-						
PASS-1											
6. Locus composite	-.18	-.07	.09	-.10	.02	-					
7. Generality Pos.	.02	.22	.08	-.05	.27[a]	**.92*****	-				
8. Generality Neg.	.20	.13	.12	.03	.15	**.89*****	**.93*****	-			
CASCQ											
9. Secure	-.02	**.53*****	.04	**.37***	.22	.12	**.38***	.01	-		
10. Anxious	-.23	.10	**.36***	-.10	-.20	-.28[a]	.15	.09	-.07	-	
11. Avoidant	-.07	.03	.18	.08	-.11	-.24	-.09	.12	-.23	**.32***	-
SDQ											
12. Pro-social Behav.	.19	-.02	**-.35***	.01	.16	**-.40****	**-.32***	-.21	.11	.20	.04

Note: DANVA2 = Diagnostic Assessment of Nonverbal Accuracy, **HIF** = How I Feel Questionnaire, **PASS-1** = Peer-Social Attribution Scale**, CASCQ** = Child Attachment Style Classification Questionnaire, **SDQ** = Strengths and Difficulties Questionnaire. Higher scores are indicative of increased levels of each construct/variable, with high locus composite scores indicating the presence of self-serving bias and lower pro-social scores indicating more difficulties.

***** $p < .05$ ** $p < .01$ ***$p < .001$ $^{a}p < .10$

Descriptive Statistics

Descriptive information for the predictor variables (reading, theory of mind, emotion understanding, emotion experience, social attributions, attachment, and pro-social behaviour) and the dependent variable (behavioural symptoms) are presented in this section.

Reading Achievement and Nonverbal IQ Results for Participants in RD and TA Groups

Combined and group means and standard deviations for reading (WIAT-II) and IQ (KBIT-2) are presented in *Table 7.* As expected, reading composite means for the TA and RD groups differed significantly, with children in the RD group obtaining lower composite reading scores, t (40) = 12.80, $p < .001$, and composite IQ scores, t (40) = 3.88, $p < .001$. Children in the RD group also obtained significantly lower scores on each of the reading subtests - word reading, reading comprehension, and pseudoword decoding (see *Appendix J*).

Due to the strength of the relationship between verbal IQ scores and reading achievement scores (as noted in the introduction), non-verbal KBIT-2 scores were used for all analyses which controlled for IQ. Participants in the RD group obtained significantly lower scores for non-verbal IQ, t (40) = 2.81, $p < .01$, than participants in the TA group. This has also been noted in previous studies where RD participants generally obtain lower scores than controls, although both groups are within the normal range (see Pereira-Laird, et al., 1999; Pisecco et al., 2001; Rutter & Maughan, 2005; Smart et al., 1996). However,

the correlations between non-verbal IQ scores and composite IQ scores were high for both groups: $r = .91$, $p < .001$ for the TA group; and, $r = .93$, $p < .001$ for the RD group (see *Appendix H2*).

Table 7. **Combined and Group Means and standard deviations for measures of reading (WIAT-II) and IQ (KBIT-2).**

	TA group (*n* = 21)		**RD group** (*n* = 21)		**Combined** (*N* = 42)	
	M	***SD***	***M***	***SD***	***M***	***SD***
WIAT-II						
Word reading	111.81	9.02	80.43	9.79	96.12	18.40
Comprehension	109.33	6.78	83.48	8.52	96.40	15.14
Pseudoword Decoding	108.81	6.81	79.67	8.42	94.24	16.57
Target Words	96.20	4.51	70.43	20.61	88.31	19.68
Reading Composite Score	**110.81**	8.12	**78.52**	8.23	**94.67**	18.22
KBIT-2						
Verbal IQ	108.95	14.10	94.05	7.65	101.50	13.51
Non-verbal IQ	**107.38**	13.44	**95.22**	13.93	**101.45**	14.79
Composite IQ	109.71	14.54	94.19	11.18	101.95	15.03

Note: KBIT-2 = Kaufman Brief Intelligence Test, 2nd Edition, **WIAT-II** = Wechsler Individual Achievement Test, 2nd Edition.

Descriptive Statistics and Correlations with Reading Difficulties

Means, standard deviations, and group differences (*t* statistics) for emotion understanding, emotion experience, theory of mind, social attributions, and attachment, with reading group (TA or RD) are shown in *Table 8* (with RD coded 1, and TA coded 0; for correlations by reading group, see *Appendix H3*).

Table 8. **Overall and group means, standard deviations, and t statistics for emotion understanding (DANVA2), theory of mind (Faux Pas Stories), emotion experience (HIF), peer-social attributions (PASS-1), attachment style (CASCQ), and behavioural symptoms (SDQ), with reading group (TA or RD).**

	TA group (*n* = 21)		**RD group** (*n* = 21)		**Combined** (*N* = 42)		***t statistic*** *t* (40)
Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	
DANVA2 (%)[26]							
Child Faces	84.13	8.43	79.82	12.13	81.97	10.55	1.34
Child Voices	71.01	12.25	71.01	16.91	71.01	14.58	0.00
Adult Faces	76.84	13.55	69.91	11.89	73.38	13.07	1.76[a]
Adult Voices	63.23	19.68	71.69	14.58	67.46	17.64	1.58
Total	73.80	8.38	73.11	9.56	73.46	8.89	0.25
HIF							
Positive Total	3.54	.67	3.49	.97	3.52	.82	0.19
Negative Total	2.26	.56	2.59	.72	2.42	.66	1.68
Emotion Control	3.60	.77	3.47	.59	3.53	.68	0.58
Faux Pas							
(no. correct)	5.14	1.31	4.19	2.14	4.67	1.82	1.74
PASS-1							
Locus Composite	6.67	.99	7.00	1.19	6.83	1.09	.99
Generality Pos.	4.99	1.03	5.23	1.36	5.11	1.20	.64
Generality Neg.	4.81	1.01	5.46	1.73	5.13	1.44	1.48
CASCQ							
Secure	3.60	.70	3.69	.65	3.64	.67	0.41
Avoidant	2.93	.58	2.65	.70	2.79	.66	1.43
Anx-ambivalent	2.52	.62	2.61	.94	2.57	.79	0.34
SDQ[27]							
Behav. Symptoms	**13.00**	8.69	**22.00**	11.61	17.50	11.11	**2.84***
Pro-social Behav.	16.19	2.62	14.95	3.63	15.57	3.19	1.27

Note: DANVA 2 = Diagnostic Assessment of Nonverbal Accuracy, **HIF** = How I Feel Questionnaire, **PASS** = Peer-Social Attribution Scale**, C ASCQ** = Children's Attachment Style Classification Questionnaire, **SDQ** = Strengths and Difficulties Questionnaire (with higher scores indicative of more behavioural symptoms, and lower pro-social scores indicating problems).
***** $p < .01$ [a] $p < .1$

As predicted, membership in the RD group correlated with higher scores for behavioural symptoms, $r = .41$, $p < .01$ (and correspondingly with SDQ impact ratings, $r = .56$, $p < .001$; see *Appendix K*). Of the current sample, 29% of participants in the RD group had behavioural symptoms scores in the *abnormal* range of the SDQ, whereas none of the NA participants did. This pattern was evident on all four subscales of the SDQ, with 14% of participants in the RD group scoring in the abnormal range for hyperactivity (vs.

[26] The DANVA subscale means obtained in the current study are comparable to previously obtained means (across studies) of 75% for adult faces, 85% for child faces, 62% for adult voices, and 77% for child voices (Nowicki, 2004).
[26] Combined (mean) parent and teacher Strengths and Difficulties Questionnaire (SDQ) ratings.

5% for the TA group), 10% in the abnormal range for conduct problems (vs. 0% for the TA group), 5% in the abnormal range for emotional symptoms (vs. 0% for the TA group), and 19% in the abnormal range for peer problems (vs. 5% for the TA group).

Although the predicted relationship between emotion understanding (DANVA2) and reading difficulties was not found (r = - .04, *ns.*), there was a significant link between reading group and accuracy for the faces subtest of the DANVA2, r = -.31, p < .05, such that participants with reading difficulties were less accurate (but not for voices, r = .17, *ns.*). Likewise, for low intensity emotions, the correlation was in the expected direction and approached significance, r = .26, p < .10. The link between reading group and theory of mind scores was also approaching significance, r = -.27, p <. 1, with reading difficulties being associated with lower theory of mind scores. No other significant correlations between reading group and predictor variables were found.

Behavioural Symptom Scores and Predictor Variable Correlations

As previously noted, total behavioural symptom scores (i.e., psychosocial problems) correlated significantly with reading difficulties, and correlations for each of the SDQ subscales are shown in *Table 9.* This predicted relationship between reading difficulties and behavioural symptoms was central to the research hypotheses, and formed the basis for further moderating analyses. The relationship remained significant when controlling for gender and non-verbal IQ (see *Appendix L1*).

As expected, behavioural symptom scores on the SDQ correlated negatively with pro-social behaviour scores on the same scale, r = -.65, p <.001 (and positively with SDQ impact ratings, r = .75, p < .001), as expected. Higher behavioural symptom scores were negatively correlated with both theory of mind scores (Faux Pas Stories), r = -.44, p < .005, and non-verbal IQ scores (KBIT), r = -.32, p < .01. No other variables correlated with SDQ behavioural symptom scores (see *Appendix H4*).

Table 9. **Reading group (TA, RD) correlations with behavioural symptoms (SDQ).**

	Hyperactivity	Conduct Problems	Emotional Symptoms	Peer Problems	Impact Score	Total Behavioural Symptoms
Reading Group (TA / RD) (*N* = 42)	**.34***	**.41****	**.31***	26[a]	**.56*****	**.41****

***** $p < .05$ ****** $p < .01$ *** $p < .001$ [a] $p < .10$

Pro-social Behaviour

Participants with RD did not obtain lower scores for pro-social behaviour than those in the TA group, t (40) = 1.27, *ns*. However higher levels of pro-social behaviour correlated significantly with lower levels of negative emotion, $r = -.35$, $p < .05$; lower levels of self-serving bias (i.e., internal attributions for success events and external attributions for failure events), $r = -.40$, $p < .01$; and lower generality positive scores (i.e., less stable and global attributions for success events), $r = -.32$, $p < .05$. Thus, lower levels of negative emotion, lower levels of self-serving bias, and lower generality positive scores were all significantly correlated with *higher* pro-social behaviour scores, with further analyses revealing no interaction effects.

Gender and Predictor Variable Correlations

Females scored significantly higher than males on the avoidance dimension of attachment, $r = .42$, $p < .01$, whereas males were more likely than females to be classified as secure, $r = -.35$, $p < .05$. The link between gender and the presence of self-serving bias (PASS-1) was significant, $r = -.32$, $p < .05$, with males more likely to demonstrate a self-serving bias than females. Females tended to have higher pro-social scores than males, but this was only marginally significant, $r = -.30$, $p < .01$. No other variables were significantly correlated with gender (see *Appendix H5*).

Summary of Descriptive Results

Preliminary analyses of the data showed that each of the variables was reasonably normally distributed, and that where outliers occurred they were due to genuine extreme responses and did not result from errors. Overall, most measures demonstrated acceptable levels of internal reliability.

The dependent variable, behavioural symptoms, did not vary as a function of any child or maternal demographic variables. Examination of the intercorrelations among the predictor variables showed significant positive correlations for emotion control and positive emotion, as well as secure attachment scores with positive emotion, emotion control, and generality positive attributions. Negative emotion was also positively related to anxious-ambivalent attachment scores. These correlations were all in the expected directions, supporting the construct validity of the scales.

Negative correlations were noted for pro-social behaviour and generality positive attributions and negative emotions. Somewhat unexpectedly, the presence of a self-serving bias was strongly linked with lower levels of pro-social behaviour and higher levels of behavioural symptoms.

As expected, participants in the RD group had significantly lower composite reading and non-verbal IQ scores than those in the TA group . Nonverbal IQ was significantly correlated with behavioural symptoms, gender, and attachment (see *Appendix H6*). It had been predicted that reading difficulties would correlate negatively with emotion understanding but this was not supported, although reading difficulties did correlate significantly with the dependent variable, behavioural symptoms. Behavioural symptoms also significantly correlated with (lower) theory of mind, and pro-social behaviour scores.

Main Statistical Analyses

Predictors of Behavioural Symptoms

Multiple regression analyses were carried out with the variables that correlated significantly with behavioural symptoms and/or reading difficulties (controlling for non-verbal IQ and gender) to determine how much unique variance each predictor contributed to behavioural symptom scores and whether any of these variables were moderating the relationship between reading difficulties and behaviour.

Table 10 below shows the correlations for the posited moderating variables (i.e., theory of mind, emotion understanding, positive emotion, and secure attachment) and behavioural symptoms by reading group (TA or RD). The following regressions and moderating analyses examine these relationships in more detail, with the objective of revealing the effects that differing levels of these variables may have on the behavioural symptoms of children with and without reading difficulties.

Reading group (RD and TA) and theory of mind scores (r = -.27, *ns*.) were entered into a simultaneous multiple regression, with results showing that each independently and significantly predicted behavioural symptoms while controlling for the other, R^2 = .28, F (*2,39)* = 7.72, $p < .005$ (as shown in *Table 11* and *Figure 2*)[28]. Thus, reading difficulties and theory of mind, accounted for 28% of the variance in behavioural symptoms, with reading difficulties accounting for 9.3%, and theory of mind for 11.6% respectively.

Table 10. **Correlations for reading group and posited predictor or moderating variables with behavioural symptoms.**

	Behavioural Symptoms		
	TA group (n = 21)	**RD group** (n = 21)	**Combined** (N = 42)
Theory of Mind	**-.55****	-.29	**-.44*****
Emotion understanding	.40[a]	-.42[a]	-.10
Positive Emotion	.30	-.39[a]	-.15
Secure Attachment	.06	**-.44***	-.20

[28] Adjusted R^2 = .25; tolerance and VIF were checked and found to be well within acceptable limits (see Appendix S).

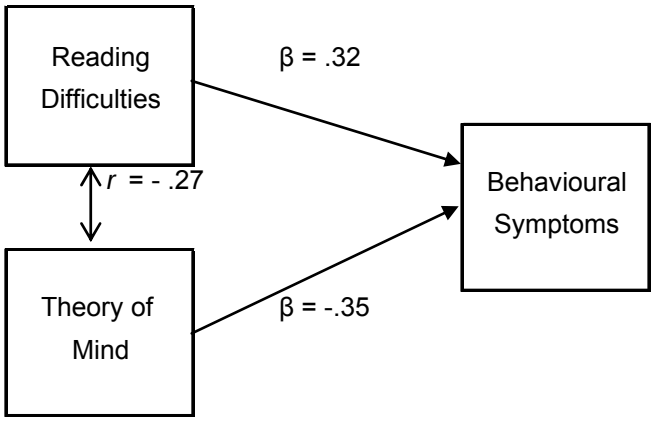
* $p < .05$ ** $p < .01$ *** $p < .005$ [a] $p < .10$

Table. 11. **Multiple regression with reading group (TA and RD) and theory of mind as predictors of behavioural symptoms.**

	Behavioural Symptoms (N = 42)			
	Beta weight	*t* statistic	Semi-partial R^2 (effect size)	Maximum *h statistic*
Reading Difficulties *(TA=0, RD=1)*	.32	**2.25***	.09	.16[29]
Theory of Mind	-.35	**-2.51****	.12	*na*

* $p < .05$ ** $p < .005$

Next, the multiple regression was re-run for reading difficulties, controlling for non-verbal IQ and gender, $R^2 = .20$, F (3, 38) = 3.07, $p < .05$[30]. As shown in *Table 12*, neither non-verbal IQ nor gender accounted for significant variance in behavioural symptom scores, and reading difficulties remained a significant independent predictor even when the control variables were included in the regression equation.



[29] Indicating outliers are not a problem, using .20 criterion.
[30] Adjusted $R^2 = .13$

Figure 2. **Reading difficulties and theory of mind as independent predictors of behavioural symptoms.**

Finally, the regression for theory of mind was re-run while controlling for non-verbal IQ and gender, $R^2 = .23$, $F\ (3, 38) = 3.87$, $p < .05$[31]. Theory of mind also remained a significant independent predictor of behavioural symptoms when non-verbal IQ and gender were entered as control variables, with neither control variable contributing significantly to the amount of variance.

Although these analyses show that reading difficulties and theory of mind independently predict behavioural symptoms, a plausible causal model, with theory of mind as a possible partial mediator of the relationship between reading difficulties and behavioural symptoms, was also tested (see *Figure 3*).

Table 12. **Multiple regression with reading group, and theory of mind predicting behavioural symptoms, while controlling for non-verbal IQ and gender.**

	Behavioural Symptoms (N = 42)	
	Beta Weight	*t* statistic
1.		
Reading Difficulties	.34	**2.12***
Non-verbal IQ	-.18	-1.13
Gender	.01	.06
2.		
Theory of mind	-.39	**-2.58***
Non-verbal IQ	-.21	-1.39
Gender	.07	.47

* $p < .05$

[31] Adjusted $R^2 = .17$

This mediation model is included here, although the correlation between reading difficulties and theory of mind was not significant (r = -.27, p = .09) and Sobel's test did not show a significant decrease in the beta weight (Sobel test = 1.76, p = .08), given that the results were in the predicted direction and were likely to have been attenuated by power and reliability issues (see Chapter 5: Discussion). None of the other predictor variables were potential mediating factors, given that they did not correlate with either reading difficulties or behavioural symptoms.

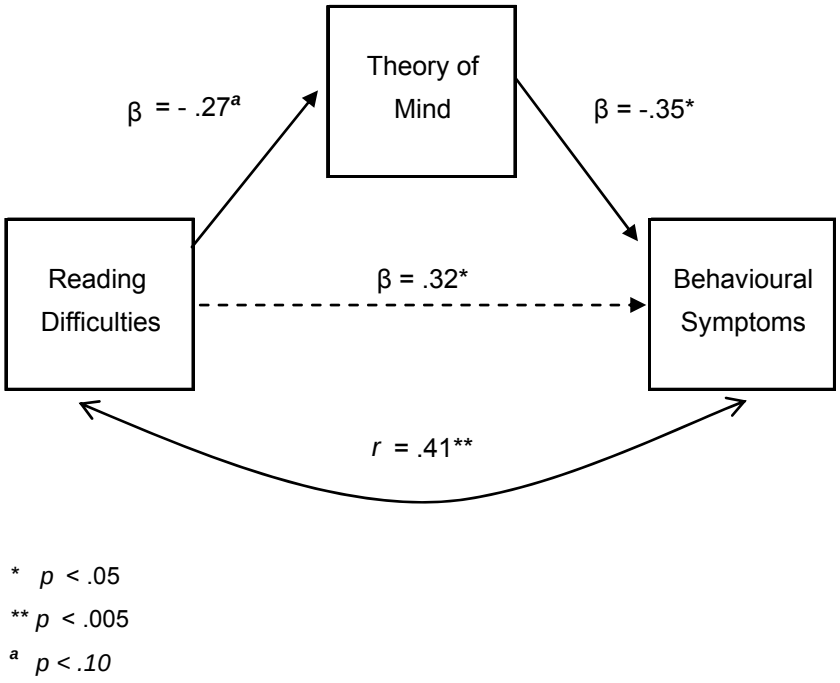


Figure 3. **Proposed (partial) mediational model for the relationship between reading difficulties, theory of mind, and behavioural symptoms.**

Moderators of the Link Between Reading Group and Behavioural Symptoms

All of the social information processing (SIP) variables were checked for possible moderating effects (i.e., interaction effects) on the relationship between reading difficulties and behavioural symptoms (5 measures, for a total of 10 analyses). Of these, both emotion understanding and positive emotion were shown to moderate this relationship, with secure

attachment approaching (but not attaining) significance and displaying a similar pattern of results as the previous two moderating analyses, Each of these analyses will next be described in turn.

Emotion understanding as a moderator. Using the standard approach to test for moderation, emotion understanding (DANVA2) was entered into a hierarchical regression model along with reading difficulties (r = -.04, *ns*.)[32]. The overall model, including the main effects and interaction term, explained significant amounts of variance, R^2 = .31, F (*3, 38*) = 5.65, $p < .005$[33] (see *Table 13*). Examination of the scatterplot for leverage (h) statistics revealed a single outlier. The regression analysis was re-run with the outlying case removed, and the results remained significant (see *Appendix L2),* so the original analysis was retained.

The total model (reading difficulties and emotion understanding) accounted for 31% of the variance on behavioural symptoms. By squaring the semi-partial correlations obtained in the regression analysis, it was calculated that the interaction term (Reading Difficulties X Emotion Understanding) contributed an additional 16.2% of variance to the dependent variable (behavioural symptoms), over and above that contributed by reading difficulties (16.5%) and emotion understanding (0%; for details see *Appendix L2*).

The moderating effects of emotion understanding remained significant when the regression analyses were re-run with gender and non-verbal IQ entered as separate control variables (see *Appendix L1*).

The standard approach was used to illustrate this interaction. That is, data points representing one standard deviation above and below the mean for each reading group (TA vs. RD) and the moderating variable (high emotion understanding vs. low emotion understanding) were plotted to illustrate the interaction effect (see *Figure 4*)The results showed that, as predicted, for participants who were *high* in emotion understanding ability,

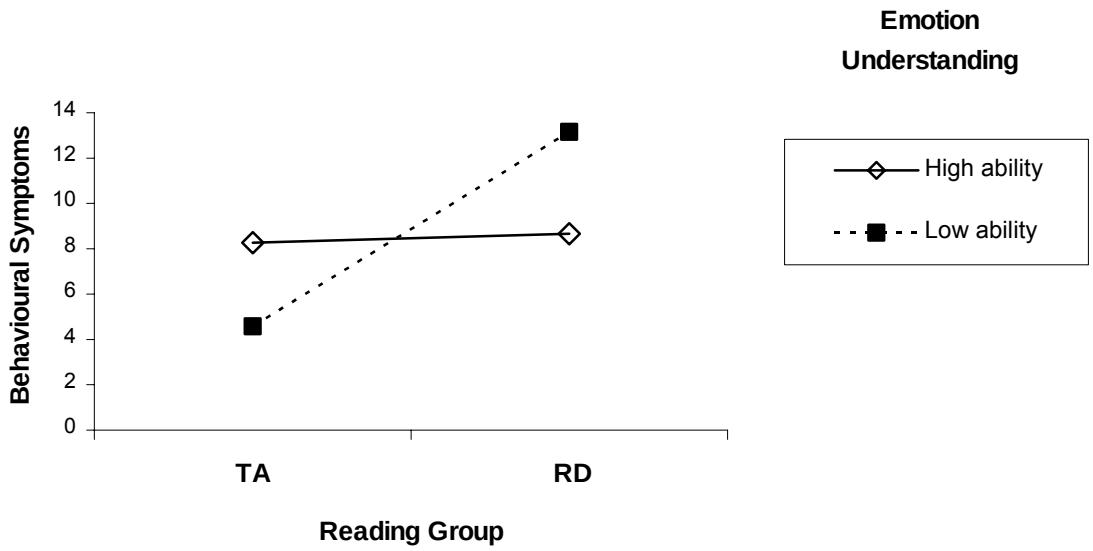
[32] Tolerance and VIF were within acceptable limits for reading group and DANVA.
[33] Adjusted R^2 = .25.

the presence of reading difficulties had virtually no effect, but that for participants *low* in emotion understanding ability , the presence of reading difficulties corresponded to significantly higher levels of behavioural symptoms.

Table 13. **Regression coefficients for emotion understanding as a moderator for the link between reading difficulties and behavioural symptoms.**

	Behavioural Symptoms (N = 42)		
	Beta Weight	*t* statistic	Maximum *h* statistic
Moderating Model 1:			
Reading Difficulties	.41	**2.80****	
Emotion understanding	-.08	.57	.22[34]
Interaction	-.55	**2.71****	
Moderating Model 2:			
Reading Difficulties	.41	**2.81****	-.35
Positive Emotion	-1.4	-.97	
Interaction	-1.46	**-2.13***	

Note. Main effects have been calculated without the interaction term.
* $p < .05$ ** $p < .01$



[34] *h* statistics for both regressions indicating no cases have undue leverage, using .50 criterion.

Figure 4. **The moderating effects of emotion understanding on the link between reading difficulties and behavioural symptoms.**

Positive emotion as a moderator. Positive emotion (HIF) was entered into a hierarchical regression model along with reading difficulties (r = -.03, ns.)[35]. The overall model, including the main effects and interaction term, explained significant amounts of variance between reading difficulties and behavioural symptoms, R^2 = .27, F (3,38) = 4.78, $p < .01$[36] (see *Table 14*), with the total model accounting for 27% of the variance on behavioural symptoms.

Examination of the scatterplot for the leverage statistics revealed a single outlier (see *Appendix L3*). However, when the moderating analysis was re-run with the outlying case removed, the model remained significant, and so the original analysis was retained. By squaring the semi-partial correlations produced in the regression analysis, it was calculated that the interaction term (Reading Difficulties X Positive Emotion) contributed an additional 9% of variance to the dependent variable, over and above that contributed by reading difficulties (14%) and positive emotion (3%; see *Appendix L2*). The moderating effects of positive emotion remained significant when the regression analyses were re-run with the (separate) addition of gender and non-verbal IQ, separately, as control variables (see *Appendix L1*).

The standard approach was again used to illustrate this interaction. That is, data points representing one standard deviation above and below the mean for each reading group (TA vs. RD) and the moderating variable (high positive emotion vs. low positive emotion) were plotted to illustrate the interaction effect (see *Figure 5*). The results showed that for participants who reported *high* levels of positive emotion (happiness and excitement) the presence of reading difficulties had only a small effect on behavioural symptoms, but that for participants with *low* levels of positive emotion, the presence of reading difficulties corresponded with significantly higher levels of behavioural symptoms.

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[35] Tolerance and VIF were within acceptable limits for reading difficulties and positive emotion.
[36] Adjusted R^2 = .22

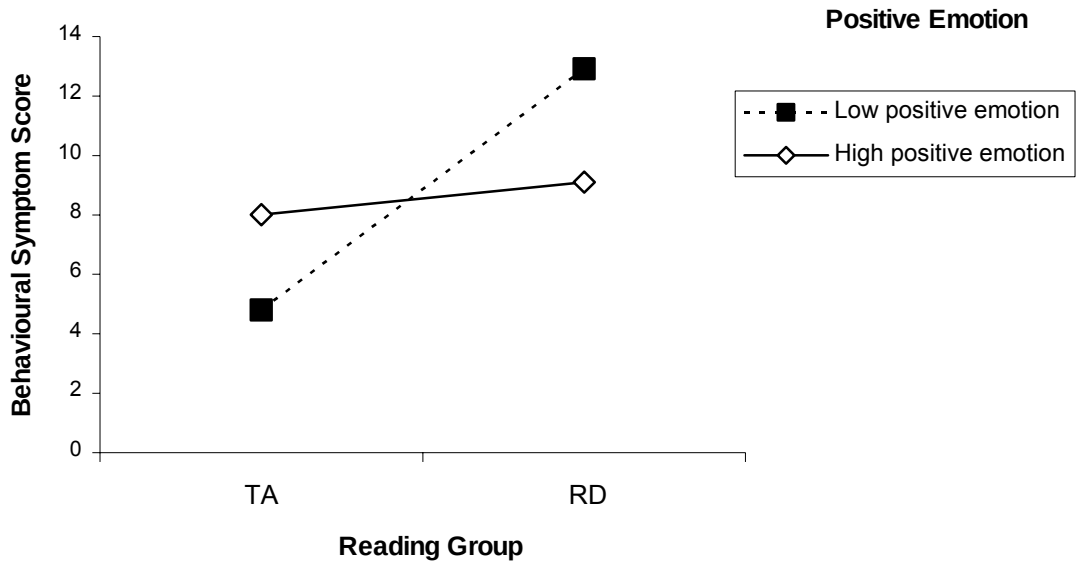

Figure 5. **The moderating effects of positive emotion on the link between reading difficulties and behavioural symptoms.**

Possible moderating effects of secure attachment. A two-way analysis of variance was used to test this interaction, as both predictor variables (reading group: reading difficulties vs. TA, and attachment style: secure vs. insecure) were dichotomous. There was a main effect of reading difficulties, F (1, 38) = 11.89, $p < .001$; no main effect for secure attachment, F (1, 38) = 2.12, *ns*.; and, an interaction effect for reading difficulties and secure attachment, F (1, 38) = 3.25, $p < .10$, on behavioural symptoms. This analysis has been included, although the interaction effect for secure attachment was only significant at the $p < .10$ level, because the results were in the expected direction and consistent with the previous findings, suggesting a lack of power may have had an attenuating effect. The significance level of secure attachment as a potential moderator did not change when the results were re-analysed using a regression approach, and controlling for gender and IQ separately.

Table 14. **Two-way ANOVA summary table for reading difficulties and secure attachment.**

Source	Sum of Squares	*df*	Mean Squares	*F*
Reading difficulties	288.34	1	288.34	11.89
Secure attachment	51.45	1	51.45	2.12
Interaction Term	78.87	1	78.87	3.25
Error	921.68	38		
Total	4480.25	42		

The moderating effects of secure attachment revealed in the ANOVA are shown in *Figure 6.* For participants categorised as *securely* attached, the presence of reading difficulties had a small effect on behavioural symptoms, but for participants categorised as *insecurely* attached, the presence of reading difficulties corresponded with significantly higher scores for behavioural symptoms.

Summary

Analyses showed that both the presence of reading difficulties and poorer theory of mind abilities independently predicted behavioural symptom scores, together explaining 28% of the variance. There was also some evidence that theory of mind *may* partially mediate the relationship between reading difficulties and behavioural symptoms.

Examination of the moderating analyses showed that both emotion understanding and positive emotion significantly moderated the link between reading difficulties and behavioural symptoms, and there was some evidence that secure attachment *may* also have a moderating effect on this relationship. In all cases, the presence of poorer abilities (emotion understanding and theory of mind), less positive emotion, and insecure attachment, were risk factors for children with reading difficulties displaying behavioural symptoms.

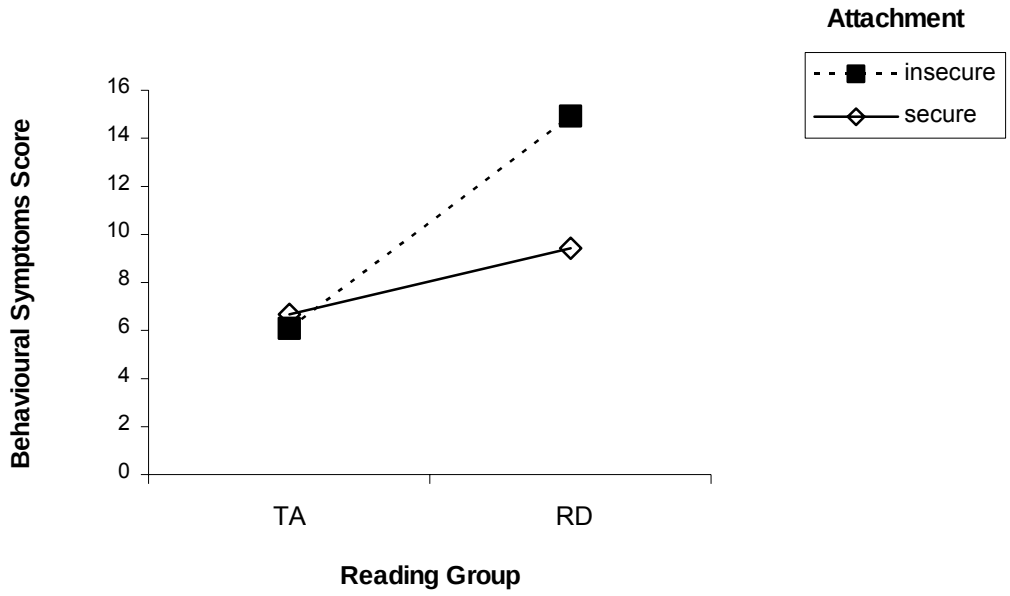

Figure 6. **Secure attachment as a possible moderator of the link between reading difficulties and behavioural symptoms.**

Thus, of the five variables examined, only peer-social attributions did not seem to contribute to behavioural symptoms. Of the remaining four, one independently predicted behavioural symptom scores (theory of mind), two moderated the relationship between reading difficulties and behavioural symptoms (emotion understanding and positive emotion), and one other possibly moderated this relationship (secure attachment). To summarise, each of these variables (main effects plus interaction terms) explains a moderate amount of variance in behavioural symptom scores (particularly in view of the low sample size), as indicated by the R^2 values of between .27 and .31 that were obtained.

Discussion

The aim of the current study was to investigate the effects of several aspects of social information processing (SIP) on the relationship between reading difficulties (RD) and psychosocial problems. In general, findings were consistent with predictions. First, RD

were related to increased levels of psychosocial problems, replicating the standard findings in this area. Second, better theory of mind skills predicted lower levels of psychosocial problems for children in both reading groups (RD and TA). Third, consistent with the main hypotheses, two (and possibly three) SIP variables moderated the relationship between RD and psychosocial problems.

Specifically, children with RD and *higher* levels of emotion understanding (and positive emotion) were indistinguishable from equivalent children in the TA group in terms of psychosocial problems. In contrast, children with RD and *lower* levels of emotion understanding (and positive emotion) demonstrated considerably higher levels of psychosocial problems than equivalent children in the TA group. A similar pattern of findings was obtained for secure attachment (i.e., children with RD and an insecure attachment style had higher levels of psychosocial problems) although probability levels for this variable did not attain significance. Theory of mind abilities, on the other hand, predicted psychosocial problems across both the RD and TA groups. Against predictions, however, social attributions did not moderate the relationship between RD and psychosocial problems.

These main findings will be discussed in the following section. First, the results concerning RD and psychosocial problems will be dealt with. Second, results concerning emotion understanding, positive emotion, and attachment as protective factors will be addressed. Third, theory of mind as a predictor of psychosocial problems will be discussed, followed by the results for attributions, and variables which were associated with pro-social behaviour. Finally, the strengths and limitations of the current study are outlined, and the discussion concludes with possible implications for interventions and future research

Reading Difficulties and Psychosocial Problems

As initially hypothesised, the presence of RD was associated with increased levels of psychosocial problems (i.e., behavioural symptoms - a composite of hyperactivity, conduct symptoms, emotional symptoms, and peer problems). This finding was not a function of gender or IQ, as these were statistically controlled for in the analyses. Ratings of psychosocial problems were made by both teachers and parents, thus confirming the presence of psychosocial problems across both school and home settings.

This finding replicates and extends extant findings in the literature by demonstrating this relationship in a carefully selected and clearly defined sample of non-referred children with RD. In contrast, many previous studies have used heterogenous samples, comprising children with both verbal and non-verbal LD, making it difficult to draw conclusions about the nature of the relationship between RD per se, and psychosocial problems (e.g., Kuhne & Wiener, 2000; Lyon et al., 2003; Nabuzoka & Smith, 1995; Sprouse et al., 1998).

The exclusion of participants with ADHD, in the current study, minimised the possibility of confounds due to ADHD (such as attention problems and hyperactivity) having undue inflationary effects on ratings of psychosocial problems. Furthermore, participants in the current study were drawn from a community sample, whereas participants in similar studies are often clinically referred, implying that psychosocial problems may already have reached levels necessitating clinical intervention (see Greenham, 1999). Thus, the increased levels of psychosocial problems found in the current study (with 29% of participants with RD scoring in the abnormal range on the SDQ) provides evidence of the link between RD and psychosocial problems in a young (pre-adolescent) and non-referred sample.

Several causal explanations for the relationship between RD and psychosocial problems have been proposed, as previously outlined in the introduction section (see Carroll et al., 2005; Rutter & Yule, 1970; Sanson et al., 1996). First, RD may cause psychosocial problems (e.g., through repeated failure and frustration leading to low self-esteem;

Maughan, 1995). Second, psychosocial problems may cause RD (e.g., through decreasing learning opportunities, creating less positive relationships with teachers; Spira et al., 2005). Third, another variable(s) may cause both RD and psychosocial problems (e.g., poor attention skills, hyperactivity). Fourth, the relationship between RD and psychosocial problems may be reciprocal, with each contributing to the development of the other (Hinshaw, 1992). The current thesis (consistent with an emerging consensus; e.g., Welsh et al., 2001) adopts this reciprocal viewpoint, and further suggests that the relationship between RD and psychosocial problems is in turn influenced by a range of protective factors.

RD and Adverse Psychosocial Outcomes: Protective Factors

The position taken here is that in the presence of the RD risk factor, protective variables interact with RD to influence psychosocial outcomes. In their protective capacity, these variables serve to reduce the likelihood of the negative developmental trajectory implied by the presence of RD (Morrison & Cosden, 1999; Murray, 2003).

Secure attachment (Al-Yagon, 2003; Morrison & Cosden, 1997), emotion regulation and reciprocity (Margalit, 2003), and the number and quality of friendships (Wiener, 2002, 2004) have been identified as protective factors in previous studies of children with RD. Many of these, and other, researchers have pointed to the need for further studies of potential protective factors to help identify which children with RD do well psychosocially, and possible reasons for their success (e.g., Margalit, 2003; Spira et al., 2005; Tur-Kaspa, 2002).

In terms of a risk and protective framework, the current study contributes to this growing body of research by adding emotion understanding and positive emotion to the list of potentially protective variables for children with RD (as well as providing some evidence for the role of secure attachment). The identification of such protective factors

has direct implications for intervention, as such factors are likely to be modifiable in many cases.

Emotion Understanding as a Moderator of the Link between RD and Psychosocial Problems

As predicted, children with RD and relatively more accurate emotion understanding did not differ from their TA peers on ratings of psychosocial problems, whereas children with RD and relatively less accurate emotion understanding displayed much higher levels of psychosocial problems than their TA peers (i.e., there was an interaction effect) . Thus, emotion understanding appears to be fulfilling a protective function for children with RD, in terms of the risk of adverse psychosocial outcomes.

This finding is novel and was not explained by alternative variables such as gender and IQ, with the interaction effect remaining unchanged when these variables were statistically controlled for. Several explanations with regard to this finding are possible. First, it is plausible that children with RD who have more accurate emotion understanding are able to interact more appropriately with their peers and are better liked, making the development of psychosocial problems less likely than if they have RD and less accurate emotion understanding (Denham, 1998). Perhaps, for TA children with less accurate emotion understanding, this is compensated for by gaining peer status in other ways - such as through academic and language-based competencies (which are less available to children with RD). Thus, for TA children, less accurate emotion understanding may have a lesser impact on psychosocial outcomes due to other, compensatory, pathways available to them.

This explanation is consistent with the proposition that two major areas of competence, language skills and emotion understanding, provide much of the information concerning mental states of others (Harris, de Rosnay, & Pons, 2005). Thus, when there is a deficit in one of these due to a learning disorder (i.e., language), *and* the individual is less competent

in the other (i.e., emotion understanding), adverse psychosocial outcomes become more likely.

The hypothesis that poorer emotion understanding would be correlated with the presence of RD was not supported. This finding stands in contrast to much of the extant literature (e.g., Cooley & Triemer, 1992; Holder & Kirkpatrick, 2001; Maheady and Sainato, 1986; Sprouse et al., 1998; Wiig & Harris, 1974). However, one possible reason for this finding in the current study is that many of the previous studies used non-standardised measures (e.g., Nabuzoka & Smith, 1995), or participants of mixed diagnostic categories (e.g., LD and emotional disturbance; Cooley & Triemer, 1992), issues which were avoided in the current study.

Whereas children with non-verbal learning disabilities (NLD) have been included in some of the prior published research in which deficits in emotion understanding were found (e.g., Bauminger et al., 2005), the current study included only individuals with reading difficulties. It may be that children with NLD demonstrate relatively more difficulties with emotion understanding than those with RD (see Dimitrovsky et al., 1998). Further support for this possible explanation comes from the view that NLD are largely due to deficits in the right hemisphere, and as such have particular implications for emotion understanding and psychosocial outcomes (see Bender & Golden, 1990; Pelletier et al., 2001; Worling et al., 1999). For example, there is evidence for amygdala involvement in facial expression and emotion processing (see McClure, 2000), as well as in the more general emotion processing difficulties often associated with learning difficulties (Bradley, 2000; Easter, et al., 2005; Stevens et al., 2001).

An alternative possibility, also implicating the role of non-verbal skills, is Nowicki and Duke's (1992) claim that as non-verbal skills are necessary to regulate ongoing interactions, poor non-verbal skills lead to more academic problems due to the social nature of the classroom learning environment. In support of this argument, it has been

found that children with behavioural disorders tend to spend less time scanning their social environment, thereby failing to pick up on affective information from others (Denham, 1998). These possible explanations are speculative but deserve further research attention.

Positive Emotion as a Moderator of the Link between RD and Psychosocial Problems

As predicted, emotion experience also moderated the relationship between RD and psychosocial problems. Specifically, children with RD who reported lower frequency and intensity of positive emotion demonstrated much higher levels of psychosocial problems than TA children (i.e., there was an interaction effect). Thus, positive emotion experience also appears to be a protective factor for children with RD, in terms of their risk for adverse psychosocial outcomes. The role of positive emotion has not previously been studied in children with LD or RD, and this finding was not explained by alternative variables such as gender or IQ, which were statistically controlled for during the analyses.

This finding is consistent, however, with those of previous studies concerning the role of positive emotion in relation to learning and behaviour. For example, positive affect has been linked with better performance on a range of academic and social problem-solving tasks (Bryan, 2005; Tur-Kaspa, 2002), and has been shown to facilitate thinking and problem-solving, thereby leading to both new learning and increased utilisation of existing knowledge (Isen, 2004).

One plausible explanation for the finding in the current study is that children who experience more positive affect will feel better able to address the challenges they face in coping with their RD on a daily basis. They may approach potentially stressful situations (such as reading instruction with its associated fear of failure; Bus & van Ijzendoorn, 1995) with more optimism, and be less likely to display psychosocial problems as a result. Children who feel more positive are correspondingly likely to display more positive affect, and will therefore be more well-liked by their peers (e.g., Hubbard & Coie, 1994).

The expectation that children with RD would report lower perceived emotion control than TA children was not confirmed, although children in the RD group did report slightly lower levels of perceived emotion control than those in the TA group. Similarly, although no group differences were found on levels of negative emotion, it is of interest that higher negative emotion levels predicted lower levels of pro-social behaviour (for both groups, TA and RD), but were not related to increased levels of psychosocial problems as may have seemed likely. The area of the role of emotion experience deserves more research attention, as little is known about the links between emotion experience, learning, and behaviour in children with RD.[37]

Individuals need to be able to regulate both their experience and expression of emotion appropriately in social interactions, and these competencies may be particularly important for children with RD (Bridges & Grolnick, 1995; Eisenberg et al., 1997). For example, Bugental and colleagues (1995) reported that children with self-perceived high emotion control responded to negative social cues with increased attention (i.e., attempted to understand a controllable stimulus), whereas children with self-perceived low emotion control responded to negative social cues with *attentional avoidance* (i.e., responded defensively), and it is easy to see how a similar response pattern could be linked to the incidence of psychosocial problems in children with RD. Possible reasons for the lack of significant findings regarding emotion control in the current study, are the low sample size (i.e., power issues) and the use of a non-referred sample (i.e., with less severe psychosocial problems than would be likely to be found in a clinical sample).

Secure Attachment as a Possible Moderator of the Link between RD and Psychosocial Problems

The data obtained in the current study were consistent with the hypothesis that secure attachment would moderate the link between RD and psychosocial problems, although

[37] Emotion control was also positively related to levels of positive emotion, as previously reported by Walden and colleagues (2003).

these results were marginally significant. Children with RD who were classified as insecure (i.e., those with predominantly avoidant or ambivalent attachment styles) demonstrated higher levels of psychosocial problems in comparison to the TA group. As with the previous moderating findings, this effect was not a function of gender or IQ. Thus, secure attachment may be a protective factor for children with RD in terms of the risk of adverse psychosocial outcomes.

Secure attachment is thought to influence positive psychosocial outcomes through its facilitating effect on on-going social interactions, and this would be a plausible explanation for its possible protective role in the current study. Thus, an individual with RD and a secure attachment style will acquire social competencies which will in turn facilitate the occurrence of positive social interactions. In contrast, at the other end of the spectrum, an individual with RD and an insecure attachment style will be more likely to experience psychosocial problems, particularly anxiety and depression (Mineka et al., 2003).

The results obtained in the current study are generally consistent with the two previous studies in which attachment styles have been examined in children with RD (Al-Yagon & Mikulincer, 2004a,b). Using a risk and resilience framework, Al-Yagon and Mikulincer found secure attachment mediated the link between RD and socio-emotional adjustment (using sense of coherence and loneliness measures) in a sample of children with LD aged 8 -11 years. However, in contrast to Al-Yagon and Mikulincer's findings, no direct relationship was found between reading group (RD or TA) and attachment style (r = -.20, *ns*.) in the current study, although the same measure of attachment was used (CASCQ; Finzi, et al., 1996) and participants were similarly aged (9 - 11 years).[38]

[38] Interestingly, Al-Yagon and Mikulincer (2004a,b) also found significant group differences for attachment, with 45% of participants with LD classified as secure compared to 71% of participants in the control group. In the current study, exactly the same proportion of participants in the TA group were classified as secure (71%), however, this proportion was the same for both groups. Moreover, Al-Yagon and Mikulincer (2004a,b) found no gender effects for categorical (secure/insecure classification), or continuous (secure,avoidant, anxious) measures of attachment, whereas the current study found that females were higher than males on avoidance, and males were more likely to be classified as secure (as previously found in a younger at-risk for LD sample; Al-Yagon, 2003). An interesting correlation was also noted between

It is not clear what the explanation for this discrepancy in findings may be. However, participants in the studies by Al-Yagon and Mikulincer had all been referred to specialist services for assessment because of difficulties with reading, writing, or mathematics, and it is known that children with behavioural symptoms *and* RD (rather than RD alone) are more likely to be referred for specialist assessment (see Arnold, et al., 2005; Lerner, 2000). This may partially explain the different results obtained, as the current study used a school-based, non-referred sample. Also, Al-Yagon and Mikulincer had a more heterogenous sample, including with children with a variety of LD, whereas participants in the current study all had RD. It is also possible that Al-Yagon and Mikulincer's findings were not replicated simply due to a lack of power in the current study (the sample here: N = 42 vs. Al-Yagon and Mikulincer's sample: N = 196). Furthermore, reliabilities obtained for the CASCQ in the current study were quite low (α = .38 to .59) which would have attenuated the results obtained.

Theory of Mind as a Predictor of Psychosocial Problems

While the hypothesised moderating influence of theory of mind skills was not supported, a relationship between theory of mind abilities and psychosocial problems was found across both groups, replicating previous findings. That is, children (both TA and with RD) with lower theory of mind competence were more likely to have psychosocial problems than children with higher theory of mind competence. This link between theory of mind abilities and psychosocial problems was not a function of gender or IQ, as these were statistically controlled for during the analyses.

This finding is consistent with previous studies (e.g., Bartsch & Estes, 1996; Capage & Watson, 2001; Fahie & Symons, 2003) and extends these to a sample of children with RD, using a relatively new (and developmentally appropriate) measure requiring the

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attachment and maternal marital status, with a secure classification correlating significantly with married/partner status ($r = .40$, $p < .01$).

identification of *faux pas* made in a range of social situations (Faux Pas Stories; Baron-Cohen, et al., 1999; Stone, et al., 1998).

It is not immediately clear why theory of mind abilities would affect participants in both reading groups (TA and RD) equally, rather than constituting a protective factor for the children with RD. However, it is plausible that whereas some factors (such as emotion understanding) can be compensated for through language and/or academic skills, theory of mind skills cannot because they are inextricably linked to language skills (see Bartsch & Estes, 1996; Hughes & Leekam, 2004), and thus are associated with psychosocial outcomes for both reading groups (TA and RD). In support of this suggestion, language skills (and access to conversation) have consistently been shown to correlate strongly with theory of mind abilities (see Harris et al., 2005). Recent studies have also emphasised the roles of emotion and empathy in moral development and behaviour (see Dolan & Fullam, 2004).

Although reading group (TA and RD) differences for theory of mind were not significant, the relationship was in the expected direction (r = -.27, *ns*.), and there was some evidence for a partial mediation model (i.e. a causal pathway from RD to theory of mind and from theory of mind to psychosocial problems). Further investigation is warranted in this regard, particularly given the small sample size in the current study.

Recent studies in which the Faux Pas Stories measure was used (e.g., Baron-Cohen, et al., 1999) have included an additional empathy question (i.e., how the speaker and the recipient would feel after the *faux pas* has been made) and group differences have been found (for participants with antisocial personality disorders, and autism) in these responses even when no differences on identification and understanding of the *faux pas* have been found (e.g., Dolan & Fullam, 2004). Thus, it is possible that differences between the RD and TA groups may have emerged, had an empathy question been included in the current study. In contrast with previous research (e.g., Baron-Cohen, et al., 1999), no gender

differences were found for performance on theory of mind tasks in the current study. Again, this may have been due to power issues, and requires further clarification.

Theory of mind competencies may be conceptualised both from a socio-cognitive perspective (i.e., the general ability to make cognitive inferences about other's mental states); and from a socio-perceptual perspective (i.e., the ability to make rapid online judgements about mental states), with both competencies being necessary for successful social functioning. One possible explanation for the current findings is that children with RD may, in fact, differ from TA children with regard to theory of mind competencies, but in a more fine-grained way. That is, children with RD may demonstrate theory of mind deficits but only with regard to the socio-perceptual aspects of theory of mind rather than the socio-cognitive aspects of theory of mind. Thus, it may be valuable for future studies to examine theory of mind competencies in terms of the speed and accuracy of *online* judgements in an experimental situation (see Flavell, 2000; Hughes & Leekam, 2004).

In relation to the above points, discrepancies between theory of mind task performance in research settings, and in everyday social interactions, have been found in both older children and adults, with individuals performing well on hypothetical tasks, but poorly in everyday situations requiring similar inferences. For example, in a study by Happé and Frith (1996), children with conduct disorder who passed a theory of mind task (false-belief) were nevertheless rated more poorly on everyday theory of mind items, a finding which questions their ability to make accurate on-line inferences about their own and others' mental states. An interesting question deserving more research is the extent to which children with RD demonstrate accuracy in terms of standard theory of mind tasks, but lack the speed and automaticity required for *in vivo* social interactions (consistent with other known speed of processing deficits present in RD; e.g., Rucklidge & Tannock, 2002; Wolf & Bowers, 2000).

It is also possible that theory of mind skills are developed through the act of reading itself (as a proxy for actual experiences) when readers take the perspective of story characters as events unfold. The likelihood of a link between (fictional) story reading and theory of mind (perspective taking) is apparent when the degree of plot dependence on misunderstandings and misinterpretations of others' thoughts, feelings, and beliefs is considered. Along these lines, one previous study has looked at the relationship between folk-tales containing deception and theory of mind skills in preschoolers, in terms of the parent-child conversations engendered during the shared reading of such stories, and concerning the thoughts and beliefs of the story characters (Ratner & Oliver, 1998). Theory of mind skills were also linked to reading comprehension (but not overall reading ability) in a study by Gardner and Smith (1987). This link was particularly strong for questions requiring responses based on information implied in the text (but not explicitly stated), that required taking the perspective of the characters.

Thus, it is plausible that children with RD experience decreased opportunities for developing higher-order theory of mind skills through reading, an interesting possibility for future research. Overall, further studies are needed to clarify the precise nature of the relationships between emotion understanding, theory of mind, and psychosocial problems in children with RD (see Harris, et al., 2005; Hughes et al., 1998; Hughes & Leekam, 2004).

Attributions do not Appear to Moderate the Link between RD and Psychosocial Problems

Contrary to predictions, neither more stable social attributions for negative outcomes, nor the absence of a self-serving bias moderated the link between RD and psychosocial problems. However, these results may have been attenuated by the relatively low reliability

coefficient obtained for the locus of control subscale of the social attribution measure (α = .32), and the low sample size in the current study. Further investigation may be warranted, perhaps with some adaptations to the measure so that actual causal attributions generated by individuals can be recorded and included in analyses. This would also reduce the memory-loading inherent in the task, which may have affected the results obtained in the current study.

A further possible explanation for the lack of support for this hypothesis may reside in the specific psychosocial problems measured in the current study (i.e., hyperactivity, conduct symptoms, peer problems, and emotional symptoms). Prior studies have found links between attribution styles and psychosocial outcomes such as loneliness, depression, anxiety, and low self-esteem (see Dalley, Bolocofsky, Alcorn, & Baker, 1992; Margalit & Al-Yagon, 2002; Toner & Heaven, 2005), which were not measured in the current study.

Negative Emotions and Self-Serving Bias as Predictors of Pro-social Behaviour

Also contrary to expectations, the presence of RD were not related to lower levels of pro-social behaviour. This indicates that children with RD behave just as pro-socially as their TA peers, despite demonstrating generally higher levels of psychosocial problems. Notably, few studies (if any) have investigated pro-social behaviour (as opposed to the absence of psychosocial problems) in children with RD. One simple explanation for this finding is that the reciprocal causal model of RD and psychosocial problems exists independently of children's pro-social abilities, and that these are not affected by the presence of RD.

Peer-social attributions were related to pro-social behaviour across both groups, such that stability and globality attributions for positive social events and higher levels of self-serving bias (i.e., positive events attributed to internal causes and negative events attributed to external causes), were both linked with *lower* levels of pro-social behaviour. A plausible explanation for these findings may be that by attributing less stability and globality to

positive outcomes for social events, individuals take a more proactive role in their efforts to initiate and maintain pro-social interactions, whereas if attributions for positive outcomes are more stable and global, individuals may develop the (mistaken) expectation that things will always turn out well with no action necessary on their part. Likewise, the presence of a self-serving bias may be adaptive from a coping standpoint, but may lead to lower levels of pro-social behaviour through the individual believing that negative outcomes are always out of their control.

Strengths and Limitations

The main limitation of the current study was the small sample size. This inevitably led to power issues for some variables, where results were in the predicted direction but did not attain statistical significance (e.g., secure attachment). However, the fact that significant results were obtained for the moderating analyses, as described above, even with a small sample, was encouraging since moderating analyses using continuous variables are known to be conservative.

A further limitation of the current study is that it uses cross-sectional data, and is of a correlational design, meaning that causality of the moderating effects obtained cannot be determined with certainty. For example, it could be that emotion understanding moderates the link between RD and psychosocial problems (as described), or equally that RD moderate the link between emotion understanding and psychosocial problems. However, longitudinal studies would be useful in dealing with these questions.

Low internal reliabilities were obtained for some of the measures used in the current study (especially the newer attachment and social attributions measures). This limitation almost certainly attenuated the results, and it may be that these variables play a more important role in the relationship between RD and psyschosocial problems than has been demonstrated here. Other than the low sample size, possible reasons include that measures

were applied cross-culturally (i.e., in NZ) and were relatively new in some cases (as in the social attribution measure and the theory of mind measure).

It is likely that other variables not measured in the current study, such as personality traits and parenting style, may also influence the relationship between RD and psychosocial problems and these too need to be addressed from a risk and protection framework in future studies.

Calls have been made for the narrowing of research parameters, due to the heterogenous nature of both LD and of differences in the measures of psychosocial adjustment employed across studies (see Hinshaw, 1992). The design of the current study took this into consideration by selecting only participants with RD. In addition, individuals with ADHD were excluded in order to control for associated attention and hyperactivity problems (see Greenham, 1999). The use of a non-referred sample in the current study also increases the generalisability of the findings to the population of children with RD. However, the DSM-IV-TR (APA, 2000) discrepancy method for identifying *reading disorder* was not used, and this limits the generalisability of the findings to children identified as having a *reading disorder* based on the DSM-IV-TR criteria.

The current study also took other methodological concerns into consideration. For example, much of the prior research in RD has used mainly male participants, and several researchers have called for this gender imbalance to be redressed so that possible links between gender, RD, and psychosocial outcomes can be investigated (e.g., Morrison & Cosden, 1997; Tur-Kaspa, 2002). The sample in the current study comprised equal numbers of male and female participants (and no gender effects were found). Measures were also selected in order to match the developmental level of the participants, and care was taken to ensure that only minimal reading was involved so that participants with RD were not disadvantaged in any way (see Hinshaw, 1992). In addition, multiple aspects of SIP were assessed in a single study as recommended by Tur-Kaspa (2002).

A further methodological strength of the current study was that data were obtained from both parents and teachers for the dependent variable, behavioural symptoms. The importance of using multiple sources for ratings of psychosocial problems was demonstrated by Pisecco, Baker, Silva, and Brooke (1996) who investigated hyperactivity and antisocial behaviours in children with RD and ADHD. Using parent and teacher ratings, they were able to ascertain differences in the groups in the levels of behavioural symptoms displayed across both home and school settings.[39] Several measures in the current study were based on self-report by children (emotion experience, attachment, and social attributions) and these data may not be as objective (or accurate) as direct observations. Notwithstanding this limitation, the use of parent and teacher ratings of psychosocial problems (and pro-social behaviour) and the high degree of agreement between these ratings increases confidence in their validity.

A final feature of the current study is that identification of RD was based on a multifactor model (Pereira-Laird, et al., 1999), which should have reduced the likelihood of obtaining both false positive and false negative RD classifications of participants.

Implications

Interventions

Although more than 200 social-skills interventions have been designed for children with RD, very few are research-based or have had their effectiveness objectively demonstrated (see Bryan,2005; Elksnin & Elksnin, 2004; Keogh, 2005; Nowicki, 2003; Williams &

[39] Results of the study by Pisecco and colleagues indicated that only children with co-morbid RD/ADHD displayed more hyperactive behaviour in the home. However, at school, children from all three groups (RD, ADHD, and RD/ADHD) displayed more hyperactivity and antisocial behaviours.

McGee, 1996). For example, a recent review of social skills interventions for children with LD concluded that these were of little benefit on the whole, either statistically or clinically (Kavale & Mostert, 2004). This is consistent with an earlier meta-analysis of social skills interventions, where a mean effect size of .19 was found, equivalent to an improvement of only 8 percentile ranks (Kavale, Mathur, Forness, Rutherford, & Quinn, 1997).

Recently, the important role of emotion regulation and aspects of social cognition (such as theory of mind and social attributions) in interventions for children with RD have been noted (e.g., Deater-Deckard, 2001), and belief/attribution targeted interventions have been shown to have positive effects on social competence (Dweck & London, 2004). However, findings with regard to such interventions are mixed, with interventions targeting positive affect and attributions also shown to be beneficial academically but not socially (Bryan, 2005), and some academic interventions also having positive effects on classroom behaviour (see Fleming et al., 2004; Wehby, et al., 2003).

It is encouraging to note that each of the SIP factors identified in the current study are potentially amenable to change, given appropriate intervention. For example, several interventions have been shown to successfully improve children's emotion understanding (e.g., Grinspan, Hemphill, and Nowicki, 2003; Pons, Harris, & Doudin, 2002), and a recent study found an emotion-based intervention was more beneficial than a cognitive-based intervention for children with LD in terms of beneficial effects on behaviour problems, self-efficacy, and social skills (Schechtman, & Pastor, 2005).

In addition to the amenability of emotion understanding to positive change, results of the current study indicate that interventions which are targeted at increasing levels of positive affect, improving theory of mind abilities, and developing secure attachment styles, may also be beneficial for some children with RD. Overall, there is a need for research-based social interventions, "to help all children acquire the personal and

interpersonal skills they need to maximise their self-efficacy and academic achievement" (Bryan, 2005, p.121).

Future Research

Findings from the current study emphasise the need for further research into variables that serve a protective function for children with RD, in terms of their at-risk status for adverse psychosocial outcomes. Increasing our understanding of individual differences among children with RD, and identifying further protective factors, will facilitate the development of more effective psychosocial interventions, and allow them to be targeted according to individual needs (Morrison & Cosden, 1999; Semrud-Clikeman, 2005). Specifically, the development of secure attachment styles with regard to relationships with peers and teachers requires further investigation. Clarification of the role of speed of information processing with regard to SIP would also be valuable, as deficits in this area are known to be associated with reading difficulties (i.e., rapid-naming speed deficits), and may also contribute to SIP deficits (e.g., in the area of emotion understanding).

Future research should include prospective longitudinal studies, to further clarify the reciprocal causal effects of RD and psychosocial problems. For example, on the basis of the findings in the current study, the presence of protective factors (such as emotion understanding) in children with RD should be reflected in better long-term reading outcomes for these children, in comparison to children with RD who demonstrate lower levels of competency in these protective domains.

Conclusion

The main contribution of the current study lies in showing that children with RD who are better able to understand emotions, are happier, more secure, and have relatively good theory of mind skills, are just as likely as their TA peers to have good psychosocial outcomes, although children with RD are generally at higher risk for psychosocial

problems. The current study was methodologically sound and has identified some potentially important moderating factors which could be included in future psychosocial interventions for children with RD.

Although a strength of the current study is that a non-referred sample was used (increasing generalisability of the findings), many participants nevertheless demonstrated relatively high levels of psychosocial problems (with 29% in the abnormal range of the SDQ), and thus would be likely to benefit from access to early psychosocial, as well as academic, interventions. Given that in NZ, where the RD classification is not officially recognised, it is imperative that appropriate psychosocial interventions for at-risk children, such as those with RD, are available. It is arguably just as important to address these (potential) psychosocial problems as it is to address the academic deficits, particularly since the psychosocial correlates of RD tend to be long-standing and may contribute to further, more serious, problems in adolescence.

The findings of the current study are encouraging, given that the protective factors identified are all potentially amenable to change. There is evidence that emotion understanding, positive affect, and theory of mind skills, may all benefit from appropriate interventions, and secure attachment styles (with peers and teachers) can be facilitated in the classroom.

Recent studies have focused on various individual differences in children with RD (e.g., Teglasi, Cohn, & Meshbesher, 2004) and on determining factors that facilitate successful coping with both the academic and emotional implications of reading disorders. Future research will lead to a better understanding of the complex interactions between SIP factors and RD, and a better understanding of the reasons why academic difficulties are so often accompanied by social difficulties in children with RD (Elias, 2004). Results from the current study, and other research using a risk and protective framework, are beginning to paint a more hopeful picture, in which protective factors (such as emotion

understanding, and theory of mind abilities) can reduce the risk of children with RD developing psychosocial problems. Perhaps most importantly, such research suggests some specific ways in which targeted psychosocial interventions might interrupt the on-going cycle between reading disorders and psychosocial problems, that often seems to develop in spite of determined efforts by parents and teachers to intervene.

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Appendices

Appendix A

NJCLD definition of learning disabilities

Learning disabilities is a general term that refers to a heterogenous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur

across the lifespan. Problems in self-regulatory behavior, social perception, and social interactions may exist with learning disabilities but do not by themselves constitute a learning disability. Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences (NJCLD, 2001, p.31).

Appendix B

Background information form

Background Information _____ _____

The information you provide is confidential and will only be used for research purposes.
If you would prefer to fill this form out verbally, or if you have any questions, please contact Kim Nathan on 3642987 ex. 7990.

1. Child's name: _____

2. Child's date of birth: _____

3. Your name: _____
   (mother or main caregiver)

4. Your contact telephone number and/or email address:

   _____

5. Your relationship to child: _____
   (e.g. mother)

6. Which ethnic group/groups do you belong to?
   (you can tick more than one)
   NZ European ☐
   NZ Māori ☐
   Pacific Island ☐
   Chinese ☐
   Indian ☐
   Other (please specify): _____

7. Which ethnic group/groups does your child belong to?
   (you can tick more than one)
   NZ European ☐
   NZ Māori ☐
   Pacific Island ☐
   Chinese ☐
   Indian ☐
   Other (please specify): _____

8. What is your **highest** educational qualification? *(please tick)*
   Did not complete Year 11 (Form 5) ☐
   Completed Year 11 (Form 5), with fewer than 3 School Certificate subjects ☐
   Completed Year 11 (Form 5) with School Certificate in 3 or more subjects ☐
   Sixth Form Certificate and/or University Entrance ☐
   Diploma or trade qualification ☐
   University Degree ☐
   Other qualification _____ ☐

8a. How old are you? _____

9. Are you: Single ☐ Married / have partner ☐

10. Do you: Receive a benefit ☐ Work part time ☐ Work full time ☐

    What is your occupation: _____

11. Please list your children by age and gender:

	boy	girl	age
1.			
2.			
3.			

12. Has your child ever been seen by any social agency, psychologist, psychiatrist, therapist, etc ?

yes ☐ no ☐

If yes, please give details: _____

_____

_____

13. How old was your child when he / she first **walked**?
(if you are not sure please note whether your child walked early, on time, or late)

_____

14. How old was your child when he / she first **talked** in short sentences?
(if you are not sure please note whether your child talked early, on time, or late)

_____

15. Was your child born:

on time ☐ early ☐ late ☐ don't know ☐

16. Were there any problems (such as high blood pressure, illness, or infections) during pregnancy?

yes ☐ no ☐ don't know ☐

If yes, please give details: _____

17. Did your child have any problems / difficulties during birth or in the first few days after birth?

yes ☐ no ☐

If yes, please give details: _____

_____

18. Has your child ever had a head injury causing loss of consciousness?

yes ☐ no ☐

If yes, please give details: _____

19. Does your child have a history of ear infections?

yes ☐ no ☐

If yes, please give details: _____

20. Does your child have any of the following:
(please tick)

asthma	yes ☐	no ☐
allergies (eg. hay fever)	yes ☐	no ☐
epilepsy (seizures)	yes ☐	no ☐
diabetes	yes ☐	no ☐
ADD or ADHD	yes ☐	no ☐
autism / Aspergers / ASD	yes ☐	no ☐
specific learning disability	yes ☐	no ☐

developmental disability (eg. Downs syndrome, cerebral palsy) yes ☐ no ☐

any other medical or psychological conditions _____

21. Is your child on any long term medication ? yes ☐ no ☐

If yes, please give details: _____

22. Does your child have any problems with vision and/or hearing? yes ☐ no ☐

If yes, please give details (e.g wears glasses, uses hearing aid etc)

_____

You have finished - thank you.

Appendix C

PAT scores, decile rankings, teacher characteristics, and number of participants per school

School	PAT scores available	Decile Ranking	Male teachers	Female teachers	Total no. of teachers	No. of participants nominated (RD)	No. of participants nominated (NA)	Total no. of participants[40]
A	Yes	7	1	1	2	5	9	14 (0)
B	No	3	0	2	2	4	5	9 (3)
C	Yes	3	0	2	2	4	4	8 (2)
D	No	10	2	2	4	2	2	11 (4)
E	No	5	0	2	2	2	2	3 (1)
F	No	8	0	2	2	4	4	8 (1)

Appendix D1

Faux Pas Stories and Sample Questions

[40] with number of exclusions noted in parentheses

Story 1:
Jack was in one of the toilet cubicles at school. Joe and Peter were at the sinks nearby. Joe said, "Doesn't that new boy in our class, Jack, look really weird!". Then Jack came out of the toilet. Peter said, " Oh, hi Jack. Are you going back to class?"

Story 2:
Sarah's favourite uncle was coming over for tea, and Sarah helped her Mum make a mince pie for him. When he arrived, she brought the pie out and said, " I made this specially for you." "Yum" replied her uncle, " that looks delicious. I love pies, all except mince pies that is".

Story 3:
James gave his friend Aaron a book about aeroplanes for his birthday. A few weeks later they were looking at the book together and James accidentally ripped
a page. "Don't worry," said Aaron, " I never liked this book much anyway. Someone gave it to me for my birthday."

Story 4:
Sally has short hair. One day she is at her Aunty Jenny's house watching tv. Then her auntie's neighbour, Mrs. Dowson, comes over. She says "Hello" to Aunty Jenny. Then she looks at Sally and says, "I don't think I've met this little boy before. What's his name?" Aunty Jenny says, "Does anyone want a biscuit?".

Story 5:
Mrs. West is a teacher. One morning she tells her class that one of the boys, Simon is very sick in hospital. The class are all feeling very sad and are stiing quietly doing their work. Then one of the girls, Rebecca, comes in late. "Hey, have you heard my joke about the boy in hospital?" she asks. The teacher says, "Sit down and get on with your work".

Story 6:
Emma had just had her bedroom redecorated. She went shopping and her mother let her choose some new cushions for her room. The next day, her best friend Caitlin came round and said, " ooh, those cushions are horrible. Are your going to get some new ones?" Emma asked, "do you like the rest of my bedroom?".

Story 7:
Rachel's Mum was planning a surprise party for Rachel's birthday. She invited Nicky and said, "Don't tell anyone, especially Rachel!". The day before the party, Rachel and Nicky were playing on their bikes. Nicky fell off and got grass stains on her new jeans. "Oh no" she said, " I was going to wear these to your party". "What party?" said Rachel. "Come on" said Nicky, " let's go and see if my mum can get these stains out.

Faux Pas Stories - sample questions:

1. Determination question: *Did anyone say something they shouldn't have* ?

2. Identification question: *What was it* ?

3. Comprehension question, specific to story, e.g., *what kind of pie had Sarah made* ?

4. Theory of mind question, specific to story, e.g. , *did her uncle know it was a mince pie?*

Scoring: Each story was scored 1 if all four questions were answered correctly, and 0 if any were answered incorrectly.

Appendix D2

How I Feel Scale (HIF)

How I Feel _____

Please read each sentence and decide how true it has been for you in the past three months. Put a circle around the number that matches your answer.

		not true at all	not very true	sort of true	true	very true
1	I was happy very often.	1	2	3	4	5
2	When I felt sad, my sad feelings were very strong.	1	2	3	4	5
3	I was in control of how often I felt angry.	1	2	3	4	5
4	I was excited almost all the time.	1	2	3	4	5
5	When I felt scared, my scared feelings were very powerful.	1	2	3	4	5
6	When I felt happy, I could control or change how happy I felt.	1	2	3	4	5
7	I was sad very often.	1	2	3	4	5
8	When I felt angry, my angry feelings were very strong.	1	2	3	4	5
9	I was in control of how often I felt excited.	1	2	3	4	5
10	I was scared almost all the time.	1	2	3	4	5
11	When I felt happy, my happy feelings were very powerful.	1	2	3	4	5
12	When I felt sad, I could control or change how sad I felt.	1	2	3	4	5
13	I was angry very often.	1	2	3	4	5
14	When I felt excited, my excited feelings were very strong.	1	2	3	4	5
		not true at all	not very true	sort of true	true	very true

15	I was in control of how often I felt scared.	1	2	3	4	5
16	I was happy almost all the time.	1	2	3	4	5
17	When I felt sad, my sad feelings were very powerful.	1	2	3	4	5
18	When I felt angry, I could control or change how angry I felt.	1	2	3	4	5
19	I was excited very often.	1	2	3	4	5
20	When I felt scared, my scared feelings were very strong.	1	2	3	4	5
21	I was in control of how often I felt happy.	1	2	3	4	5
22	I was sad almost all the time.	1	2	3	4	5
23	When I felt angry, my angry feelings were very powerful.	1	2	3	4	5
24	When I felt excited, I could control or change how excited I felt.	1	2	3	4	5
25	I was scared very often.	1	2	3	4	5
26	When I felt happy, my happy feelings were very strong.	1	2	3	4	5
27	I was in control of how often I felt sad.	1	2	3	4	5
28	I was angry almost all the time.	1	2	3	4	5
29	When I felt excited, my excited feelings were very powerful.	1	2	3	4	5
30	When I felt scared, I could control or change how scared I felt.	1	2	3	4	5

YOU HAVE FINISHED - THANK YOU ! ☺

Child Attachment Style Classification Questionnaire (CASCQ)

CASCQ _____

Please listen to each sentence and decide how true it is for you. There are no right or wrong answers. Listen carefully, then circle the answer you choose.

		almost always not true	mostly not true	sometimes true, sometimes not true	mostly true	almost always true
1	I make friends with other children easily.	1	2	3	4	5
2	I don't feel comfortable trying to make friends.	1	2	3	4	5

3	It's easy for me to depend on others, if they're good friends of mine.	1	2	3	4	5
4	Sometimes others get too friendly and close to me.	1	2	3	4	5
5	Sometimes I'm afraid that other kids won't want to be with me.	1	2	3	4	5
6	I'd like to be really close to some children and always be with them.	1	2	3	4	5
7	It's alright with me if good friends trust and depend on me.	1	2	3	4	5
8	It's hard for me to trust others completely.	1	2	3	4	5
9	I sometimes feel that others don't want to be good friends with me as much as I do with them.	1	2	3	4	5
10	I usually believe that others who are close to me will not leave me.	1	2	3	4	5

Please turn the page….

		almost always not true	mostly not true	sometimes true, sometimes not true	mostly true	almost always true
11	I'm sometimes afraid that no one really loves me.	1	2	3	4	5
12	I find it uncomfortable and get annoyed when someone tries to get too close to me.	1	2	3	4	5
13	It's hard for me to really trust others, even if they're good friends of mine.	1	2	3	4	5
14	Children sometimes avoid me when I want to get					

	close and be a good friend of theirs.	1	2	3	4	5
15	Usually when anyone tries to get too close to me it doesn't bother me.	1	2	3	4	5

YOU HAVE FINISHED - THANK YOU !
☺

Appendix D4

Peer-Social Attribution Scale (PASS-1)

Scenarios read aloud to participants:

A. Some girls/boys you don't know are playing an interesting game. You would like to play, and when you try to join in, they let you.

B. A girl/boy from your class is sitting by herself/himself and crying. You feel sorry for her/him and ask her/him what's wrong, but she/he tells you to go away.

C. Pretend you move to a new house and meet a girl/boy your age who lives next door. She/he seems to like you and you soon become friends.

D. Your parents allow you to ask a friend to come and stay in the weekend. But when you ask your friend, she/he says she/he doesn't want to.

E. Your parents allow you to ask a friend to go out with you and your family to the movies. When you ask your friend, she/he says that she/he will come.

F. Pretend you go to a new school and don't know anyone. After three weeks you haven't made any friends and the other kids are not being very nice to you.

G. You join a sports team that plays on the weekend. Even though you don't know anyone you soon make friends and get on well with all the other team members.

H. Pretend you meet a new girl/boy that comes to your school. You are friendly to her/him but she/he is not friendly back.

I. A girl/boy from your class is having a birthday party. She/he is not one of your friends so you didn't expect to be invited, but you get an invitation.

J. While running across the playground you trip over and hurt yourself. Some girls/boys from your class start laughing at you.

PASS-1 response sheets:

PASS

Think of the reason this happened. Would it probably be because of something about you, or because of other reasons ?

All because of other reasons	Mostly because of other reasons	Partly because of something about me and partly because of other reasons	Mostly because of something about me	All because of something about me

A	1	2	3	4	5
B	1	2	3	4	5
C	1	2	3	4	5
D	1	2	3	4	5
E	1	2	3	4	5
F	1	2	3	4	5
G	1	2	3	4	5
H	1	2	3	4	5
I	1	2	3	4	5
J	1	2	3	4	5

How long would this reason affect you ?

	Just that day	A few days	A week or so	The rest of the term	All year, permanently
A	1	2	3	4	5
B	1	2	3	4	5
C	1	2	3	4	5

D	1	2	3	4	5
E	1	2	3	4	5
F	1	2	3	4	5
G	1	2	3	4	5
H	1	2	3	4	5
I	1	2	3	4	5
J	1	2	3	4	5

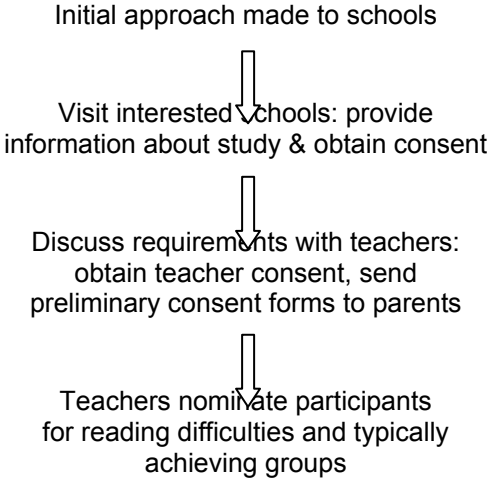
How much do you think this reason would affect other things you do?

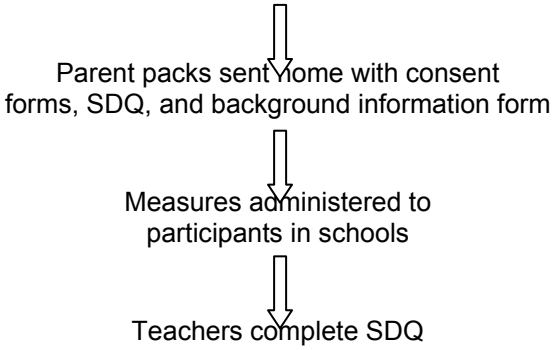
	1 It wouldn't affect anything else I do.	**2** It would affect some things I do	**3** It would affect lots of things I do	**4** It would affect most things I do	**5** It would affect everything I do
A	1	2	3	4	5
B	1	2	3	4	5

C	1	2	3	4	5
D	1	2	3	4	5
E	1	2	3	4	5
F	1	2	3	4	5
G	1	2	3	4	5
H	1	2	3	4	5
I	1	2	3	4	5
J	1	2	3	4	5

Appendix E1

Data Collection Procedure





Appendix E2

School Letter, Information Sheet, & Consent Form

The Principal

Attn:

Dear,

I am a Masters student (Psychology) at the University of Canterbury, and am writing to ask whether your school might be willing to participate in a research project involving children with and without learning (particularly reading) difficulties.

The rationale behind this study is that although academic remediation programmes are often very effective for children with reading difficulties (RD), social skills intervention programmes are known to be considerably less so. Many children with reading difficulties have relatively poor social skills and exhibit socially inappropriate behaviours. However, a subset of these children (about 25%) have no social difficulties at all. What I am hoping to do is to identify some of the factors that determine the social adjustment of this group of children.

A number of possible areas have been identified (based on prior research) and the project looks at the following aspects of emotion understanding and peer relationships:

- how well children with RD understand emotions expressed through facial expressions and tone of voice (in comparison with their non-RD peers)
- differences between children with RD and their non-RD peers regarding their reasoning for the way social interactions turn out.

- differences in understanding what others know and believe, in children with and without RD.
- differences in relationship styles (with peers) between children with and without RD.
- differences in how children with and without RD experience their own emotions.

It is my hope that the results of this research will have implications for designing more effective social skills interventions for children, as well as increase our understanding of the social difficulties faced by many children with RD.

To carry out this research I need access to children with and without RD in Years 5 and 6. Having taught in classroom situations myself, I understand that teachers face many demands on their time. With this in mind, I have limited teacher involvement to identifying children in their class with and without reading difficulties, and filling out a very brief questionnaire (5-10 minutes), with the main research component being children completing a set of tasks for me. However, I am keen to have input from teachers, as their perspective of children's social skills and behaviour adds a valuable dimension to the research.

An information sheet is attached, setting out what would be involved for children, parents, and teachers who agree to participate in the study. All information gathered during the research will remain confidential, and the project has been approved by the University of Canterbury Human Ethics Committee.

Please feel free to contact me (or my supervisor, Dr. Julia Rucklidge) if you would like more information. I am also happy to meet with you to discuss this further at your convenience. Thank you for your time - your school's participation in this research will be greatly appreciated.

Yours sincerely,

Kim Nathan (BA Hons., Dip. STN)
Tel: 03 3642987 ex. 7990
Mobile: 021 1094523
Email: kmn27@student.canterbury.ac.nz
Fax: 03 3642181

Dr. Julia Rucklidge PhD.
Senior Lecturer & Clinical Psychologist
Department of Psychology
Tel: 03 3642987 ex. 7959
Email: julia.rucklidge@canterbury.ac.nz

Information Sheet

Research Project: Affective Competence in Children with Reading Difficulties

All information provided by children, parents/caregivers, and teachers will be kept strictly confidential. At the conclusion of the study, a summary of the results will be sent to all school principals, and parents who have indicated that they would like to receive this on the consent form.

Children

It is expected that children will find most of the tasks interesting and fun to complete. Two sessions will be required (a maximum of one hour each) with questionnaires being completed in small groups of 3-4 children at a time, and other tasks individually. To minimise the need for reading, questions will be read out and children will then circle their chosen answers on the questionnaire response sheets.

Session One:

- a brief questionnaire regarding relationships with peers
- a brief questionnaire regarding how children experience emotions
- listening to a set of short story scenarios and determining what someone knew or believed in the situation.
- a brief assessment of reading abilities

Session Two:

- a brief assessment of vocabulary and puzzle-solving skills
- a brief questionnaire about the possible reasons for outcomes of given social situations
- a computer-based task involving identifying emotions expressed via facial expression and tone of voice.

All children who participate in the study will receive a certificate and will go into a prize draw (for a $50 Borders voucher), with the winner being announced at the conclusion of the study.

Parents

Mothers (or primary caregivers) of children who participate in the study will be asked to complete two tasks, each of which will take approximately 10 minutes to complete:

- a brief questionnaire about their child's strengths and difficulties (SDQ)
- a background information form

Parents who participate in the study will go into a prize draw (for a $70 Westfield voucher), with the winner being announced at the conclusion of the study.

Teachers (Years 5 & 6)
Teachers will be asked to identify children with and without reading disabilities in their class. They will also complete a strengths and difficulties questionnaire for each participating child, which will take a maximum of 10 minutes per child.
Teachers will each receive a $10 petrol voucher.

Research Project: Affective Competence in Children with Reading Disabilities

Consent Form (school)

Researcher: Kim Nathan

Contact Address: Psychology Dept., University of Canterbury (Tel: 3642987, ex. 7990).

Email: kmn27@student.canterbury.ac.nz

Date: _____

We have read and understood the letter and information sheet regarding the above research project. We give our consent for staff and students of our school to participate in the study, subject to their consent (and the consent of parents), on the understanding that all information collected will remain confidential, including the identity of our school. We also consent to publication of the results of the study on the understanding that anonymity will be preserved at all times.

Name of School: _____
(please print)

School Address: _____
(please print)

Name of Principal: _____
(please print)

Signature of Principal: _____

Name of Chairman of Board of Trustees: _____
(please print)

Signature of Chairman of Board of Trustees: _____

We would like to receive a summary of the results of the study when available.

Yes / No

Research Project: Affective Competence in Children with Reading Disabilities

Consent Form (teachers)

Researcher: Kim Nathan

Contact: Psychology Dept., University of Canterbury (Tel: 364 2987 ex. 7990).

Date: _____

I have read and understood the letter and information sheet regarding the above research project.

I agree to participate in the project, and consent to publication of the results of the project, with the understanding that confidentiality will be preserved at all times.

I also understand that I may withdraw from the study at any time, including withdrawal of the information I have provided.

Teacher's Name: _____
(please print)

Teacher's Signature: _____

School: _____

I would like to receive a summary of the results of the study.

Yes / No

(please fax completed form to: **Kim Nathan, Psychology Dept. , University of Canterbury, 3642181**. Thank you)

Appendix E3

Parent Letter, Information Sheet, & Consent Form

Dear Parents,

I am a Masters student in psychology at the University of Canterbury, and am carrying out a research project about children's understanding of emotions in your child's school. It is my hope that the results of this research will help us to design more effective social skills interventions for children, particularly those with reading difficulties.

There will be two groups of children taking part in the study, a group with reading difficulties, and a comparison group who do not have reading difficulties. Your child has been chosen either because he/she has been identified as having a reading difficulty or because he/she will be in the comparison group.

The research looks at the following aspects of emotion understanding and peer relationships:

- How well children with and without reading difficulties understand emotions expressed through facial expressions and tone of voice
- Differences between children with and without reading difficulties in their reasoning as to the way social interactions turn out.
- Differences in understanding what other people know and believe in children with and without reading difficulties.
- Differences in relationship styles (with peers) between children with and without reading difficulties.
- Whether the ways in which children with and without reading difficulties experience emotions differ.

The attached information sheet sets out what will be involved for children, parents, and teachers who agree to participate in the study. All information provided during the study will be kept *confidential* and will be securely stored at all times. Please read the information sheet, and then go over the child's information sheet with your child. If you agree to participate please sign the attached consent form.

Please feel free to contact me (or my supervisor, Dr. Julia Rucklidge) if you would like any further information. Your participation in this research will be greatly appreciated.

Thank you.

Yours sincerely,

Kim Nathan
Tel: 03 3642987 ex. 7990
Mobile: 021 1094523
Email: kmn27@student.canterbury.ac.nz

Dr. Julia Rucklidge PhD, CPsych
Senior Lecturer & Clinical Psychologist
Department of Psychology
Tel: 03 3642987 ex. 7959
Email: julia.rucklidge@canterbury.ac.nz

Information Sheet

Research Project: Affective Competence in Children

I am a postgraduate psychology student carrying out research at your child's school. If you are willing to allow your child to participate please sign the attached consent form and return it to school in the envelope provided, along with the questionnaire and background form. Your support will be much appreciated.

All information provided by children, parents, and teachers is kept strictly confidential. At the conclusion of the study, a summary of the results will be sent to parents who have indicated that they wish to receive this on the consent form.

Children

Children will complete a set of tasks with me (ranging from 5 to 20 minutes each), with questionnaires being completed in small groups of 3-4, and other tasks individually.

- a brief questionnaire regarding relationships with peers
- a brief questionnaire regarding experiencing feelings and emotions
- listening to a set of short stories and answering questions about the characters
- a brief assessment of reading skills
- a brief assessment of vocabulary and puzzle-solving skills
- a brief questionnaire about social situations
- a computer-based task involving identifying emotions

In recognition of their contribution to this research, all children will receive a certificate and go into a prize draw for a $50 Borders voucher, with the winner being announced at the conclusion of the study.

Parents

Mothers (or primary caregivers) of children who participate in the study need to complete:

- the strengths and difficulties questionnaire (see attached)
- and, a background information form (see attached)

Together, these will take approximately 10 minutes to complete.

In recognition of their contribution to this research, parents will go into a prize draw for a $70 Westfield voucher, with the winner being announced at the conclusion of the study.

(**Teachers** also complete the strengths and difficulties questionnaire for each participating child in their class).

Thank you very much.

Kim Nathan
kmn27@student.canterbury.ac.nz

Consent Form (Parents and Children):

Researcher: Kim Nathan
Contact Address: Psychology Dept., University of Canterbury
Email: kmn27@student.canterbury.ac.nz

Date: _____

Parent
I have read and understood the letter and information sheet regarding the research project on affective competence in children.

I agree to participate in the study, and give my consent for my child _____ to participate. I also give my consent for my child's school to provide relevant information about him/her to the researcher, and for completion of the Strengths and Difficulties questionnaire by my child's teacher, on the understanding that all information provided remains confidential. I consent to publication of the results of the study also on the understanding that all information remains confidential.

I understand that I (or my child) may withdraw from the study at any time, including withdrawal of the information we have provided.

Parent's Name: _____
(mother or primary caregiver; please print)

Child's Name: _____
(please print)

Parent's Signature: _____

I would like to receive a summary of the results of the study when available. ***Yes / No***

Child

- I understand that if I agree to take part I will be asked to do some activities at school.

- I agree to take part in the research project on the understanding that all my answers are kept confidential.
- I understand that I can quit (withdraw) at any time and ask for my answers to be taken out.
- I give my consent for the researcher (Kim) to ask my teacher and my parents questions about me, and understand that this information will also be kept confidential.

Child's Signature: _____

Appendix E4

Child Information Sheet

Information Sheet (Children)

(Parents – please read to your child)

This sheet explains what the research project is about and what you will be asked to do if you agree to take part.

Why are we doing this project?

We know that being able to understand feelings is important for children. This project is going to look at what you understand about emotions and why other people do the things they do.

Why did we choose you?

We have chosen some children who find reading difficult and some children who don't. You will be in one of these groups. It won't matter which group you are in when we do the activities because everybody does the same things.

What will I have to do?

The activities are all short and we think you will enjoy them. Some will be done in small groups, and some will be done on your own. The last activity is done on a computer. You will need to see me, Kim, *(researcher)* twice (on different days), for about an hour each time.

Who will see my answers?

You won't put your name on your answer sheets so no one will know what your answers are. Everything you say or do on these activities is *confidential*. That means that we promise not to tell anyone your answers, or let them see what your answers are.

If you agree to take part, you will be given a certificate and your name will go into a prize draw for a $50 Borders voucher.

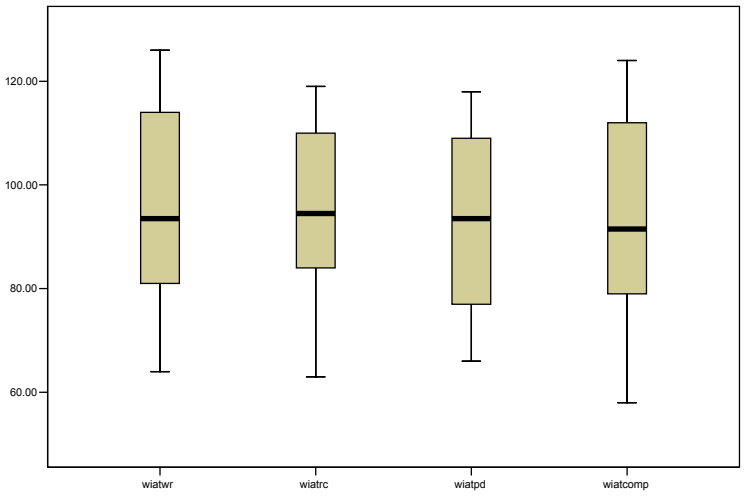
Have a think about it, and ask any questions you want to. Then decide if you want to take part in the project. If you do, ask your parents to read through the consent form with you before you sign it. If you don't want to take part, that's fine – it's up to you.

Thank you. ☺

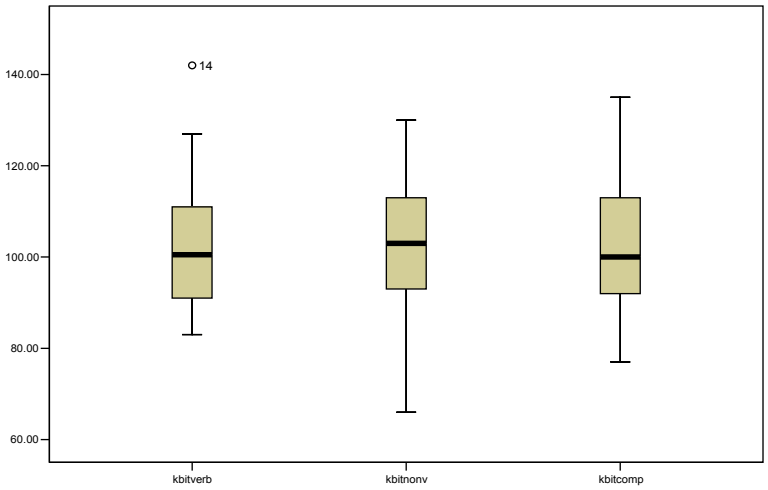
Appendix F

Boxplots of Variables

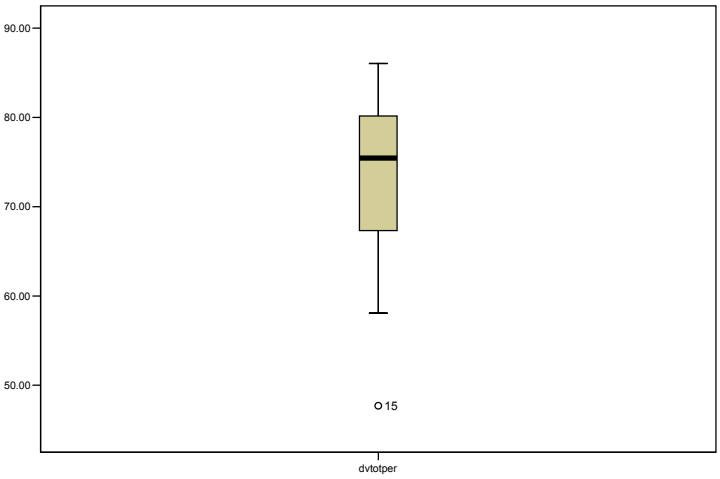
Composite reading scores (WIAT), from left to right – word reading, reading comprehension, pseudoword decoding:



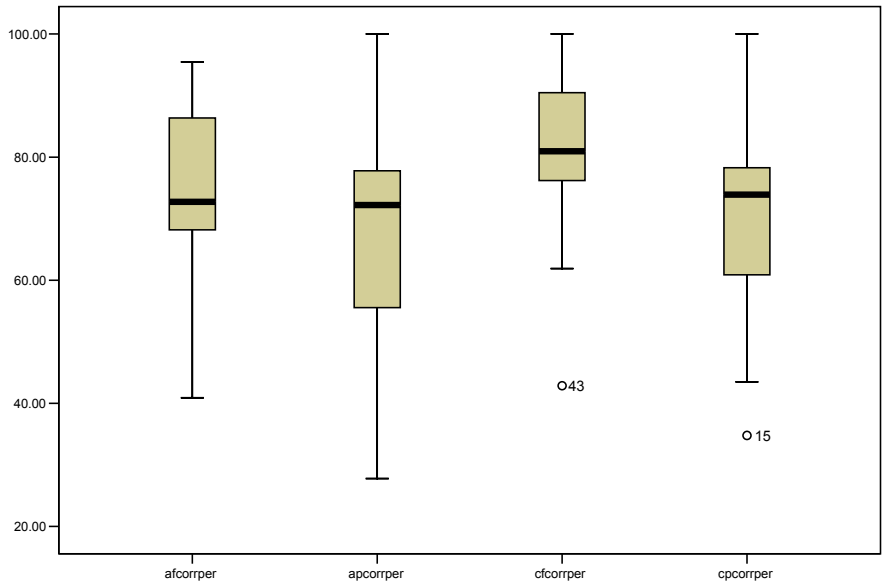
IQ subscales (KBIT-2), from left to right – verbal, non-verbal, composite:



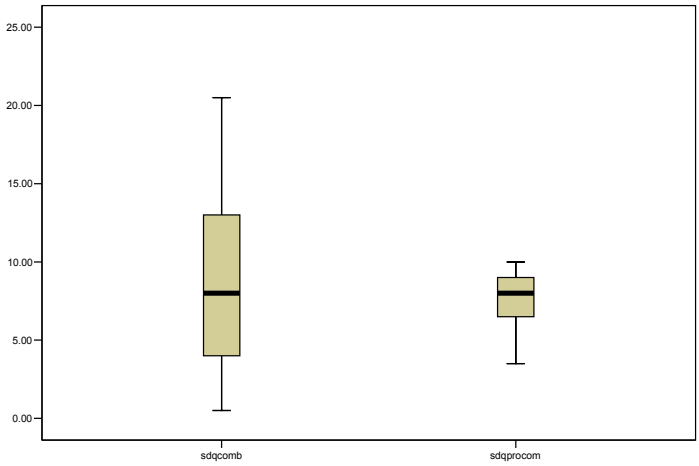
DANVA-2 Total Score:



DANVA2 subscales from left to right – adult faces, adult voices, child faces, child voices:

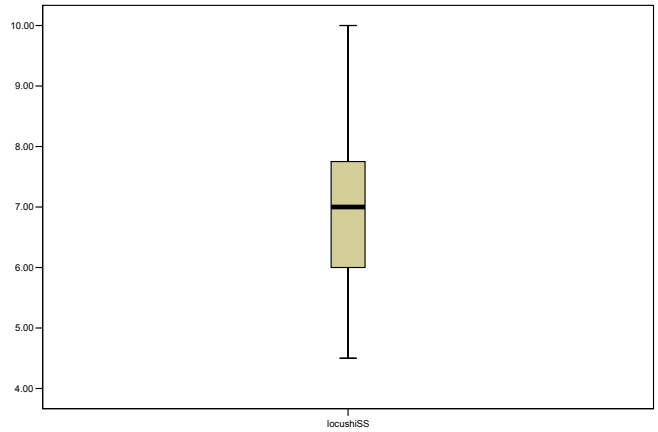


Strengths & Difficulties Questionnaire (SDQ) combined parent and teacher ratings – behavioural symptoms (L), pro-social (R):

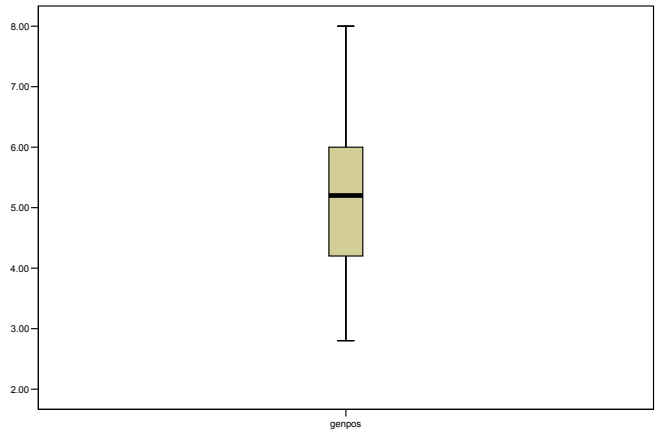


Notes. One outlier was present in the *parent* ratings of pro-social behaviour.

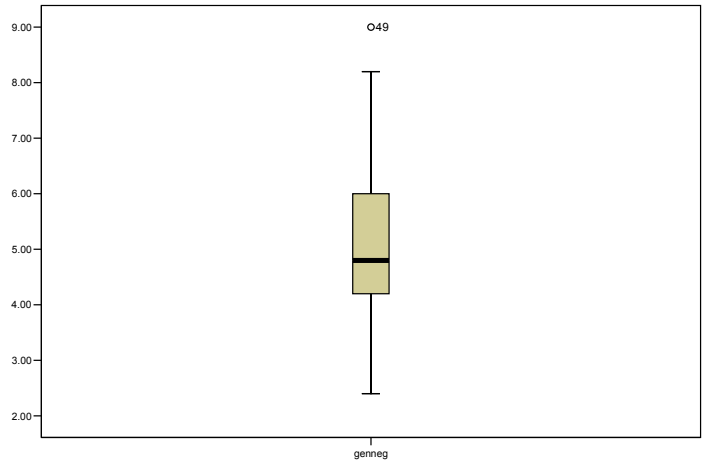
Peer-social attributions (PASS-1) - locus composite**:**



Peer-social Attributions (PASS-1) – generality positive:

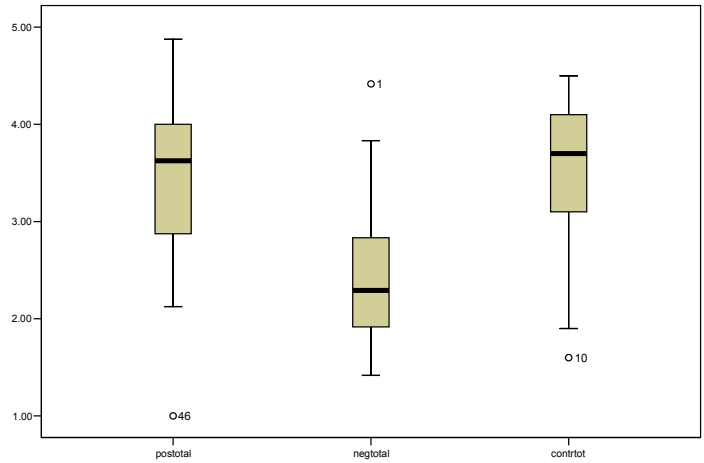


Peer-Social Attributions (PASS-1) – generality negative**:**

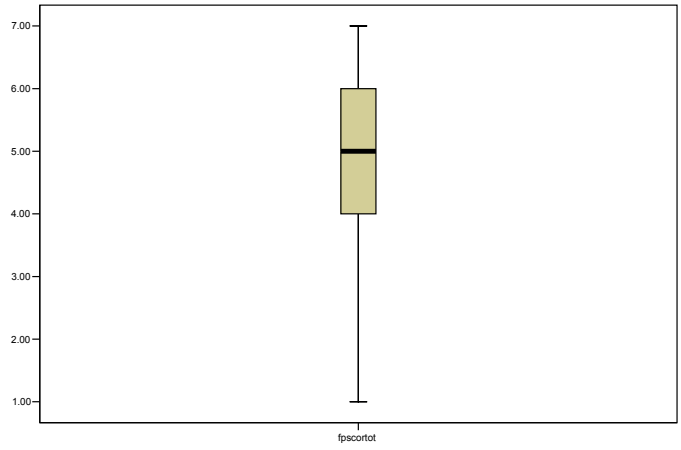


Note: One outlier present.

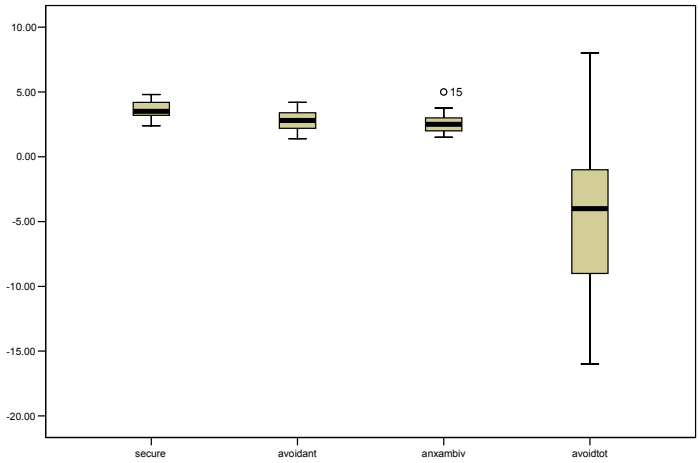
Emotion Experience (HIF) - positive emotion (L) , negative emotion (C), and emotion control (R):



Theory of mind (Faux Pas Stories):



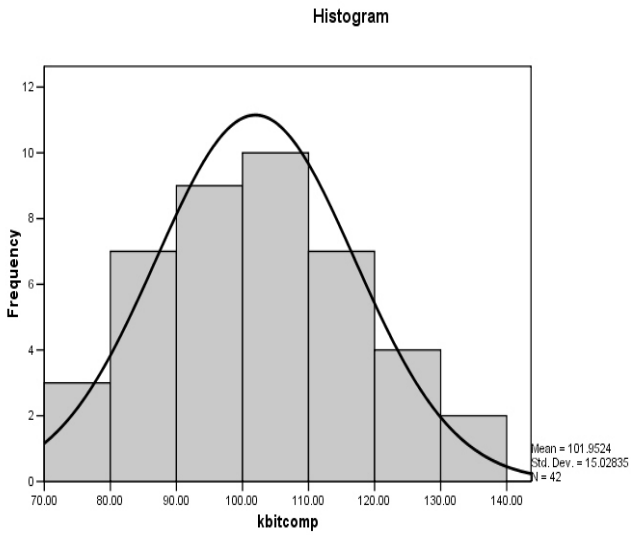
Attachment (CASCQ) – secure (L), avoidant (C), anxious-ambivalent (R), and avoidance-secure (avoidance dimension) far right:



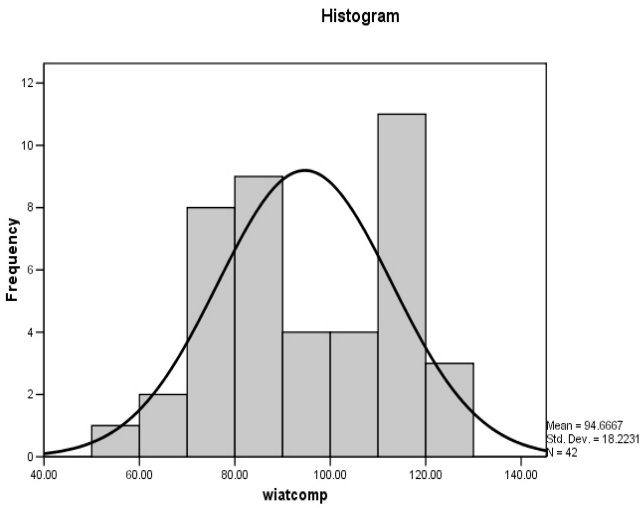
Appendix G

Distributions of Variables

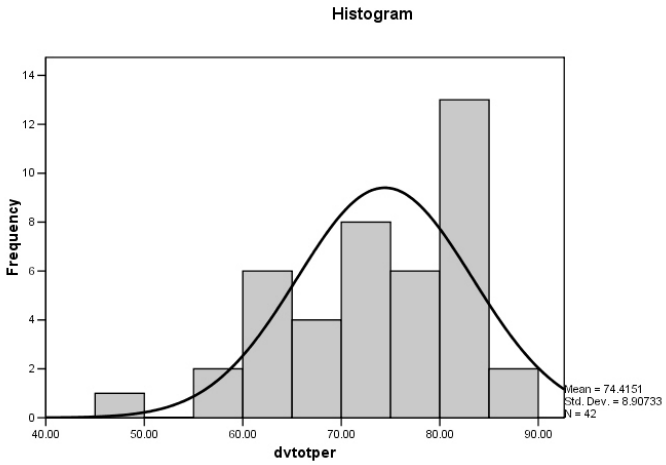
Non-verbal IQ (KBIT-2):



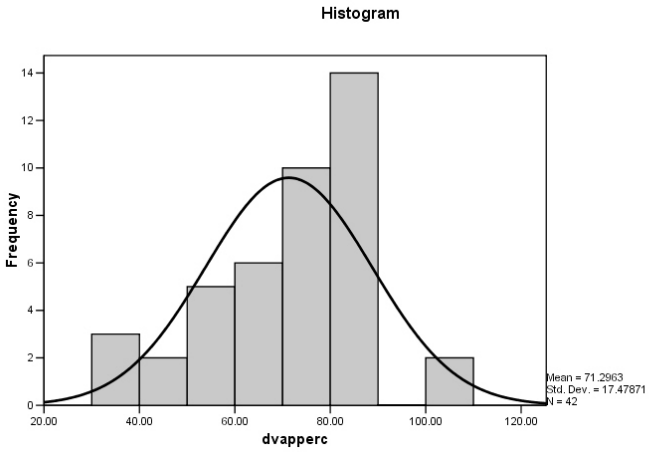
Composite reading score (WIAT-II):



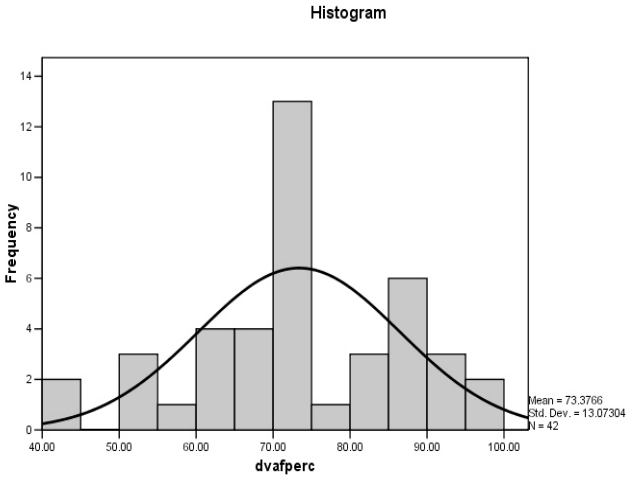
DANVA2 total correct:



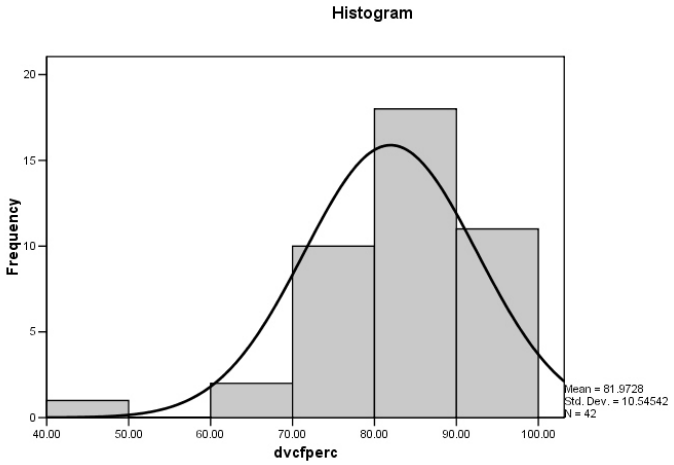
DANVA2 – adult voices:



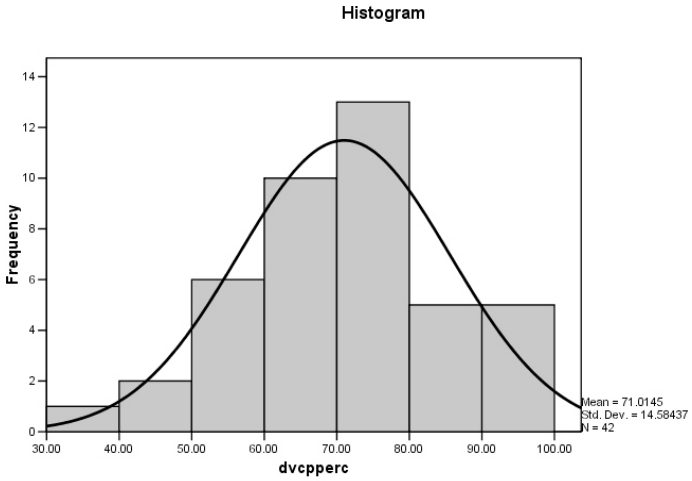
DANVA2 - adult faces:



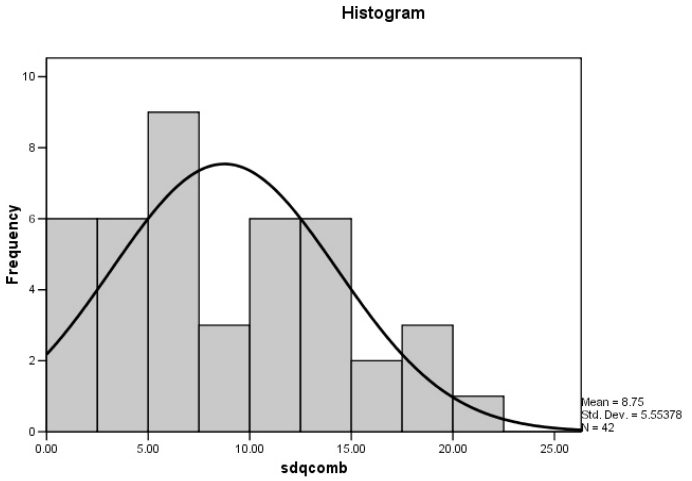
DANVA2 – child faces:



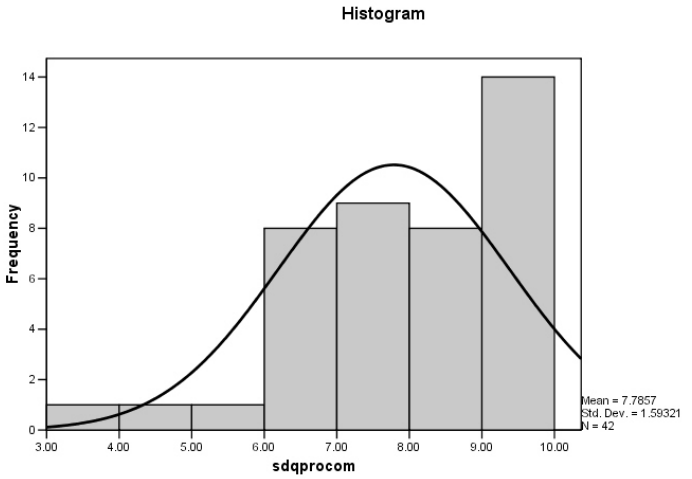
DANVA2 – child voices:



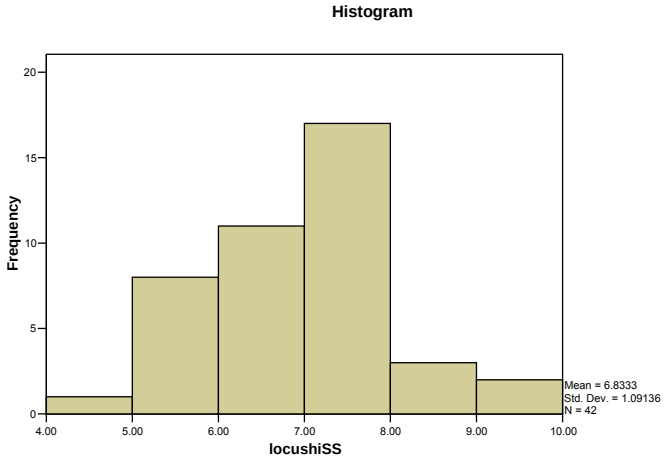
SDQ total behavioural symptoms (combined):



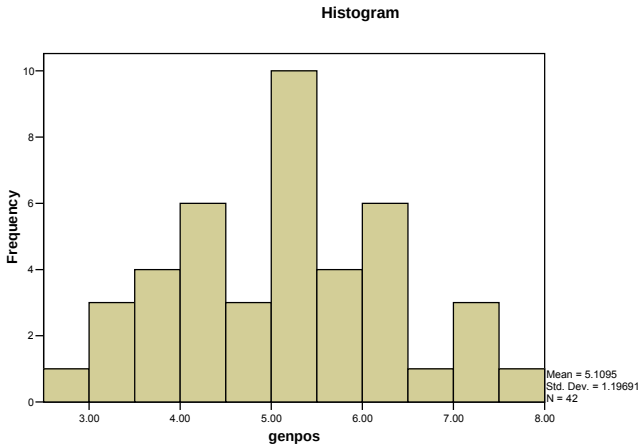
SDQ pro-social (combined):



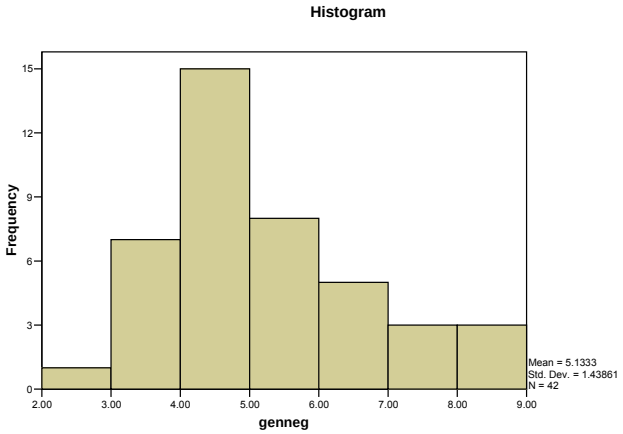
Locus Composite (PASS-1):



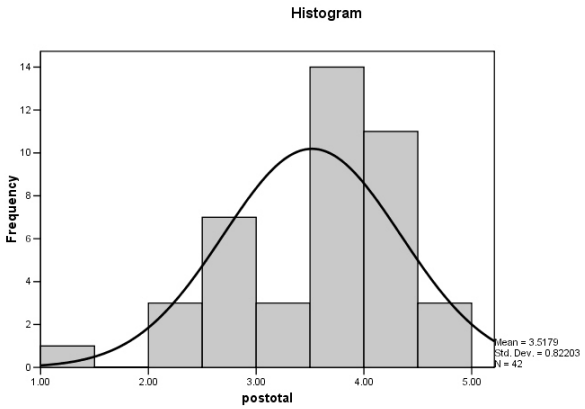
Generality Positive (PASS-1):



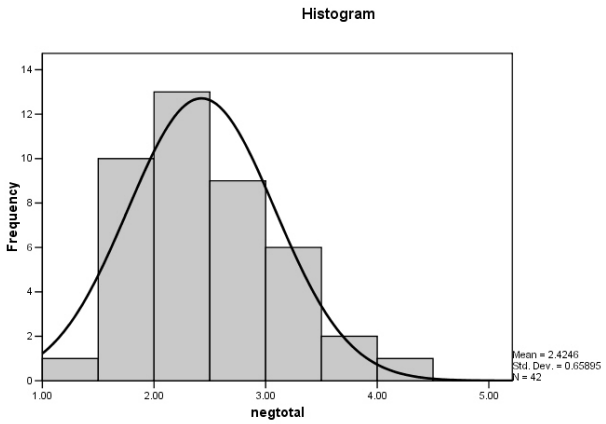
Generality Negative (PASS-1):



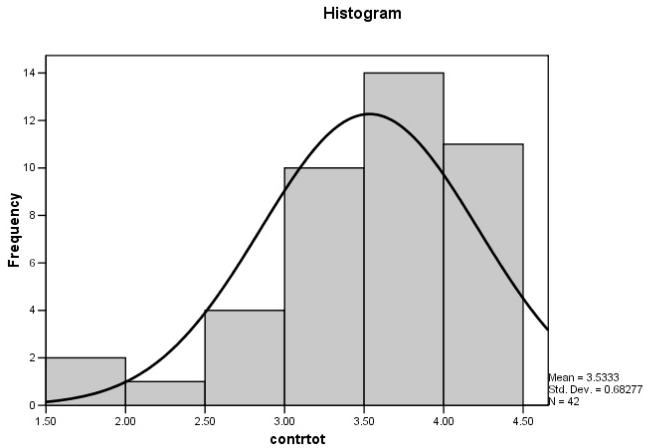
Positive emotions (HIF):



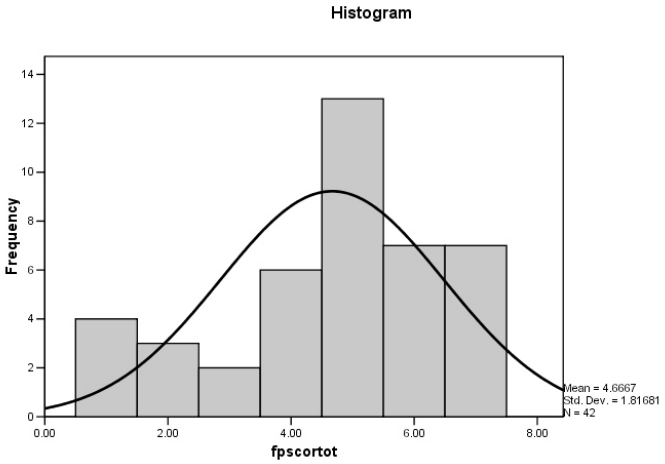
Negative emotions (HIF):



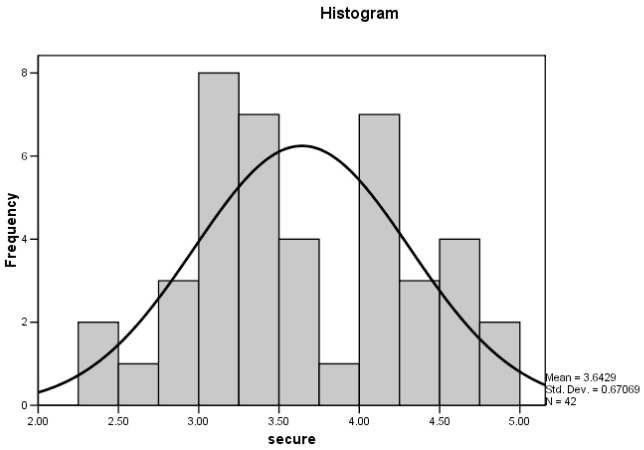
Emotion control (HIF):



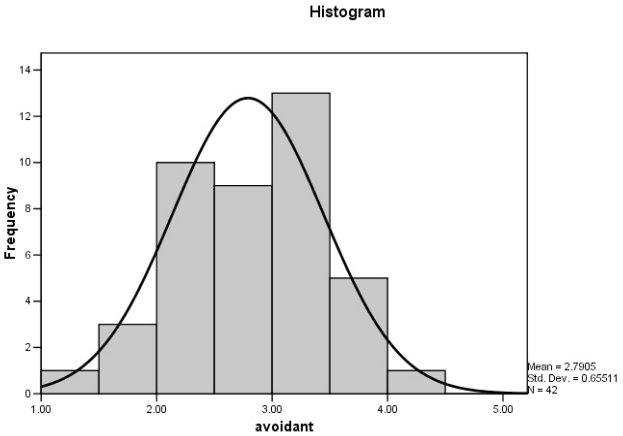
Theory of Mind (Faux Pas Stories):



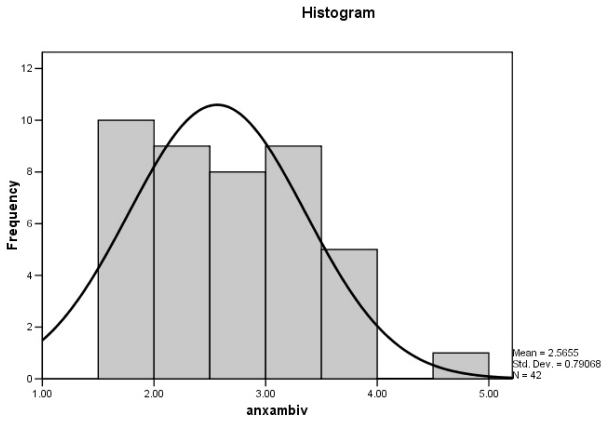
Secure attachment subscale (CASCQ):



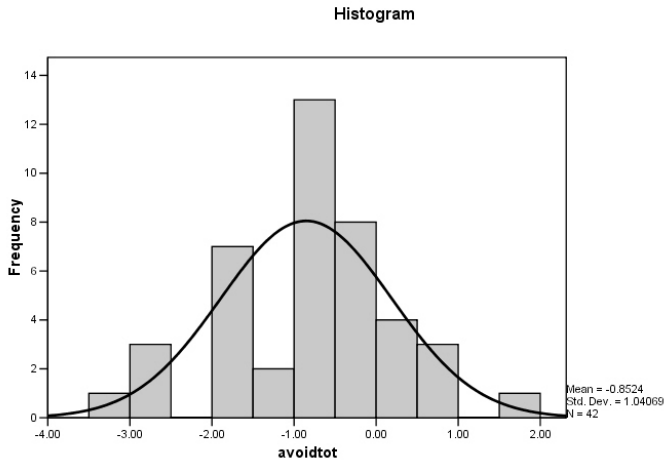
Avoidant attachment subscale (CASCQ):



Anxious-ambivalent attachment subscale (CASCQ):



Avoidance attachment dimension (avoidant – secure score, CASCQ):



Appendix H1

Correlations between child and maternal demographic variables with behavioural symptoms.

	Age	Ethnicity	No. of Children	Health Status	Marital Status	Education Level	Employment Status
Child Characteristics	-.13	-.15	.12	.19			
Maternal Characteristics	.05	-.06			-.17	-.26	-.02

Appendix H2

KBIT-2 subscales and composite IQ correlations for TA and RD groups.

	NA group (n=21)		**RD group** (n=21)		**Combined** (N=42)	
KBIT	Non-verbal	Verbal	Non-verbal	Verbal	Non-verbal	Verbal
Non-verbal	-	**.65****	-	**.49***	-	**.66****
Composite	**.91****	**.91****	**.93****	**.77****	**.92****	**.90****

***** $p < .05$
****** $p < .001$

Appendix H3

Correlations for reading group (RD and TA) with non-verbal IQ, and SIP variables.

Reading Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
RD	-.21	-.42[a]	**-.72*** **	-.15	.18	-.39[a]	.17	-.26	-.29	.06	.26	**-.44***
TA	-.14	.40[a]	**-.49***	.07	.31	.30	.01	-.02	**-.55****	**.46***	-.14	.06

* $p < .0$ ** $p < .01$ *** $p < .001$ [a] $p < .10$

Note. 1 = non-verbal IQ (KBIT-2), **2** = emotion reading (DANVA), **3** = pro-social behaviour (SDQ), **4** = negative attributions (PASS), **5** = positive attributions (PASS), **6** = positive emotion (HIF), **7** = negative emotion (HIF), **8** = emotion control (HIF), **9** = theory of mind (Faux Pas Stories), **10** = anxious-ambivalence (ACSQ), **11** = avoidance (ACSQ), **12** = secure classification (ACSQ).

Appendix H4

Behaviour symptoms correlations (N=42) with reading group, and SIP variables.

	1	2	3	4	5	6	7	8	9	10
SDQ behaviour symptoms	-.10	-.15	.20	-.16	**-.44***	.25	.17	.19	-.01	**-.65****

***** $p < .005$ ****** $p < .001$

Note*: 1* *= DANVA2,* ***2*** *= HIF positive,* ***3*** *= HIF negative,* ***4*** *= HIF control,* ***5*** *= Faux Pas,* ***6*** *= PASS-1 positive,* ***7*** *= PASS-1 negative,* ***8*** *= CASCQ anxious-ambivalent,* ***9*** *= CASCQ avoidance,* ***10*** *= pro-social behaviours.*

Appendix H5

Correlations for non-verbal IQ with SIP variables.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
IQ (non-verbal)	.09	-.07	-.03	-.10	**.**29	-.07	-.11	.12	-.02	**-.32***	.05

Note: ***1*** *= DANVA,* ***2*** *= HIF positive,* ***3*** *= HIF negative,* ***4*** *= HIF control,* ***5*** *= Faux Pas,* ***6*** *= PASS positive,* ***7*** *= PASS negative,* ***8*** *= ASCQ anxious-ambivalent,* ***9*** *= ASCQ avoidance,* ***10*** *= SDQ behavioural symptoms,* ***11*** *= SDQ pro-social behaviours.*

***** $p < .01$

Appendix H6

Zero-order correlations for gender.

	1	2	3	4	5	6	7	8	9	10	11	12
Gender	.06	-.16	.03	-.15	.15	-.27	.01	.21	**.42***	.00	**.**30	.03

Note: ***1*** *= DANV2,* ***2*** *= HIF positive,* ***3*** *= HIF negative,* ***4*** *= HIF control,* ***5*** *= Faux Pas,* ***6*** *= PAS-1S positive,* ***7*** *= PASS-1 negative,* ***8*** *= CASCQ anxious-ambivalent,* ***9*** *= CASCQ avoidance,* ***10*** *= SDQ behavioural symptoms,* ***11*** *= SDQ pro-social behaviours,* ***12*** *= non-verbal IQ.*

***** $p < .01$

Appendix I1

Details of internal reliability analyses for DANVA2, PASS-1, and CASCQ.

	Items all correct	**Items removed**	**Total no. of items remaining**	**Cronbach's alpha**
DANVA2				
Child Faces	5 8 22	2 12 16	21	.57

Child Paralanguage	none	16	23	.67
Adult Faces	1 24	4 13	22	.63
Adult Paralanguage	18	1 4 5 7 12 19	18	.70
PASS-1				
Positive attributions:				
Internal/External	n/a	1	4	.53
Temporary/Permanent	n/a		5	.55
Global/Specific	n/a		5	.56
Negative attributions:				
Internal/External	n/a		5	.22
Temporary/Permanent	n/a		5	.55
Global/Specific	n/a		5	.71
CACSQ				
Secure	n/a		5	.59
Avoidant	n/a		5	.38
Anxious-Ambivalent	n/a	6 (I'd like to be really close to some children and always be with them)	4	.59

Note. **DANVA2** = Diagnostic Assessment of Nonverbal Accuracy; **PASS-1** = Peer-Social Attribution Scale; **CASCQ** = Attachment Style Classification Questionnaire.

Appendix I2

Internal reliabilities for SDQ subscales, parent and teacher ratings.

	Strengths & Difficulties Questionnaire							
	Parent Ratings				Teacher Ratings			
	H	CP	ES	PP	H	CP	ES	PP
Cronbach's alpha	.82	.79	.73	.65	.86	.58	.68	.83

Note. **H** = hyperactivity, **CP** = conduct problems, **ES** = emotional symptoms, **PP** = peer problems.

Appendix J

Group (TA and RD) and combined, reading subtest scores on WIAT-II.

	TA		RD		Combined		*t* (40)
	M	*SD*	*M*	*SD*	*M*	*SD*	
Word Reading	111.81	9.02	80.43	9.79	96.12	18.40	**10.80***
Reading Comprehension	109.33	6.78	83.48	8.52	96.40	15.14	**10.88***
Pseudoword Reading	108.81	6.81	79.67	8.42	94.24	16.57	**12.34***
Target Words	96.20	4.51	70.43	20.61	83.31	19.68	**5.60***

* $p < .001$

Appendix K

Combined impact ratings (parent and teacher) by reading group (TA and RD)

	SDQ Impact Ratings							
	RD group (%)				TA group (%)			
	0	*1*	*2*	*3*	*0*	*1*	*2*	*3*
Child upset by difficulties	41	31	14	**14**	86	10	5	0
Problems with friends	52	24	12	**12**	88	7	5	0
Problems in class	41	14	31	**14**	83	10	7	0
Stress on parent/family or teacher/class	52	26	19	2	88	10	0	2

Note: Higher scores = higher impact rating; 0 = *not at all (or n/a if no difficulties)*, 1 = *a little*, 2 = *a medium amount*, 3 = *a great deal*.

Appendix L1

Regression analyses for reading difficulties and behavioural symptoms, controlling for gender and IQ

1. **Regression analysis for reading group and behavioural symptoms controlling for gender:**

   DV: Behavioural symptoms

   IVs: Reading group (TA, RD), gender

R^2 : .17, F (4, 37) = 3.94, $p < .05$

Gender: β = .00, t = .03, *ns*.

2. **Regression analysis for reading group and behavioural symptoms controlling for non-verbal IQ**:

DV: Behavioural symptoms

IVs: Reading group (TA, RD), non-verbal IQ

R^2 : .20, F (4, 37) = 4.73, $p < .05$

Gender: β = .18, t = 1.14, *ns*

Regression analyses for moderating variables (emotion reading, positive emotion, and secure attachment) with the addition of gender and non-verbal IQ as control variables:

1. Moderator = Emotion Understanding

DV: Behavioural symptoms.

IVs: Emotion understanding, reading difficulties, gender.

$\boldsymbol{R^2}$ = .31, F (4,37) = 4.21, $p < .01$.

Interaction effect: β = -.57, t = -2.72, $p < .01$.

Gender: β = .07, t = .49, n.s.

DV: Behavioural symptoms.

IVs: Emotion reading, reading difficulties, non-verbal IQ.

R^2 = .34, *F* (4,37) = 4.68, *p* < .005.

Interaction effect: β = -.56, *t* = -2.75, *p* < .01.

Non-verbal IQ: β = -.18, *t* = 1.24, *ns*.

2. Moderator = Positive Emotion

DV: Behavioural symptoms.

IVs: Positive emotion, reading difficulties, gender.

***R*^{2}** = .28, *F* (4,37) = 3.52, *p* < .05.

Interaction effect: β = -.53, *t* = -2.12, *p* < .05.

Gender: β = -.04, *t* = -.29, *ns.*

DV: Behavioural symptoms.

IVs: Positive emotion, reading difficulties, non-verbal IQ.

R^2 = .30, *F* (4,37) = 3.98, *p* < .01.

Interaction effect: β = -.51, *t* = -2.08, *p* < .05.

Non-verbal IQ: β = -.18, *t* = 1.19, *ns*.

3. Possible moderator = secure attachment

DV: Behavioural symptoms.

IVs: Secure attachment, reading difficulties, gender.

***R*^{2}** = .28, *F* (4,37) = 3.61, *p* < .05.

Interaction effect: β = -.55, *t* = -1.86, *p* <.10.

Gender: β = -.11, *t* = -.71, *ns.*

DV: Behavioural symptoms.

IVs: Secure attachment, reading difficulties, non-verbal IQ.

R^2 = .28, *F* (4,37) = 3.58, *p* < .05.

Interaction effect: β = -.51, *t* = -1.70, *p* < .10.

Non-verbal IQ: β = -.10, *t* = -.64, n.s.

Appendix L2

Semi-partial correlations for regression analyses.

1. **Semi-partial correlations for regression with reading difficulties and emotion understanding**:

	Semi-partial correlation	Semi-partial correlation^2	% Unique variance accounted for
Reading Difficulties	.41	.17	17
Emotion Reading	-.08	.00	0
Interaction Term	.40	.16	16

2. **Semi-partial correlations squared for regression with reading difficulties and positive emotion**:

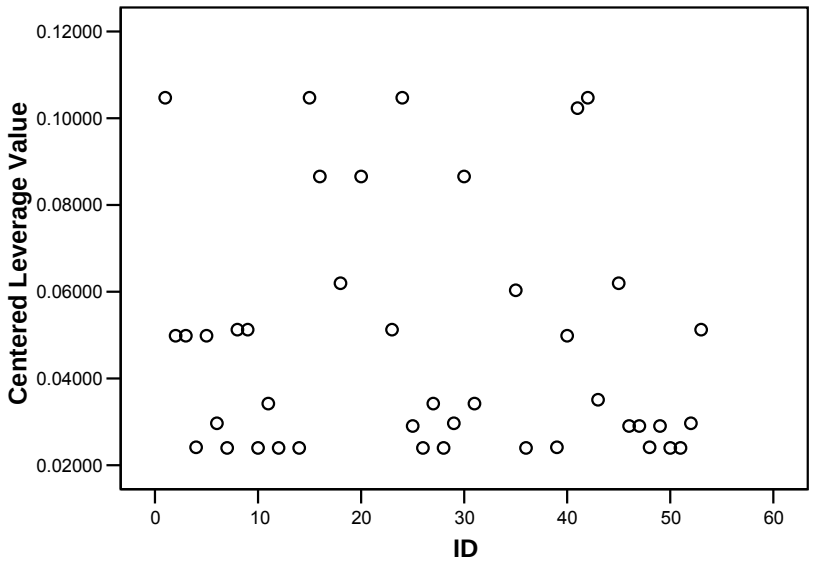
	Semi-partial correlation	Semi-partial correlation^2	% Unique variance accounted for

Reading Difficulties	.37	.14	14
Positive Emotion	-.03	.03	3
Interaction Term	.30	.09	9

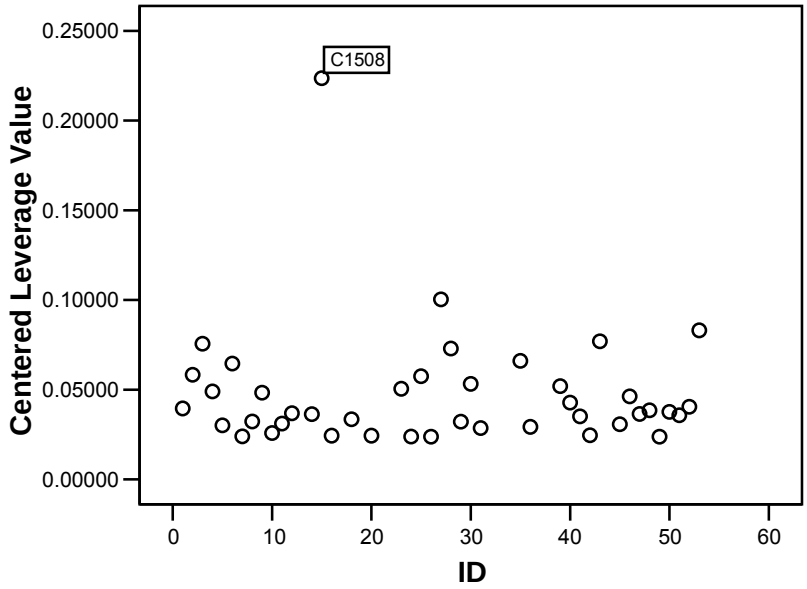
Appendix L3

Simple residual plots for multiple regression analyses

Reading difficulties and theory of mind:

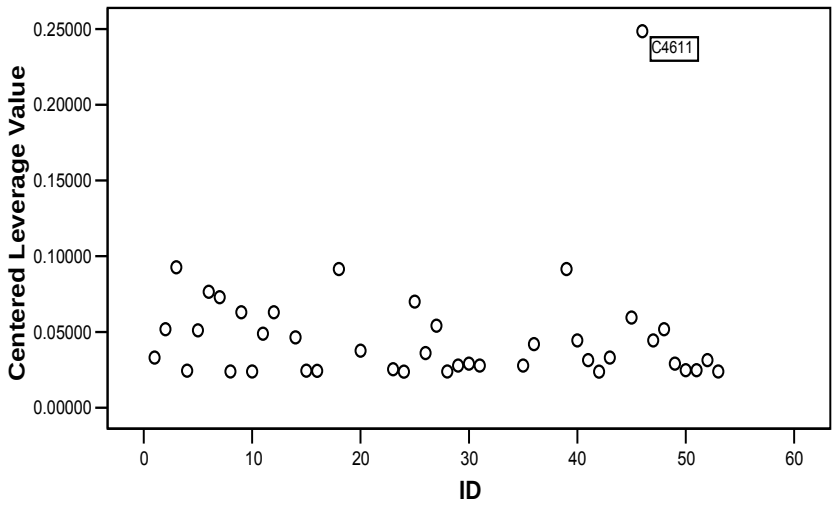


Reading difficulties and emotion understanding:



This regression analysis was re-run with case #15 removed and the moderating effects of emotion understanding remained significant, $R^2 = .24$, F (3, 37) = 3.80, $p < 05$.

Reading difficulties and positive emotion:



This regression analysis was re-run with case #46 removed and the moderating effects of *positive emotion* remained significant, $R^2 = .30$, F (3, 37) = 5.21, $p < 005$.