

Potential Moderators of Psychosocial Problems in Children with Reading Difficulties

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The relationship between reading difficulties (RD) and psychosocial problems is well-documented; however, less is known about possible protective factors. This study explored the possible protective functions of two socio-cognitive abilities (theory of mind and emotion understanding) in children with RD. Participants were 21 children with RD, and a matched group of 21 typically-achieving peers aged 9-11 years. Psychosocial problems were assessed using the Strengths and Difficulties Questionnaire, Faux Pas Stories and the Diagnostic Assessment of Nonverbal Accuracy provided measures of theory of mind and emotion understanding respectively. Confirming previous findings, RD were significantly correlated with higher levels of psychosocial problems. Moreover, lower theory of mind scores predicted higher levels of psychosocial problems. Consistent with our hypothesis, emotion understanding moderated the link between RD and psychosocial problems. These findings provide evidence of the possible protective functions of socio-cognitive abilities for children with RD, and highlight the need for further investigation.

Reading difficulties (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' (Shaywitz & Shaywitz, 2004). Reading difficulties in children tend to be stable over time and often persist into adolescence and early adulthood (Fleming, Harachi, Cortes, Abbott, & Catalano, 2004; Maughan, 1995; Smart, Prior, Sanson, & Oberklaid, 2001). International prevalence rates for RD range from 3 - 7% when stringent criteria are applied, and from 15 - 17% when less stringent criteria are applied (APA, 2000; Muter, 2003; Rutter et al., 2004). In two epidemiological studies in New Zealand, RD prevalence rates of 21 - 22% for boys and 9 - 10% for girls have been obtained (Rutter et al., 2004). According to Torgesen (2000), even with appropriate early intervention, approximately 4 - 6% of children may

experience reading difficulties.

Children and adolescents with RD are at increased risk for a range of psychosocial, behavioural, and psychiatric problems including poor task engagement, poor self control, poor attention, anxiety, depression, and aggression (Arnold et al., 2005; Halonen, Aunola, Ahonen, & Nurmi, 2006; Hinshaw, 1992; Maughan, Pickles, Hagell, Rutter, & Yule, 1996; Walker & Nabuzoka, 2007). Significant deficits in reading tend to persist, and are associated with children and adolescents being at risk for poor longer term outcomes, including delinquency, early school leaving, poverty, unemployment, incarceration, and psychopathology (Morgan, Farkas, Tufis, & Sperling, 2008; Weiser et al., 2007).

Although awareness of the role of individual differences in the functioning of children with RD is increasing (e.g., Spira, Bracken, & Fischel, 2005), current understanding of factors associated with

positive outcomes for children with RD is limited. However, it is likely that specific protective factors ameliorate the increased risk for negative psychosocial outcomes associated with RD (Rutter, 2006). Identification of protective factors for children with RD has important implications for the design and delivery of interventions to prevent psychosocial difficulties and promote positive outcomes for this group.

The social information processing model provides the theoretical basis for this study (see Crick & Dodge, 1994; Dodge, Laird, Lochman, & Zelli, 2002; Lemerise & Arsenio, 2000). In particular we were interested in the encoding and mental representation of social cues relating to the comprehension of nonverbal cues and taking others' perspectives. To date, few studies have examined associations between socio-cognitive abilities such as these and psychosocial outcomes specifically in children with RD. Nevertheless, it seems plausible that children with RD who are able to more accurately infer others' emotions and mental states are less likely to experience psychosocial problems. Thus, as described below, we investigated the potential contributions of these two socio-cognitive variables to positive psychosocial adjustment.

Theory of mind refers to the 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. In middle childhood (9-11 years), the understanding of mistaken beliefs, biases and expectations, social

deception, and mixed/ambivalent emotions continue to undergo intensive development (Stone, Baron-Cohen, & Knight, 1998). Moreover, children with learning disabilities perform more poorly than their typically-achieving (TA) peers on a range of perspective-taking tasks (see Ferretti, MacArthur, & Okolo, 2001; Tur-Kaspa, 2002). Theory of mind and perspective taking competencies have in turn been linked to social competency ratings, although not specifically in RD samples (Dunn, 1999; Fahie & Symons, 2003; Pears & Fisher, 2005; Pons, Harris, & Doudin, 2002). Although there is limited research on theory of mind skills in children with RD, based on the extant findings we expected that better theory of mind abilities should serve as a protective factor for children with RD, in terms of their risk for psychosocial problems.

The ability to perceive, understand, manage, and use emotional information is also crucial to the development of social competence (Eisenberg, Fabes, & Losoya, 1997; Hubbard & Coie, 1994; Most & Greenbank, 2000; Nowicki & Duke, 2001; Salovey, Kokkonen, Lopes, & Mayer, 2004). Children with poor social information processing may mistakenly interpret others' actions as hostile and fail to adopt appropriate social goals - responding with aggression for example (Dodge et al., 2002). Deficits in emotion understanding have been associated with psychosocial problems in several studies (e.g., Cook, Greenberg, & Kusche, 1994; Izard, Fine, Schultz, Ackerman, & Youngstrom, 2001). Conversely, children with better emotion understanding tend to demonstrate more positive social adjustment (Schultz, Izard, Ackerman, & Youngstrom, 2001) and have fewer psychosocial problems.

More specifically, the ability to accurately interpret affective meaning conveyed non-verbally, in facial expressions and tone of voice, is a key social competency and increases in importance as children develop (Bridges & Grolnick, 1995; Most & Greenbank, 2000; Nabuzoka & Smith, 1995; Rothman & Nowicki, 2004). Lower accuracy on facial expression processing has been associated with higher rates of internalising and externalising behaviours (e.g., Cooley

& Triemer, 2002; Lancelot & Nowicki, 1997; Nabuzoka & Smith, 1995). Less accurate face/voice processing has also been correlated with lower academic achievement in preschool boys, and with lower teacher-ratings of social competence (Most & Greenbank, 2000; Nowicki & Mitchell, 1998). Given the important role of (non-verbal) emotion understanding in children's psychosocial functioning, we expected that better understanding of simple emotions should also serve as a protective factor for children with RD.

Current Study

The current study explored the possible protective functions of two socio-cognitive abilities (theory of mind and emotion understanding) in children with reading difficulties, a topic which has received little prior research attention. 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).

The use of a risk and protective framework facilitates the identification of factors (and specific competencies) which may protect individuals from the increased risk of psychosocial problems associated with RD. 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.

The sample comprised twenty-one children (9 – 11 years) with RD, and a matched group of their typically-achieving (TA) peers. The inclusion of a TA comparison group allows assessment of whether socio-cognitive abilities fulfil a protective function for RD children, or fulfil similar functions for both the TA and RD groups. The former proposition implies a strong negative correlation between psychosocial problems and say, emotion understanding, within the RD group, but a null (flat) correlation between the same two variables in the TA group. This pattern would produce an interaction effect, with socio-cognitive abilities moderating the relationship between the reading group variable (RD

vs. TA) and psychosocial problems.

Such an interaction effect is plausible, given that the kind of stress and challenges imposed by reading difficulties could realistically increase the extent to which children normally make use of emotion understanding or theory of mind abilities to manage and control their social interactions. However, it is also quite possible, given the key role of such socio-cognitive skills, that they facilitate positive psychosocial adjustment generally and are equally important for both groups of children (RD and TA).

In summary, we expected that a non-referred sample of children with RD would demonstrate higher levels of psychosocial problems than their typically-achieving (TA) peers, replicating prior research. Second, we expected that theory of mind abilities and emotion understanding would fulfil protective functions for children with RD.

Method

Participants

Letters were sent to all primary schools in Christchurch with positive responses received from six schools. A sample of Year 5 and Year 6 children was selected from these schools and participants were placed into either the reading difficulties (RD, $n = 21$), or typically-achieving (TA, $n = 21$) group with 11 boys and 10 girls in each (see below for selection criteria). Of the 42 participants, 28 were of NZ European ethnicity, 12 NZ Māori, and two Pacific Island. Children in the RD and TA groups did not differ significantly on health, language development, or age ($M = 10$ years 5 months, $SD = 6.7$ months). Mean maternal age was 40.72 years for the RD group, and 39.14 years for the TA group. There were no significant group (RD or TA) differences for maternal ethnicity or education level, or socio-economic status. Approximately half of the children lived in single parent households, 33% of the RD group and 52% of the TA group. Schools were of varying deciles, with 28%, 38%, and 34% of participants attending low-, mid-, and high-decile schools respectively. Fourteen teachers participated in the study (3 male, 11 female).

RD participants. A five-step multifactorial assessment model (based on Pereira-Laird, Deane, and Bunnell, 1999) was used to select the RD participants. Pereira-Laird and colleagues' 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 (from 14 classes across 6 schools), based on their own observations of low reading achievement in the classroom. The decision to use this approach was based on the increased likelihood of capturing the complexity of the construct, and because the model had previously been used successfully with a New Zealand sample.

Following teacher selection, the remaining four criteria were used: 1. 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 previous studies in which a similar cut-off has been used (e.g., Rucklidge & Tannock, 2002; Torgesen, 2000; Tur-Kaspa & Bryan, 1993; Wiener & Schneider, 2002); 2. Evidence of satisfactory achievement (above the 30th percentile) in at least one other academic area, based on recent scores on Progressive Achievement Tests (listening comprehension, mathematics) where available, or teacher report when test scores were not available; 3. In line with conventional exclusion criteria, children with evidence of neurological abnormalities, sensory impairments, developmental disorders (including ADHD), psychoactive medication, or English as a second language were excluded from the study; 4. Minimum score of 85 on either the verbal or non-verbal IQ subscales of the KBIT-2 (see below). Based on these selection criteria, eight of the teacher-nominated children were excluded (IQ score below 85 – one, ADHD diagnosis – one, reading scores above the 25th percentile but nominated for RD group – six). All children who met the criteria for inclusion took part in the study (for rationales for each of

these criteria, see Pereira-Laird et al., 1999).

TA participants. Participants in the TA group were carefully matched with RD participants; drawn from the same classes (i.e., with the same teacher), and being of the same age, gender, and ethnicity. Teachers selected children who were reading at or above age level, and the same exclusionary criteria as above were applied. A WIAT-II reading composite score at or above the 30th percentile was required (i.e., at or above .5 of a standard deviation below the mean; see Pereira-Laird et al., 1999). Based on these selection criteria, two children were excluded from the study due to obtaining reading scores below the 30th percentile.

Measures

Reading. Reading achievement was assessed using the three reading subtests, *word reading*, *reading comprehension* and *pseudoword reading*, of the Wechsler Individual Achievement Test, 2nd edition (WIAT-II; Psychological Corporation, 2001). The WIAT-II has a standardised population mean of 100 and a standard deviation of 15.

The WIAT-II is a norm-referenced test with well-established reliability and validity in both typical 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). As per the standard procedure, reading subtests were administered in the same order with word reading first, followed by reading comprehension, and finally pseudoword reading.

IQ. The Kaufman Brief Intelligence Test, 2nd Edition (KBIT-2; Kaufman & Kaufman, 2004) was used to assess verbal, non-verbal, and composite IQ. The KBIT-2, and its predecessor, have been used to assess intelligence in numerous studies and have demonstrated excellent reliability, with coefficients of .81 – .93 (verbal, non-verbal, and composite scores) and test-retest correlations of .76 – .88, for participants aged 9 – 11 years in the norm sample

(see Kaufman & Kaufman, 2004; Levy, Smith, & Tager-Flusberg, 2003). The KBIT-2 has a standardised population mean of 100 and a standard deviation of 15.

Some modifications for the New Zealand context were made. 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 substituted for *barber* in item 22, and *candy bar* (item 30) was explained when necessary (without mentioning any of the correct responses).

Socio-Cognitive Measures

Emotion understanding. The ability to identify emotions (happy, sad, angry, and fearful) through facial expressions and tone of voice, was assessed using the computer-based Diagnostic Analysis of Nonverbal Accuracy scale, 2nd edition (DANVA2; Nowicki & Duke, 1994) in which emotions enacted by adults and children in a series of still photographs (faces) and audio segments (voices) are presented via computer. Subscales of the DANVA2 have demonstrated good internal consistency across numerous studies, with participants from a range of ages, cultural backgrounds, intellectual abilities, and psychological adjustment ($\alpha = .70 - .76$) and test-retest reliability (Collins & Nowicki, 2001; Nowicki, 2004). Subtests were administered in counter-balanced order, and the number of correct responses summed for each subscale (24 items each) prior to the four subscale scores being summed to produce an overall emotion understanding score.

Theory of mind. Theory of mind was assessed using Faux Pas Stories (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999; Stone et al., 1998). A faux pas is defined as someone saying something they should not have said, without understanding that they have done so. Faux Pas Stories comprises a set of ten vignettes, some containing a faux pas. Participants are required to: 1. determine whether a faux pas occurred; 2. if so, identify it; 3. answer a comprehension question; and 4. answer a related theory of mind question. Faux Pas Stories has been used as a measure of higher order theory of mind skills in several studies (e.g. Dolan & Fullam, 2004; Milders, Fuchs, &

Crawford, 2003) and has demonstrated good construct and predictive validity (Baron-Cohen et al., 1999; Watling & Banerjee, 2005). For the current study, seven vignettes were recorded by a male narrator onto an audio cassette tape with minor changes to the script to ensure stories were appropriate to the New Zealand context. Stories not selected contained references which would be unfamiliar to New Zealand children (e.g., dinner lady). Following standard procedure, a score of 1 was given if all four questions pertaining to each story were answered correctly, and 0 if any of the four questions were answered incorrectly. Scores were then summed to produce an overall theory of mind score.

Dependent Variable

Psychosocial problems. Parents and teachers completed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), a scale commonly used to assess psychosocial problems. The SDQ demonstrates excellent

convergent validity with the Child Behavior Checklist (see Goodman & Scott, 1999; Klasen et al., 2000), and its validity has been demonstrated across a range of 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 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).

The SDQ comprises 25 items, five in each of the following domains: hyperactivity, conduct symptoms, emotional symptoms, peer problems, and pro-social behavior (see Hill & Hughes, 2007; Mellor, 2005). Consistent with standard practice, scores for the four negative domains were summed to produce a total score for psychosocial problems. As the mean for hyperactivity

was considerably higher than the means for other domains (across both groups), the four domain subtotals were converted to z-scores, in order to equally weight domains prior to summing for use in the regression analyses. Teacher and parent ratings for psychosocial problems were significantly correlated ($r = .48, p < .001$); therefore, combined parent and teacher SDQ (mean) scores were used for all analyses in order to increase the reliability of the findings. All analyses reported here were repeated using the separate parent and teacher ratings and the results obtained were very similar to the analyses reported using the combined ratings.

Procedure

Ethical approval was obtained from the University of Canterbury's ethics committee. Teacher-nominated children (potential RD and matched TA participants) took home parent and child *Study Information* sheets, consent and assent forms, the SDQ (parent form), and a *Background Information* form. On

Table 1. Means, standard deviations, and reliability coefficients for the major variables

	TA group ¹		RD group		Combined		Cronbach's alpha
	(n = 21)		(n = 21)		(N = 42)		
	M	SD	M	SD	M	SD	
WIAT-II ²							
Composite Reading	110.81	8.12	78.52	8.23	94.67	18.22	n/a
DANVA 2							
(% correct) ³	73.80	8.38	73.11	9.56	73.46	8.89	.57-.69
Total							
KBIT 2 ⁴							
Composite IQ	109.72	14.54	94.20	11.19	101.95	15.03	n/a
Faux Pas							
(no. correct)	5.14	1.31	4.19	2.14	4.67	1.82	.67
SDQ							
Psychosocial Problems ⁵	13.00	8.69	22.00	11.61	17.50	11.11	.74

¹TA = typically achieving; RD = reading difficulties, WIAT-II = Wechsler Individual Achievement Test; DANVA 2 = Diagnostic Assessment of Nonverbal Accuracy; KBIT 2 = Kaufman Brief Intelligence Test; Faux Pas range = 0 – 7; SDQ = Strengths and Difficulties Questionnaire (range = 0 – 40), raw scores are presented here (see method).

²Standardised scores on the WIAT-II have a population mean of 100 and a standard deviation of 15.

³Twelve items with negative item-total correlations were not included, when calculating the DANVA scores. However, results were very similar, whether the full or reduced scale was used.

⁴Standardised scores on the KBIT 2 have a population mean of 100 and a standard deviation of 15.

⁵Clinical scores for the SDQ: Boys 7-10 ≥ 19 (parent), ≥17 (teacher); boys 11-13, ≥17 (parent), ≥15 (teacher). Girls 7-10: ≥ 17 (parent), ≥15 (teacher); girls 11-13: ≥17 (parent) , ≥14 (teacher)

Table 2. Correlations among major variables

	1	2	3	4	5
	Reading Difficulties	DANVA 2	Faux Pas Stories	KBIT 2	SDQ
(N = 42)	(TA=0, RD=1)	Emotion Understanding	Theory of Mind	Composite IQ	Psychosocial Problems
1.	-	-.04	-.27	-.52**	.41*
2.		-	.20	.11	-.10
3.			-	.42*	-.44**
4.				-	-.43**

Note: DANVA 2 = Diagnostic Assessment of Nonverbal Accuracy; SDQ = Strengths and Difficulties Questionnaire. Higher scores indicate higher levels of each construct/variable.

* $p < .01$ ** $p < .005$

return of the completed forms, measures were administered, and teachers completed the teacher version of the SDQ. Separate consent was obtained from teachers, parents, and children and all participants were compensated for their time with vouchers. Children were seen individually and the WIAT-II was always administered first. Data were collected throughout the third and fourth terms of the school year, and most participants completed all measures within a two day period. All measures were administered in schools by the first author.

Results

Descriptive Findings

Means, standard deviations, and reliability coefficients for each variable are shown in Table 1. Acceptable variance was obtained on all measures.

Correlations

Correlations among the major variables are shown in Table 2. Note that Reading Difficulties (RD) is a categorical variable. Correlations with this variable are therefore equivalent (in terms of effect size and probability) to t-tests on means between the two groups (TA vs. RD).

In line with previous findings (e.g., Rutter & Maughan, 2005) children in the RD group obtained lower composite IQ scores than children in the TA group ($r = -.52, p < .005$) although all IQ scores for both groups were in the normal range (see Table 1 for means). As predicted, children in the RD group ($M = 22.00$) demonstrated significantly higher levels of psychosocial problems

than those in the TA group ($M = 13.00$). Notably, 29% of children with RD obtained psychosocial problem scores in the clinical range (above the 90th percentile), compared to none of the TA children.

Lower theory of mind scores were significantly associated with higher levels of psychosocial problems ($r = -.45, p < .005$) but the association with reading difficulties was not significant ($r = -.27, p < .10$). Remaining correlations among the independent variables were low and non-significant. Reading difficulties were not significantly correlated with emotion understanding. Correlations were all in the expected direction, supporting the construct

validity of the scales used.

Multiple Regression and Moderating Analyses

Emotion understanding. Using a standard hierarchical multiple regression approach to test for moderation (Baron & Kenny, 1986), emotion understanding (DANVA2) and reading difficulties were entered in the first model, and the regression coefficients calculated. Following this, the interaction term was entered. Reading difficulties significantly predicted psychosocial problems when emotion understanding was controlled for, but not vice versa (Table 3). The interaction term (reading difficulties x emotion understanding) explained a significant amount of variance (14%)

Table 3. Regression coefficients for emotion understanding (model 1), and theory of mind (model 2), as potential moderators for the relationship between reading difficulties and psychosocial problems

	Beta weight	t statistic	Semi - partial Correlation ²
Moderating Model 1:			
Reading Difficulties	.41	2.82**	.17
Emotion Understanding	.12	.80	.02
Interaction	.58	2.87**	.14
Moderating Model 2:			
Reading Difficulties	.32	2.27*	.12
Theory of Mind	-.37	2.63*	.15
Interaction	.23	.89	.02

Note. Main effects were calculated without the interaction term. The squared semi-partial correlations show the percentage of variance explained (effect size). Thus, the semi-partial correlations for the interaction terms show the increase in variance explained by the interaction term over and above the main effects. Considering only the two main effects, the multiple correlations were significant for both Model 1 ($R^2 = .30, F(2,39) = 8.18, p < .001$), and Model 2 ($R^2 = .28, F(2,39) = 7.72, p < .005$).

* $p < .05$ ** $p < .01$

over and above the variance explained by the two main effects (reading difficulties 17%, and emotion understanding 2%). Moreover, this moderating (interaction) effect of emotion understanding remained significant, staying the same or improving slightly, when the regression analyses were re-run controlling for gender, IQ, and theory of mind ($p < .05$; $sr^2 = .16, .14, \text{ and } .09$ respectively).

The nature of this interaction was illustrated using the standard approach, with data points representing one standard deviation above and below the mean plotted for each reading group (TA vs. RD), and the moderating variable (high emotion understanding vs. low emotion understanding). As shown in Figure 1, the slope for the RD group was consistent with predictions and was significant, $\beta = -.46$; $B = -4.03$, $p < .05$. That is, children in the RD group with low emotion understanding exhibited considerably higher levels of psychosocial problems, than those in the same group (RD) with high emotion understanding. In addition, the children with RD and high emotion understanding were similar (in terms of psychosocial problems) to children with low emotion understanding in the TA group. However, Figure 1 also shows (unexpectedly) that children in the TA group with low emotion understanding had relatively lower levels of psychosocial problems than those with high emotion understanding, although this slope was not significant ($\beta = .40$; $B = 2.85$).

Theory of Mind. The same approach was taken to test the moderating effects of theory of mind. The results showed that the presence of both reading difficulties and lower theory of mind scores significantly predicted higher levels of psychosocial problems, when entered into a multiple regression together (see Table 3). Importantly, when this initial step of the regression analysis was re-calculated controlling for gender and IQ, poorer theory of mind skills continued to predict increased psychosocial problems ($\beta = -.33$, $p < .05$) although the effects of reading difficulties decreased to non-significant levels ($\beta = .24$). A hierarchical multiple regression approach was again used to test for moderation, with theory of mind and reading difficulties entered together first, followed by the interaction term (reading difficulties x theory of mind). However, no significant interaction effect was found (see Table 3), and both within-group beta weights (equivalent to correlations) were in the same direction ($-.55$ for the TA group and $-.30$ for the RD group).

Discussion

The aim of the current study was to investigate the potentially protective effects of two socio-cognitive abilities for children with RD. In general, our comparisons between a group of non-referred children with RD and a matched group of typically achieving (TA) children yielded novel findings that were nevertheless largely consistent

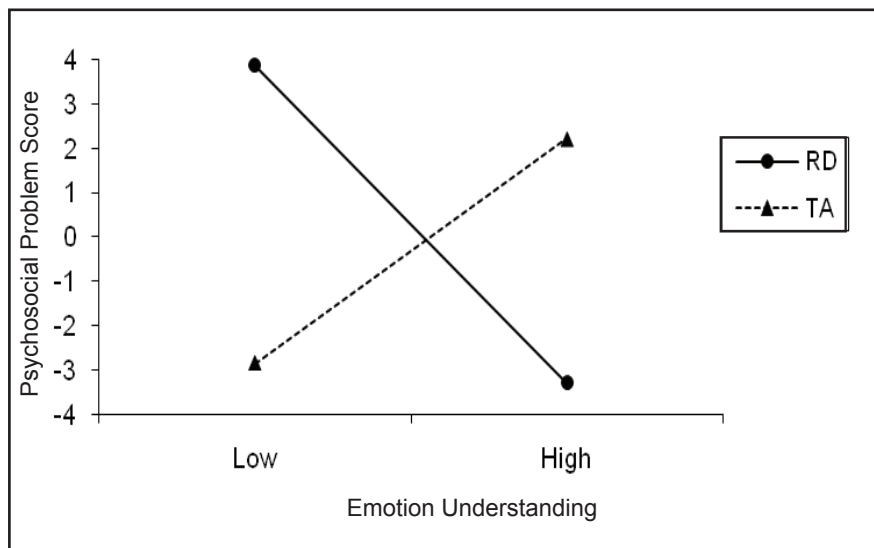
with predictions.

First, reading difficulties were significantly associated with increased levels of psychosocial problems, replicating previous findings. Second, theory of mind abilities had a similarly positive effect for both groups (RD and TA), with better theory of mind abilities predicting lower levels of psychosocial problems. Third, emotion understanding fulfilled a specific protective function for children with RD, with those having better emotion understanding skills displaying fewer psychosocial problems. In contrast, emotion understanding did not fulfil a similar role for children in the TA group. We acknowledge that, as with all studies using correlational data, further research would be needed to determine the causal direction of these findings.

The presence of RD is frequently associated with repeated experiences of failure, low self-esteem, and poorer quality relationships with peers and teachers (Maughan, 1995; Nowicki & Duke, 1994; Spira et al., 2005). Based on our findings, it seems plausible to reason that children with RD who are able to read others' emotions accurately may be better placed to cope successfully with the challenges associated with their reading difficulties. Our prediction concerned a possible protective (i.e., moderating) role for emotion understanding (rather than a main effect); however, it is interesting to note that there has been at least one other study in which children with learning difficulties (verbal) performed almost as well as control children on measures of simple emotion understanding (see Dimitrovsky, Spector, Levy-Shiff, & Vakil, 1998), as found in the current study.

To understand why emotion understanding moderates the link between RD and psychosocial problems consideration needs to be given to the reasons children with RD are at increased likelihood of experiencing poorer psychosocial functioning than their TA peers. Several plausible explanations for this have been advanced over the years, including: repeated experiences of failure leading to anger, frustration, and low self-esteem (Maughan, 1995); greater likelihood of children with RD developing poor relationships

Figure 1. Emotion understanding as a moderating variable for the association between reading difficulties (RD vs. TA) and psychosocial scores



with teachers and parents (Spira et al., 2005); and the negative effects of RD on peer relationships (Denham, 1998; Nowicki & Duke, 1994). Taken together, these findings imply that RD may be associated with multiple adverse effects for children. However, it is plausible that children who are able to read others' emotions accurately may be more able to successfully deal with adverse situations. In contrast, TA children are more academically competent, and are therefore not as likely to receive negative feedback from parents and teachers. Thus, for TA children, possessing good (or poor) emotion understanding skills may play a somewhat less pivotal role in their classroom interactions and relationships.

The finding that children with higher levels of emotion understanding in the TA group (see Figure 1) displayed relatively higher levels of psychosocial problems was unexpected. Although the associated slope was not statistically significant, and the result should therefore be treated with caution, further research using larger samples is warranted. However, it should be noted in regard to this finding that none of the participants in the TA group obtained psychosocial problem scores in the clinical range, whereas 29% of the children with RD obtained scores in this range (i.e., above the 90th percentile). Thus, we would emphasise that these findings support the claim that emotion understanding has a specific protective function that is not only of statistical significance, but potentially also of clinical significance, for children with reading difficulties.

As reported, theory of mind skills were protective for both groups (TA and RD) in terms of psychosocial problems, and we found no evidence that theory of mind skills moderated psychosocial outcomes for children with RD. That is, children with stronger theory of mind competence displayed significantly fewer psychosocial problems, regardless of their reading ability. This finding is consistent with previous studies (e.g., Capage & Watson, 2001; Fahie & Symons, 2003) but extends these findings to a sample of children with RD.

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 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. It seems possible that children with RD demonstrate theory of mind deficits with regard to the socio-perceptual, rather than the socio-cognitive, aspects of theory of mind. Happé and Frith (1996) found that children with conduct disorder who passed a false-belief theory of mind task were nevertheless rated more poorly by teachers on everyday theory of mind items. Thus, children with RD may demonstrate accuracy in 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; for example, Rucklidge & Tannock, 2002; Wolf & Bowers, 2000).

Clearer differences may also be found between the groups (TA and RD) if, as in recent studies using Faux Pas Stories, a supplementary empathy question concerning how the speaker and the recipient would feel after the faux pas was made had been included for each vignette. Group differences have been found on empathy responses (when comparing control groups with participants with antisocial personality disorders or autism) even when no differences in identification and understanding of faux pas are found (e.g., Dolan & Fullam, 2004). Future studies could profitably explore these possibilities.

The findings presented here have potential implications for intervention with children with reading difficulties, as social information processing skills have been shown to be amenable to change and improvement through instruction (Grinspan, Hemphill, & Nowicki, 2003). It may be that teaching theory of mind skills would result in similar improvements and would have a positive impact on longer term psychosocial outcomes.

This study had several limitations. First, the findings need to be replicated with a larger sample. However, although our sample was small, statistically significant results were obtained,

indicating that the effect sizes were moderately large (especially for the regression interaction analyses which are known to be conservative). Second, we used cross-sectional correlational data, whereas longitudinal studies would help address questions of causality. Third, the DSM-IV-TR (American Psychiatric Association, 2000) discrepancy method for identifying reading disorders was not used, thus limiting the generalisability of these findings to children diagnosed using DSM-IV-TR criteria (for an alternative view see Sternberg & Grigorenko, 2002). However, given that the DSM Taskforce is planning on moving away from the discrepancy model for DSM-V, our criteria for RD will be consistent with the new DSM definition.

The study also had a number of strengths. First the sample was carefully selected, with common co-morbid factors, particularly Attention-Deficit/Hyperactivity Disorder, excluded (Greenham, 1999). Second, there were equal numbers of girls and boys in each group (with no gender effects found). Third, data for psychosocial problems were obtained from both parents and teachers (see Pisecco, Baker, Silva, & Brooke, 2001), with good convergence between ratings increasing confidence in their validity. Fourth, the findings remained robust when IQ was controlled for, showing that neither the differences found between the RD and TA groups, or the within-group effects, were a function of IQ. Finally, identification of RD was based on a multifactorial model (Pereira-Laird et al., 1999), substantially reducing the likelihood of obtaining false positive or false negative RD classifications.

As previously noted, these findings provide support for the use of targeted psychosocial interventions in order to interrupt the cumulative downward spiral of reading difficulties and psychosocial problems that often develops over time. The findings of the current study suggest that children with RD who are better able to understand emotions, and have relatively good theory of mind skills (regardless of IQ or gender), are just as likely to experience positive psychosocial outcomes as their TA peers.

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