1 **The Role of Social Cognition and Prosocial Behaviour**

2 **in relation to the Socio-emotional Functioning**

3 **of Primary Aged Children with Specific Language Impairment**

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6 **Dr Ioanna Bakopoulou**

7 Centre for Educational, Appraisal and Research (CEDAR), University of Warwick

8

9 **Professor Julie E. Dockrell**

10 Department of Psychology and Human Development, UCL/Institute of Education, University

11 of London

12

13 **Address for Correspondence:**

14 Dr Ioanna Bakopoulou, Centre for Educational, Appraisal and Research (CEDAR) University

15 of Warwick, Westwood Campus, Coventry, CV4 7AL

16

17 **Email:** i.bakopoulou@warwick.ac.uk

18 **Tel**:   0044 (0) 207612 6293

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1   **Abstract**

2   *Background and Aims:* Children with language impairments often experience difficulties with

3   their socio-emotional functioning and poorly developed prosocial behaviour. However, the

4   nature of the association between language impairment and difficulties with socio-emotional

5   functioning remains unclear. The social cognition skills of a group of primary-aged children

6   (6 -11 years old) with Specific Language Impairment (SLI) were examined in relation to their

7   teachers' ratings of socio-emotional functioning.

8   *Sample*: Forty-two children with SLI were individually matched with 42 children for

9   chronological age and non-verbal cognitive ability, and 42 children for receptive language

10   ability. The children all attended mainstream primary schools or one Language Unit.

11   *Methods:* Four aspects of social cognition were directly assessed: emotion identification,

12   emotion labelling, inferring the causes of emotions, and knowledge of conflict resolution

13   strategies. The children's socio-emotional functioning was assessed using the Strengths

14   and Difficulties questionnaire (SDQ), a standardised measure, completed by their teachers.

15   Associations between children's performance on tasks of social cognition and children's

16   socio-emotional functioning were explored.

17   *Results:* Significant group differences were found for all social cognition tasks. The SLI

18   group was rated to experience significantly more problems with socio-emotional functioning

19   by their teachers than both control groups, indicating problems with all aspects of socio-

20   emotional functioning. Social cognition and prosocial behaviour, but not language ability,

21   predicted teacher-rated behavioural, emotional and social difficulties for the SLI group.

22   *Conclusion:* The results challenge current understanding of socio-emotional functioning in

23   children with SLI by pointing to the crucial role of social cognition and prosocial behaviour.

24   Factors other than expressive and receptive language play a role in the socio-emotional

25   functioning of children with SLI.

1   **1. Background**

2   *1.1   Introduction*

3   Social cognition is an umbrella term that can refer to a wide range of behaviours related

4   to the understanding of others' emotional or mental states (Botting & Conti-Ramsden, 2008;

5   Marton, Abramoff, & Rosenzweig, 2005). This includes the ability to identify, label and infer

6   emotions, and for social problem solving and conflict resolution (Sharp, Fonagy, & Goodyer,

7   2008).

8   Language competence plays a critical role in social cognition in pre-school and school-

9   aged children and adolescents (Im-Bolter, Cohen, & Farnia, 2013; Milligan, Astington, &

10   Dack, 2007), for typical and clinical populations (Farrar et al., 2009; Peterson & Siegal,

11   2000), by facilitating factors which impact on social relationships and behavioural adjustment

12   and, in turn, affect successful socio-emotional functioning (Astington & Baird, 2005). By

13   corollary, studies have demonstrated that children with language impairments commonly

14   experience difficulties with their socio-emotional functioning (Botting & Conti-Ramsden,

15   2000; Clegg, Hollis, Mawhood, & Rutter, 2005; van Daal, Verhoeven, & van Balkom, 2007),

16   show difficulties in social perspective taking (Gillott, Furniss, & Walters, 2004; Loukusa,

17   Makinen, Kuusikko-Gauffin, Ebeling, & Moilanen, 2014), and have immature social problem

18   solving and conflict resolution abilities (Marton et al., 2005). However, the association

19   between language competence and socio-emotional functioning has not consistently been

20   demonstrated (Fujiki, Brinton, & Clarke, 2002; Fujiki, Brinton, Morgan, & Hart, 1999; Hart,

21   Fujiki, Brinton, & Hart, 2004; Yew & O'Kearney, 2013). It has been hypothesised that social

22   cognition may have a mediating role between language competence and socio-emotional

23   functioning (Botting & Conti-Ramsden, 2008). The current study explores this relationship in

24   a cohort of primary-aged children (6 -11 year olds) with Specific Language Impairment (SLI).

1 *1.2   The links between Language Difficulties and Difficulties with Socio-emotional*

2 *Functioning in Children with SLI*

3   There has been much debate about the diagnostic criteria and terminology used to

4 describe the difficulties experienced by children with SLI (Bishop, 2014; Ebbels, 2014).

5 There is a general consensus that SLI is a language learning disorder where a child shows

6 significant deficits in language ability in the absence of other explanatory causes (ICD-10;

7 World Health Organisation (WHO) 1994). Recent research has shown that children with SLI

8 also show difficulties in areas of functioning not restricted to their language abilities. These

9 may include, among others, difficulties with executive functioning and processing capacity

10 and a range of motor difficulties (Im-Bolter, Johnson, & Pascual-Leone, 2006; Finlay &

11 McPhillips, 2013).

12   Children with SLI are also significantly more likely to show difficulties with various

13 aspects of socio-emotional functioning, and are at greater risk of developing behavioural,

14 emotional and social difficulties than typically developing peers (Yew & O'Kearney, 2013).

15 As pointed out by Lindsay and Dockrell (2012a), difficulties with socio-emotional functioning

16 include a variety of difficulties in related but different domains of development. The main

17 areas of difficulty for children with SLI are the development of successful peer relationships

18 (Fujiki, Brinton, Issacson, & Summers, 2001; Lindsay, Dockrell, & Strand, 2007), and the risk

19 of developing emotional difficulties, especially in studies of older primary aged children and

20 adolescents (Conti-Ramsden & Botting, 2008; Durkin & Conti-Ramsden, 2007; Lindsay &

21 Dockrell, 2012b; Redmond & Rice, 2002). Studies have also pointed out to less developed

22 prosocial behaviour with raised concerns reported by both teachers (Hart et al., 2004;

23 Lindsay & Dockrell, 2012a; 2012b; Timler, 2008), and parents (Stanton-Chapman, Justice,

24 Skibbe, & Grant, 2007). There are also reports of increased behavioural difficulties, in

25 particular, conduct problems in early childhood (Tomblin, Zhang, Buckwalter, & Catts, 2000).

26 Significant difficulties with hyperactivity/attention problems in younger and older primary

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1 aged children have often been reported (Lundervold, Heimann, & Manger, 2008; Lindsay et

2 al., 2007).

3   Several dimensions of the language system have been associated with difficulties

4 with socio-emotional functioning. Difficulties in using language to express oneself

5 (expressive language ability) have been associated with increased difficulties in socio-

6 emotional functioning (Caulfield, Fischel, DeBaryshe, & Whitehurst, 1989), predicting

7 behavioural difficulties at 10 and 12 years (Lindsay et al., 2007). Studies have also found

8 significant associations between a difficulty understanding language (receptive language

9 ability) and the development of behavioural, emotional and social difficulties (Beitchman et

10 al., 2001; Clegg, Law, Rush, Peters, & Roulstone, 2015; Conti-Ramsden & Botting, 2004;

11 Lindsay, Dockrell, & Mackie, 2008), predicting later problems with friendships (Durkin &

12 Conti-Ramsden, 2007). However, children with receptive language impairments have been

13 found to be at a greater risk for developing difficulties with socio-emotional functioning than

14 children presenting only with expressive language impairments (Toppelberg & Shapiro,

15 2000). The relationship between language and behavioural, emotional and social difficulties

16 has also been questioned. Poor performance of children with SLI on tasks measuring their

17 ability to access and participate in groups was not related to their language ability (Brinton,

18 Fujiki, Spencer, & Robinson, 1997), and children with SLI performed poorly in a task

19 requiring them to work together with their peers in cooperative learning groups even when

20 the task was non-verbal (Brinton, Fujiki, & Higbee, 1998a). Moreover, children with SLI

21 demonstrated poor negotiation skills even when the social situation posed linguistic

22 demands that were well within their expressive language abilities as assessed by

23 standardised language tests or when the linguistic demand of the task used was low

24 (Brinton, Fujiki, & Mckee, 1998b; Timler, 2008). Similarly, the social knowledge of children

25 with SLI, as measured in a conflict resolution task by Marton et al. (2005), was not related to

26 their language impairment.

1   The age of the child is also an important variable. Levels of behavioural, emotional

2   and social difficulties are reportedly higher among older relative to younger children with SLI,

3   particularly for peer problems and prosocial behaviour (Lindsay & Dockrell, 2012a).

4   Questions about the continuity of levels of behavioural, emotional and social difficulties have

5   also been considered. Continuity in levels of difficulties among children with SLI aged 4 to 8

6   years have been demonstrated (Benasich, Curtis, & Tallal, 1993), but other studies have

7   reported that continuity of difficulties over time varies according to the type of behavioural,

8   emotional and social difficulty under investigation. For example, difficulties with peer

9   relationships have been shown to be stable whereas prevalence of hyperactivity reduced

10   from 8 to 12 years (Lindsay et al., 2007). Thus studies which aim to examine the relationship

11   between social cognition, language and socio-emotional functioning difficulties should

12   consider age differences.

13   Together these studies question the direct relationship between language and socio-

14   emotional functioning. Language ability alone does not consistently predict levels of socio-

15   emotional functioning, and language ability is not the only essential prerequisite for the

16   implementation of socio-emotional skills. There is a need to take into account children's age

17   as well as their strengths and weaknesses and to examine a wider range of cognitive,

18   behavioural and emotional processes, in addition to language ability, which support

19   children's ability to be socially and emotionally successful (Clegg et al., 2015). The present

20   study's aim was to address these issues by considering the role of social cognition in the

21   socio-emotional functioning of a large cohort of children with SLI at two different

22   developmental phases of primary school education.

23   *1.3   Social Cognition Skills of Children with SLI*

24   Traditionally, social cognition in children with SLI was examined using tasks designed

25   to assess theory of mind performance, such as false belief tasks, and then compared to

26   children with ASD (Ziatas, Durkin, & Pratt, 1998). Initially, studies have suggested that

27   children with SLI were successful on false belief tasks in comparison with participants with

1   ASD (Shields, Varley, Broks, & Simpson, 1996), whilst others have produced conflicting

2   results (Norbury, 2005). Given the children's language difficulties it was hypothesised that

3   the linguistic demands of the task could reduce task performance. Miller (2001)

4   demonstrated that children with SLI (4 - 7 years) performed similarly to chronological age

5   matched peers when the linguistic complexity of the tasks was low, but their performance

6   was similar to that of younger children when the linguistic complexity was high suggesting

7   that some of the relationships observed might be due to task effects. Moreover, the failure to

8   include language matched samples means that it is not possible to rule out other

9   explanations of the children's difficulties, such as their social experience. Children's poor

10 social experience and limited access to conversations have been reported as influencing

11 task performance (Farmer, 2000; Farrant, Fletcher, & Maybery, 2006). Farmer's study

12 showed significant differences in social cognition scores and ratings of social competence

13 between typically developing children and children with SLI attending a special school

14 concluding that limited social experience and lack of rich conversational discourses may

15 interact with the language problems of the children with SLI to affect their social cognition

16 development.

17 We acknowledge that the term 'social cognition' covers a wide range of behaviours

18 (Botting & Conti-Ramsden, 2008). Since the exact nature of the different aspects of social

19 cognition is not fully agreed upon, we have adopted the term to apply to an understanding of

20 others' emotional or mental state, but acknowledge the fact that the implications of the

21 studies reviewed may vary according to different aspects examined. The reliance in previous

22 studies on false belief and false appearance tasks (Shields et al., 1996; Ziatas et al., 1998)

23 does not, arguably, capture other aspects of social cognition, such as children's

24 understanding of emotions and ability to resolve conflicts. These aspects were the focus of

25 the present study.

1   *1.3.1   Emotion Identification and Emotion Labelling in Children with SLI*

2   Being able to identify and interpret one's own emotions, as well as the emotional

3   reactions of others, has important implications for successful social functioning and

4   relationship formation (Denham, 1998). Some previous studies pointed that there were no

5   problems in the emotional identification of children with SLI. For example, children with SLI

6   (9 -14 years) performed similarly to matched peers when asked to identify basic emotions

7   but children were asked to identify only three emotions (happy, sad and angry) presented on

8   photographed still faces in a forced choice situation, and, as a result, a ceiling effect was

9   reached (Trauner, Ballantyne, Chase, & Tallal, 1993). Studies of preschool children using

10   facial drawings and cartoon faces also found no significant differences between children with

11   SLI and chronological age matched peers in their ability to identify four emotions (happiness,

12   anger, fear, sadness) (Ford & Milosky, 2003; McCabe & Meller, 2004). Similar findings have

13   been produced with children with SLI in the early stages of primary education (5 - 8 years)

14   when tasks examining the ability to match emotions (happy, sad, angry, afraid, disgusted,

15   neutral) in photographs of children's faces have been used (Loukusa et al., 2014).

16   In contrast, other studies have failed to corroborate these results. When presented

17   with facial expressions from still faces depicting seven emotions (anger, fear, sadness,

18   surprise, happiness, disgust, neutral) in a free labelling task, children (9 - 12 years) with

19   different types of learning disorders associated with verbal deficits were slower and less

20   accurate than chronological age matched peers in identifying the emotions (Dimitrovsky,

21   Spector, & Levy-Shiff, 2000). In the same vein, Spackman, Fujiki, Brinton, Nelson, and Allen

22   (2006b) compared 5 to 8 and 9 to 12 year old children with SLI with typically developing

23   peers using a forced-choice task to assess their ability to identify six emotions (happiness,

24   anger, disgust, fear, sadness, surprise) depicted in still faces, and concluded that children

25   with SLI identified the facial expressions of happiness, anger, sadness and fear with the

26   same accuracy as typically developing children, but they were significantly less accurate

27   than their peers at identifying surprise and disgust. Confusions in emotion identification and

1   labelling were further investigated by Delaunay-El Allam, Guidetti, Chaix, and Reilly (2011)

2   who used a free labelling task of five emotions depicted by still face photographs in a study

3   of 12 children with SLI aged 6 to 10 years. The researchers concluded that children with SLI

4   were less accurate in emotion labelling than typically developing children (although results

5   did not reach statistical significance) and that the semantic knowledge of anger and sadness

6   emotion concepts is deficient in this group of children.

7   In addition to identifying and labelling emotions, a child must also attend to, and use

8   contextual information to predict another's emotional response. Even if children with SLI are

9   able to identify facial expressions, they may not be able to use contextual information to

10   make appropriate emotional inferences. Using short scenarios, Spackman, Fujiki, and

11   Brinton (2006a) and Ford and Milosky (2003) examined children's ability to indicate the

12   emotions that the character experienced. Children with SLI were less accurate in integrating

13   emotion knowledge with event context to infer a character's emotion than typically

14   developing peers. In both studies, inferencing was easier for the emotion of happiness

15   whereas more inferencing errors occurred for the emotion of anger.

16   *1.3.2   Conflict Resolution Abilities of Children with SLI*

17   Knowledge of effective strategies for resolution of conflicts with peers is an important

18   aspect of social knowledge for children (Cillessen & Bellmore, 2002). The difficulties that

19   children with SLI have with language, as well as emotional understanding, are likely to

20   impact on their ability to resolve conflict situations. There is limited research examining

21   conflict resolution strategies of children with SLI. Children with learning disabilities and

22   language impairments have been found to be more passive than their peers in avoiding

23   disagreements, less persuasive and less effective in cooperative group tasks (Bryan,

24   Donahue, & Pearl, 1981). Preschool children with SLI were found to reconcile fewer conflicts

25   than children with typically developing language by seeking adult contact, preferring to solve

26   the conflict themselves (Brinton & Fujiki, 1999; Fujiki, Brinton, & Todd, 1996; Horowitz,

1 Jansson, Ljungberg, & Hedenbro, 2005; Rice, Sell, & Hadley, 1991; Redmond & Rice,

2 1998). School-age children with SLI were involved in more bullying episodes and exhibited

3 more submissive and aggressive behaviours (Baker, Cantwell, & Mattison, 1980). When the

4 ability of children with SLI to negotiate with two other chronological age matched peers in

5 triad interactions was examined, children with SLI were found to use significantly fewer

6 negotiation strategies, and those they used were at developmentally lower levels, than either

7 of the partners (Brinton et al., 1998b). Children with SLI asserted their own choices and

8 failed to request others' opinions or to reach an agreement within the group.

9 　　In studies using hypothetical scenarios and role-play enactments of conflicts, children

10 with SLI suggested fewer strategies to resolve conflicts than their peers with typically

11 developing language. They showed particular difficulties in using strategies involving

12 persuasion, asking questions to clarify situations or acquire more information, and taking into

13 account the perspective of others (Stevens & Bliss, 1995). In contrast, children with SLI

14 showed evidence of physically aggressive behaviour, or passive and withdrawn reactions,

15 such as departing the scene without resolving the conflict or expecting a third person to

16 solve the conflict to avoid the negotiation process (Marton et al., 2005).

17 *1.4　Aims and Predictions*

18 　　The aim of this study was to examine the social cognition skills of a group of primary-

19 aged children with SLI in relation to their socio-emotional functioning as rated by their

20 teachers. Given the lack of consistency in the literature of the importance of developmental

21 phase, the study also examines whether children with SLI of different ages present

22 differently in their social cognition and socio-emotional functioning.

23 　　To this end, a range of experimental tasks were devised to examine different aspects

24 of children's social cognition skills: emotion identification, emotion labelling, inferring the

25 causes of emotions, and knowledge of conflict resolutions strategies. Comparisons were

26 made between younger SLI participants (6 – 8 years) and older SLI participants (8 – 11

1   years) on their performance on the social cognition tasks to examine developmental

2   differences in the social cognition skills of children with SLI. The study also employed two

3   matched groups of typically developing children to identify any developmental delays and to

4   elucidate the role of language level on task performance. Children were matched on the

5   basis of their receptive language ability because of evidence suggesting that the ability to

6   understand and process verbal information is linked with the areas researched in this study

7   (Clegg et al., 2005; Craig & Washington, 1993; Farmer, 2000; Ford & Milosky, 2003), and

8   that children with receptive language impairment are at a greater risk for developing

9   difficulties with their socio-emotional functioning than children presenting only with

10   expressive language impairment (Toppelberg & Shapiro, 2000). The second reason was

11   methodological since the ability to process verbal information is required for all social

12   cognition tasks employed in the study and it was important to be able to relate this variable

13   to performance on the tasks.

14   In addition, information about children's socio-emotional functioning (including their

15   prosocial behaviour) was obtained through a standardised behavioural questionnaire,

16   completed by the children's teachers. Comparisons were made between younger SLI

17   participants (6 – 8 years) and older SLI participants (8 – 11 years) to investigate

18   developmental differences in the socio-emotional functioning of children with SLI as reported

19   by their teachers. In addition, comparisons were made with the two control groups to

20   determine the extent of any difficulties with socio-emotional functioning children with SLI

21   experience in comparison to typically developing peers. Finally, to investigate whether social

22   cognition, language and non-cognitive profiles were related to ratings of socio-emotional

23   functioning, the study explored associations between children's performance on social

24   cognition tasks, information about children's receptive and expressive language and non-

25   verbal cognitive ability and children's socio-emotional functioning, as rated by their teachers.

26   We predicted that:

27   1.   In terms of children's social cognition skills:

a. Children with SLI would follow typical developmental patterns in their performance on social cognition tasks in that the performance of younger SLI participants was expected to be poorer than the performance of older SLI participants in all three social cognition tasks.

b. Children with SLI would perform significantly worse than typically developing children matched for chronological age but similarly to typically developing children matched for language ability on tasks of social cognition requiring only receptive language abilities.

2. In terms of teacher rated socio-emotional functioning:

a. Younger SLI participants (6 – 8 years) would be rated as experiencing less difficulties than older SLI participants (8 – 11 years).

b. Children with SLI would be rated as experiencing more difficulties than their typically developing peers matched for chronological age.

c. Children with SLI would be rated as experiencing less developed prosocial behaviour than their typically developing peers matched for chronological age.

3. Poor language ability of the children with SLI would be significantly related to ratings of socio-emotional functioning (including children's prosocial behaviour), and specifically receptive language measures would correlate more strongly to measures of socio-emotional functioning than expressive language measures.

4. Performance on social cognition tasks would relate to teachers' ratings of socio-emotional functioning for all three participant groups.

2. Method

1   *2.1   Participants and Group Matching Procedures*

2   Forty-two children with SLI were individually matched with 42 typically-developing

3   children for chronological age and non-verbal cognitive ability (CA group) and 42 younger

4   children for receptive language ability (LA group). All the children were screened through the

5   use of standardised tests and tested on the Clinical Evaluation of Language Fundamentals –

6   Revised (CELF-R; Semel, Wiig, & Secord, 1980), and the Raven's Coloured Progressive

7   Matrices (Raven's CPM; Raven, Court, & Raven, 1986). For the identification of the SLI

8   participants, school staff were asked to suggest children for the sample who had a language

9   and communication difficulty, no known impairment in their physical, emotional or

10 neurological development.

11   The criteria for the identification of the SLI group were: a) an age equivalent score on

12 the CELF-R (Semel et al., 1980) at least 12 months below chronological age and/or Total

13 Language Standard Score at least 1.5 standard deviations below the mean for chronological

14 age and ;b) a score on Raven's CPM no lower than the 25th percentile. A total of 42 children

15 met the criteria for inclusion in the study and were aged 6 to 11;2 years. Thirty-seven were

16 male and five were female representing the gender difference in children with SLI (Law,

17 Boyle, Harris, Harkness, & Nye, 2000; Tomblin, 1996). Twenty-seven children had school

18 identified special educational needs, and 15 had received a Statement of Special

19 Educational Needs stating language and communication as their primary need (Department

20 for Education and Skills, 2001). This statement is a legal document issued by the local

21 educational authority detailing the needs of the child and how these should be addressed. Of

22 the 42 children within the SLI group, 29 children attended four mainstream primary schools

23 and 13 children attended a language unit attached to a primary school for part of their week,

24 and were included in some of the lessons in the mainstream school's classes. No receptive

25 (*t*40) = -.31, ns), expressive (*t*(40 = - 1.57*, ns*) or total language score (t(40) = -.94, *ns*)

26 differences on the CELF-R or the Raven's CPM (*t*(40) = -. 92, *ns)* were found between

27 children attending mainstream schools and a language unit within a mainstream school.

1   Thus, this variable is not considered further in the analyses. The SLI participants were also

2   sub-divided into two age groups: participants from 6 to 8 years (25 children) and participants

3   from 8;01 to 11;02 years (17 children).

4   The children with SLI were individually matched with a typically-developing group on

5   gender, non-verbal ability and chronological age (CA). For the CA group, school staff of the

6   same four primary schools were asked to suggest children from the same classes of the SLI

7   participants who had no history of speech and language impairment, no known impairment

8   in their physical, emotional or neurological development and no other academic difficulties.

9   Children were screened by administering the standardised verbal and non-verbal tests

10   administered for the identification of the SLI participants. From these results, a CA peer was

11   selected for each child in the SLI group. Children within a matched pair had chronological

12   ages that differed by no more than 3 months and ranged in age from 6 to 11;4 years. Their

13   Raven's CPM scores were in the same centile range as for the SLI participants and their

14   mean non-verbal ability score was within the average range for their age. The CA group

15   children had age appropriate language skills, defined as a CELF-R score above the 25th

16   centile.

17   SLI participants were also matched with a second younger typically-developing group

18   on their receptive language ability (LA). For each child with SLI, a match was identified who

19   had the same raw score in the three receptive language sub-tests (Linguistic Concepts,

20   Sentence Structure, and Oral Directions) on the CELF-R (Semel et al., 1980), but for whom

21   this translated into a centile score above the 25th centile. The LA group children were also

22   required to have age-appropriate non-verbal cognitive ability defined as a Raven's CPM

23   score above the 25th centile. The LA group consisted of 42 typically developing children

24   ranging in age from 5 to 7:8 years. They were drawn from the same four mainstream primary

25   schools and all had language skills and non-verbal ability scores within the average range

26   for their age. The mean age of this group was 26 months lower than that of the SLI group

27   and the CA group.

14

1   Children in all three groups had attended their current school for at least one

2   academic year and English was their first language. Detailed characteristics of SLI

3   participants and matched controls are shown in Table 1.

4   < Table 1 >

5   *2.2   Materials*

6   *2.2.1   General Procedure*

7   Each child was tested individually on two occasions. On the first visit, they were

8   tested on the language and non-verbal measures, and on the second on the social cognition

9   tasks. Teachers were given the SDQ questionnaires during the summer term of the

10   academic year when the study took place and were asked to complete and return them to

11   the researchers. In the case of the 13 children in the SLI group who attended a language

12   unit attached to a primary school for part of their week, the language unit teacher was asked

13   to complete the SDQ questionnaire as it was felt that they have a better knowledge of the

14   child. Forty-two SDQ questionnaires were returned for the SLI and the CA groups and 39 for

15   the LA group. All teachers had known the rated child for at least 7 months. The study was

16   approved by the ethics committee of the Institute of Education, University of London and

17   followed British Psychological Society guidelines. Consent for participation was obtained

18   from parents and from schools and children were given the option not to take part in tasks.

19   *2.2.2   Selection and Control Measures*

20   *Language Assessment*

21   CELF-R consists of three sub-tests measuring receptive language and three sub-

22   tests measuring expressive language (Semel et al., 1980). The receptive language subtests

23   include: Linguistic Concepts, Sentence Structure and Oral Directions. Older children (8 to

24   11;2 years) were assessed by two more receptive language subtests: Word Classes and

25   Semantic Relationships. The expressive language subtests are: Word Structure, Formulated

1   Sentences and Recalling Sentences. Older children were assessed by one more expressive

2   language subtest: Sentence Assembly.   CELF-R's reliability is .77 and the validity with the

3   Test of Language Development – Intermediate (TOLD-I) (Newcomer & Hammill, 1977) is

4   .68, with the Peabody Picture Vocabulary – Revised (PPVT-R) (Dunn & Dunn, 1981) .52,

5   and with the Wechsler Intelligence Scale for Children – Revised (WISC-R) (Wechsler, 1974)

6   .42.

7   *Non-Verbal Cognitive Ability*

8   The Raven's CPM presents children with a pattern with a section missing and

9   children are required to select the item that would complete the pattern from a choice of four

10   (Raven et al., 1986). The percentile score is reported: a cut-off at 25% indicates

11   significantly low scores. Raven's CPM demonstrates good reliability (reliability .80) and

12   validity with the WISC-R (.91) (Wechsler, 1974), and with the Standford-Binet Intelligence

13   Scales (.69) (Roid, 2003). The Matrices subtest of the British Ability Scales II (BAS II) was

14   used for children in the LA group who were not old enough for the Raven's CPM norms to be

15   used. Children are required to identify the correct item to complete a grid of designs with a

16   piece missing (reliability .85; validity with the WISC-III performance scale .47).

17   *2.2.3   Socio-Emotional Functioning and Prosocial Behaviour*

18   Children's socio-emotional functioning and prosocial behaviour were assessed using

19   the Strengths and Difficulties Questionnaire (SDQ: Goodman, 1997). SDQ is a 25-item-

20   questionnaire providing a dimensional checklist-based assessment of psychological

21   functioning for children 4-16 years-old. It asks about 25 attributes each in the form of a

22   behavioural descriptor (e.g. 'Considerate of other people's feelings'). The rater is asked to

23   comment whether this is 'not true', 'somewhat true' or 'certainly true'. The 25 items are

24   divided between four scales of five items each, generating scores for Conduct Problems,

25   Hyperactivity, Emotional Symptoms, Peer Relationship Problems. These four scales are

26   summed up to provide a Total Difficulties score. In addition, there is a five item Prosocial

1   scale that measures positive, actively helpful and friendly behaviours and resources in

2   children, rather than difficulties. Thus, the Prosocial scale is not included in the Total

3   Difficulties score because a lack of prosocial behaviour is conceptually different from the

4   presence of difficulties with socio-emotional functioning assessed by the other four SDQ

5   scales (Goodman, 1997). In all four SDQ scales, higher scores relate to poorer outcomes.

6   The Prosocial scale is scored positively so that high scores are preferable, indicating the

7   presence of more positive and adaptive behaviours and resources. The SDQ scale scores

8   are used to categorise participants according to the extent of their difficulties as being in the

9   Normal, Borderline or Abnormal range for each of the five subscales and the Total

10   Difficulties score, using the published cut scores (available from

11   http://www.sdqinfo.org/norms/UKNorm1.pdf). The concurrent and predictive validity of the

12   SDQ as well as standardization data for the cut-off points for each scale and the Total

13   Difficulties score have been set so that in a community sample approximately 80% of the

14   participants are in the normal range, 10% of the participants are in the borderline range, and

15   a further 10% are in the abnormal range on any given score (Meltzer, Gatward, Goodman, &

16   Ford, 2000).   The SDQ has also been shown to have satisfactory reliability, factor structure

17   and prediction of DSM IV (APA, 1994) diagnoses (Goodman, 2001).

18   *2.2.4   Social Cognition*

19   Participants were presented with three experimental tasks measuring labelling and

20   identifying emotions, inferring the causes of emotions and their knowledge of conflict

21   resolution strategies.

22   *Task 1:   'Labelling and identifying emotions' task.*

23   The first social cognition task aimed to establish whether children can identify and

24   appropriately label the four basic emotions: happiness, sadness, anger, and fear. Children

25   were shown the first set of photographs and were asked to identify the expressions, first

26   expressively, by naming, and prompted by the question "Please can you tell me what is this

1 boy / girl feeling?". After having labelled the emotions, the researchers showed the second

2 set of four photographs and asked the children to identify the expressions receptively, by

3 pointing to the expression the researchers named by asking "Which of these children feel

4 happy / sad / angry / frightened?" . The materials used were eight photographs portraying

5 the four expressions – a set of four photographs for the first question and a set of four

6 photographs for the second question - taken from a social skills programme, widely used in

7 schools (Spence, 1995). The child photographs were used, and the male and female version

8 was matched for the child's gender. The photographs were presented in a random order.

9 Children were given a point for a correct answer. A *Total Emotion Identification Score*

10 and a *Total Emotion Labelling Score* were measured out of 4.

11 *Task 2:   'Inferring the causes of emotion-eliciting context' task.*

12 The second task aimed to examine the ability to infer the emotions elicited by social

13 situations. The materials used were four felt material faces portraying happy, sad, angry and

14 frightened expressions, based on stories from a publicly available guide to emotional literacy

15 (National Deaf Children's Society & Reed, 2001).

16 The second task was presented to children through a software programme

17 developed for the present study and presented using the researcher's laptop. Initially,

18 children were trained to use the software programme, and were instructed in the use of the

19 different buttons on the keyboard. The participants then heard four stories. In each case,

20 the scenario was supported by pictures of the story described where the character's face

21 was blank. After listening to each story, the children were asked to choose from a selection

22 of four pictures the face that shows what the character was feeling by pressing a button on

23 the keyboard. Four emotions were presented: happy, sad, angry and frightened. Children

24 were also given the choice to press a button indicating that they had not understood the task

25 or that they do not know how the character would feel.

1   Children were given a point for a correct answer. A *Total Emotion Identification Score*

2   was then measured out of 4.

3   *Task 3:   'Conflict resolution abilities' task.*

4   The third social cognition task aimed to assess children's knowledge of a range of

5   conflict resolution strategies. Four hypothetical conflict scenarios, taken from and adopted by

6   the 'Child Role Play Measure' (Dodge, McClaskey, & Feldman, 1985), were presented to

7   children. These are stories which describe situations in which the child's task is to preserve

8   self-integrity while maintaining peer status. The scoring system developed by Dodge et al.

9   (1985) with a high level of inter-rater agreement (Cohen's kappa .92) was adopted for this

10   study. For each scenario, the scale has six possible categories ranging from low-level

11   conflict resolution strategies (indicating that the child did not respond or did not offer any

12   conflict resolution strategies) to high-level conflict resolution strategies (indicating a response

13   of an age-appropriate and sophisticated conflict resolution strategy). Since four hypothetical

14   scenarios were presented, children could receive a minimum score of 0 and a maximum

15   score of 24. The researchers followed the procedures set by the designing researchers

16   (Dodge et al., 1985).

17   *2.2.4.1 General scores derived from the three social cognition tasks.*

18   The scores from the three experimental tasks described above were combined to

19   create a *Social Cognition Composite Score*. The *Social Cognition Composite Score* was

20   derived from two different general scores: a *Total Emotion Prediction Score (*calculated from

21   Tasks 1 and 2) and a *Total Conflict Resolution Strategies Score* (from Task 3)*.*

22   A *Total Emotion Prediction Score* was calculated from the first two experimental

23   tasks. That was based on:

24   1. The Total Emotion Labelling Score (0 to 4) and Total Emotion Identification Score (0

25   to 4) from Task 1,

1   2. The Total Emotion Identification Score from Task 2 (0 to 4)

2   Thus, for the general *Total Emotion Prediction Score* children could receive a

3 minimum score of 0 and a maximum score of 12.

4   The *Total Emotion Prediction Score* (0 to 12) and the *Total Conflict Resolution*

5 *Strategies Score* (0 to 24) were combined to yield a *Social Cognition Composite Score.*

6 Children could receive a minimum of 0 and a maximum of 36. The *Social Cognition*

7 *Composite Score* is unequally-weighted due to the different score ranges of the component

8 subscales.

9   **3. Results**

10 *3.1   Results related to Hypothesis 1: Performance on Social Cognition Tasks*

11 *Task 1:   'Labelling and identifying emotions' task.*

12   Within group comparisons between younger SLI participants (below 8 years) and

13 older SLI participants (above 8 years) revealed that, in most cases, the younger SLI

14 participants were less successful in their labelling (Happiness: 96.0% vs 100%, Sadness:

15 92.0% vs 88.2%; Anger: 68.0% vs 88.2%; Fear: 32.0% vs 17.6%) and identification of

16 emotions (Happiness: 96.0% vs 100%; 64.0% vs 76.5%; Anger: 76.0% vs 76.5%; Fear:

17 68.0% vs 76.5) than the older SLI participants. Pearson's chi-square tests revealed that

18 there was no significant association between the two age groups and the ability of the

19 children from the two age groups to label (happiness: χ^2 (1) = 1.01, *n.s;* sadness: χ^2 (1) =

20 2.56, *n.s*; anger: χ^2 (1) = 2.04, *n.s*; fear: χ^2 (1) = 2.94, *n.s*) or identify (happiness: χ^2 (1) =

21 1.01, *n.s;* sadness: χ^2 (1) = 2.05, *n.s*; anger: χ^2 (1) = 0.07, *n.s*; fear: χ^2 (1) = 2.13, *n.s*) any of

22 the four basic emotions. Within group comparisons for the Total Scores between the

23 younger and the older SLI participants showed that younger SLI participants scored less on

24 the Total Emotion Labelling Score (*M* = 2.84, *SD* = .89) than the older SLI participants (*M* =

25 2.94, *SD* = .65). This difference was not significant *t*(40) = .39, *ns.* Younger SLI participants

1   also scored less on the Total Emotion Identification Score (M = 2.96, SD = 1.17) than the

2   older SLI participants (M = 3.29, SD = 1.04), a difference which was however not significant

3   t(40) = .94, $ns.$

4   Table 2 presents percentages of correct responses for the emotion labelling and

5   emotion identification task across the three participant groups as well as mean scores (SDs)

6   for the Total Emotion Labelling and Total Emotion Identification Scores.

7   < Table 2 >

8   As shown in Table 2, performance was near ceiling for labelling the emotions of

9   happiness and sadness across the three groups. Children from all three groups made more

10   errors when labelling the emotions of anger and fear. Pearson's chi-square tests revealed

11   that there was no significant association between the three groups and whether children

12   were able to label the emotion of happiness (χ^2 (2) = 2.01, $n.s$) and the emotion of sadness

13   (χ^2 (2) = 1.20, $n.s$). However, there were significant associations found between the three

14   groups and whether or not children were able to label the emotion of anger (χ^2 (2) = 8.73,

15   p=.013) and the emotion of fear (χ^2 (2) = 8.82, p=.012). The analyses for the Total Emotion

16   Labelling Scores showed a significant effect of group (F(2,123) = 5.59, p<.05, η^2=.49) where

17   children with SLI did not differ in the Total Emotion Labelling Score from the LA group (p, d =

18   .01), but differed significantly from the CA group (p < .05, d = .70). The latter two groups did

19   not differ significantly from each other (ns, d =.41).

20   In terms of emotion identification, nearly all the children with SLI identified the

21   emotion of happiness correctly (97.6%) and, the CA and LA groups reached a ceiling effect

22   for the emotion of happiness. Similarly, children from all three groups made more errors

23   when identifying the emotions of sadness, anger and fear. There was no statistical

24   significant association between the three groups for the identification of happiness (χ^2 (2) =

25   2.01, $n.s$) and fear (χ^2 (2) = .58, $n.s$) but significant associations were found between the

26   three groups and whether or not children were able to identify the emotion of sadness (χ^2 (2)

27   = 16.45, p<.001) and the emotion of anger (χ^2 (2) = 6.07, p<.05). The analyses for the Total

28   Emotion Identification Score showed a significant effect of group (F(2,123) = 4.92, p < .05,

1 η^2 = .49) where children with SLI differed significantly from the CA group (p < .05, d = .62) but

2 did not differ from the LA group (*ns*, d = .01). The latter two groups did not differ significantly

3 from each other (*ns*, d = .16).

4

5 *Task 2:* *'Inferring the causes of emotion-eliciting contexts' task*

6 Table 3 reports the frequencies and percentages of correct responses for the two

7 age groups within the SLI group, and shows that the older children with SLI were more

8 successful in inferring the causes of emotions for all emotions but fear. Pearson's chi-square

9 tests showed that there were no significant associations between the two age groups and

10 whether or not children with SLI of the two age groups were able to infer the causes of

11 emotion-eliciting contexts in the case of happiness (χ^2 (1) = 4.18, *ns*), sadness (χ^2 (1) = 0.21,

12 *ns*), anger (χ^2 (1) = 1.74, *ns*) and fear (χ^2 (1) = 3.89, *ns*).

13 <Table 3>

14 Table 4 reports the frequencies and percentages of correct responses for the three

15 groups, and show that the SLI group was less successful in linking emotions with social

16 situations than both the CA and LA groups. There were significant associations between the

17 groups and children's ability to infer the causes of emotion-eliciting contexts for the emotion

18 of sadness (χ^2 (2) = 6.64, p = .03), anger (χ^2 (2) = 11.94, p = .003) and fear (χ^2 (2) = 25.56, p

19 < .001) but no statistical significance in the association between groups and children's ability

20 to infer the emotion of happiness (χ^2 (2) = 2.98, *ns*) was found.

21 < Table 4 >

22

23 *Task 3:* *'Conflict resolution abilities' task.*

24 A between group comparison is presented in Table 5 which shows that the most

25 frequent conflict resolution strategy used by children with SLI was to involve an adult

26 (32.1%). By contrast, the most frequent conflict resolution strategy used by both children in

27 the CA and the LA groups was to ask their peer for clarifications to understand the motive

1   behind their actions (38.6% and 25.5% respectively). For the Total Conflict Resolution

2   Strategies Score, analyses showed that there was a significant group effect (F(2,123) =

3   18,17, $p < .001$, $\eta^2 = .22$). Post-hoc comparisons showed that the SLI group differed

4   significantly from the CA group ($p < 001$) and from the LA group ($p < 001$). However, the two

5   control groups did not differ from each other (*ns*).

6   < Table 5 >

7   *General Scores Derived from the Three Social Cognition Tasks*

8   Relationships between the three social cognition tasks were then considered. (Add

9   table?) Strong positive correlations were identified between the scores of all three

10   experimental tasks highlighting the fact that they measured related social cognition skills.

11   Following that, Table 6 presents the general scores derived from the three social cognition

12   tasks for the two age groups within the SLI group. There were no statistically significant

13   differences found between the two age groups for the Total Emotion Prediction Score (t(40)

14   = -1.92, *ns*) the Total Conflict Resolution Strategies Score (t(40) = -1.74, *ns*) or the Social

15   Cognition Composite Score (t(40) = -2.97, *ns*).

16   < Table 6 >

17   Table 7 presents the general social cognition scores for the three participant groups.

18   <Table 7>

19   The between-group analyses for the Total Emotion Prediction Score showed a

20   significant group effect, F(2,123) = 15,68, $p < .001$, $\eta\rho^2 = .20$, where children with SLI

21   differed from the CA group ($p < .001$), and from the LA group ($p = .01$). The latter two groups

22   did not differ from each other (*ns*). Finally, the three groups differed significantly on the

23   Social Cognition Composite Score F(2,123) = 35,33, $p < .001$, $\eta^2 = .36$, with the SLI group

24   differing significantly from the CA group ($p < 001$), as well as the LA group ($p < 001$).

25   Differences were not found between the two comparison groups (*ns*).

26

1   *3.2   Results related to Hypothesis 2: Prevalence of difficulties with socio-emotional*

2   *functioning based on teacher ratings.*

3   Table 8 presents the SDQ means (SDs) between the two age groups within the SLI

4   group as rated by their teachers. Group differences for the SDQ subscales were analysed

5   using a MANOVA with age group (2 levels) as a between factor. The results indicated that

6   there was no significant main age group effect, Wilk's Lambda: F (1,40) = .91, *ns*, ηp^2 = .08.

7   The two age groups did not differ significantly in any of the SDQ subscales or the Total

8   Difficulties Score (F(1,40) = 1.05, *ns*, ηp^2 = .02; Emotional Symptoms: F(1,40) = .32, *ns*, ηp^2

9   = .008; Conduct Problems: F(1,40) = .03, *ns*, ηp^2 = .001; Hyperactivity: F(1,40) = 1.77, *ns*,

10   ηp^2 = .04; Peer Problems: F(1,40) = 1.25, *ns*, ηp^2 = .03; Prosocial: F(1,40) = .30, *ns*, ηp^2 =

11   .008).

12   < Table 8 >

13   Table 9 shows the comparison of the SDQ results for the children with SLI and their

14   matched peers indicating that there was a significant main effect for group Wilk's Lambda:

15   F(2,120)=7.21, p<.001. The three groups differed significantly in the Total Difficulties Score,

16   and all the SDQ subscales (Total Difficulties: F(2,120)=22.59, p<.001, ηp^2=.27; Emotional

17   Symptoms: F(2,120)=10.81, p<.001, ηp^2=.15; Conduct Problems: F(2,120)=6.92, p=.001,

18   ηp^2=.10; Hyperactivity: F(2,120)=16.83, p<.001, ηp^2=.21; Peer Problems: F(2,120)=19.36,

19   p<.001, ηp^2=.24; Prosocial: F(2,120)=34.69, p<.001, ηp^2=.36). On all the SDQ subscales,

20   post-hoc analyses showed that the mean score for the children with SLI was significantly

21   higher than the mean score of both the CA and LA group children (p<.005), and that the

22   mean score of the CA group children did not differ significantly from the mean scores of the

23   LA group (*n.s*).

24   <Table 9>

1   *3.3   Results related to Hypotheses 3 and 4: The role of verbal ability, non-verbal cognitive*

2   *ability, prosocial behaviour, and social cognition on socio-emotional functioning.*

3   To examine the relationships between measures of socio-emotional functioning,

4   language ability, non-verbal cognitive ability, prosocial behaviour, and social cognition, a

5   series of partial correlations were conducted controlling for the effect of age. The effects of

6   age were partialled out as it was considered that some aspects of language ability may be

7   affected by increase in age, as might some aspects of socio-emotional functioning and

8   performance on social cognition tasks. The Social Cognition Composite Score was used as

9   an overall measure of children's social cognition competence. The SDQ Total Difficulties

10   score was used as a measure of children's overall social-emotional functioning and the

11   Prosocial Behaviour subscale, which is not included in the Total Difficulties score, was used

12   as an index of children's positive social attributes and helpful behaviours. The analyses were

13   conducted for the three groups separately.

14   As seen in Table 10 below, the only significant correlations for the SLI group were

15   between the Total Difficulties Score and the Social Cognition Composite and the Prosocial

16   Behaviour subscale of the SDQ. The negative correlations indicated that the weaker social

17   cognition skills were for children with SLI, the stronger the likelihood was for teachers to

18   report difficulties with socio-emotional functioning; and similarly, the poorer prosocial

19   behaviour was for children with SLI, the greater behavioural, emotional and social difficulties

20   teachers reported. There were no significant relationships found between measures of

21   language and non-verbal cognitive ability and the Total Difficulties SDQ Score.

22   <Table 10>

23   For the CA group (Table 11), the strongest significant relationships were found

24   between the Total Difficulties Score of SDQ and the Social Cognition Composite and the

25   Prosocial Behaviour subscale of the SDQ. These results highlight that for CA group children,

26   their performance on tasks of social cognition and their prosocial skills were strongly

27   interrelated with their general socio-emotional functioning at school. In particular, the

1   negative correlations pointed to the fact that weak social cognition skills and poor prosocial

2   behaviour correlated with more behavioural, emotional and social difficulties at school for the

3   CA group. As for the SLI group, no statistically significant relationships were found between

4   the language and non-verbal measures and the Total Difficulties SDQ Score. Finally for the

5   LA group, as seen in Table 11, the strongest relationships with the Total Difficulties Score of

6   the SDQ were found with the measure of non-verbal cognitive ability Raven's CPM, the

7   Social Cognition Composite score and the Prosocial Behaviour subscale of the SDQ. The

8   negative correlations emphasise that children's general socio-emotional functioning related

9   strongly with their non-verbal cognitive ability, as well as their ability to understand others'

10   mental and emotional states, in that lower non-verbal cognitive ability scores, poorer social

11   cognition and prosocial skills significantly correlated with poorer socio-emotional functioning

12   for the LA group.

13   < Table 11 >

14   Multiple hierarchical regressions were carried out to investigate in sequence the role

15   of verbal ability, non-verbal cognitive ability, prosocial behaviour and social cognition in

16   predicting children's socio-emotional functioning. To examine the relative role of the

17   different factors, regression analyses were performed for each group separately. The

18   dependent variable indexing socio-emotional functioning was the SDQ Total Difficulties

19   Score (excluding the prosocial behaviour subscale). The independent variables were

20   entered stepwise in five steps: (i) chronological age; (ii) social cognition composite; (iii)

21   prosocial behaviour; (iv) non-verbal cognitive ability; (v) receptive language and (vi)

22   expressive language. The assumption of non-multicollinearity was checked using the

23   correlation matrixes and the VIF values, which found to be less than 10 in all three

24   regressions thus the assumption of non-multicollinearity was met.

25   The SLI group final model was significant explaining 44% of the variance (F(1,38) =

26   13.79, p < .001., R_{adj}^2 = .44). The significant predictors were the Social Cognition Composite

27   Score (26% of the variance) and the Prosocial Behaviour Scale (18% of the variance).

28   Chronological age, language and non-verbal cognitive ability did not contribute to the final

1   model. For the CA group, the final model was significant and explained 38% of the variance

2   ($F(1,39) = 15.15$, $p < .001.$, $R_{adj}^2 = .38$) with the Prosocial Behaviour subscale as the most

3   significant variable. Finally, for the LA group the final model comprised Social Cognition

4   Composite Score, explaining a significant 61% of the variance ($F(1,31) = 51.87$, $p < .001.$,

5    $R_{adj}^2 = .61$).

6   < Table 12 >

7   **4. Discussion**

8   *4.1   Summary of findings*

9   Based on a relatively large population-based cohort, our results indicated that children

10   with SLI differed from their typically developing peers in their processing of social information

11   and, thus our results support previous studies which found that children with language

12   impairments also have subtle social cognition impairments (Botting & Conti-Ramsden, 2008;

13   Clegg et al., 2005; Farmer, 2000).   Contrary to our first prediction, children with SLI

14   performed significantly lower than both CA and LA group peers on all three measures of

15   social cognition. Crucially, because the performance of children with SLI was lower than both

16   comparison groups, performance across the three areas of social cognition investigated

17   cannot be explained solely by children's poor language ability.

18   Results from the 'Labelling and identifying emotions' task pointed to children with SLI

19   having difficulties in labelling and identifying emotions and, contrary to our first prediction,

20   their performance differed from both the CA and LA groups. Children with SLI thus

21   demonstrated difficulties with emotional understanding which suggests that the basic ability

22   to identify emotions from facial expressions may develop more slowly in this group of

23   children but also that their abilities are not directly linked to their receptive language levels

24   (Delaunay-El Allam et al., 2011; Spackman et al., 2006b). These results contrast with those

25   of McCabe and Meller (2004) with younger preschool children. The measure used in the

26   current study was not restricted by a ceiling effect as in the McCabe and Meller (2004) study

27   and, as such, allowed a clear indication of the children's difficulties.

1   Based on previous research literature, we expected that some emotions might be easier

2   to identify and label than others and this was indeed the case. Almost all the children in the

3   current study were able to identify and produce lexical labels for the facial expressions of

4   happiness and sadness (see for example Ford & Milosky, 2003). Children in all three groups

5   also made significantly more errors for the facial expressions of 'anger' and 'fear'. However,

6   differences between the groups were still observed, with the SLI group performing

7   significantly lower than both comparison groups for the emotions of sadness, anger and fear.

8   Children with SLI were also less proficient than both comparison groups at making

9   accurate social inferences of a character's emotions as shown by the 'Inferring the causes of

10   emotion-eliciting contexts' task results. Contrary to our prediction, differences between the

11   three groups were found for the emotions of sadness, anger and fear, with the SLI group

12   being less successful than both comparison groups. All three groups found it harder to

13   interpret the more ambiguous, subtle and complex emotions of sadness and fear and

14   children in all groups made significantly more correct inferences in the happy condition,

15   supporting Denham's argument (1998) about developmental differences in emotion

16   understanding. Although there is limited research in the area of emotion understanding and

17   how children with SLI infer emotions elicited by social situations, the findings support those

18   of Ford and Milosky (2003) and Spackman et al. (2006a) who found that children with SLI

19   had significantly more difficulty inferring the expected emotional reaction when compared

20   with children with typical language skills. The ability to predict the emotion that an event is

21   likely to produce is important in judging how to respond to others in social situations. The

22   difficulties experienced by the children with SLI in making causal inferences about the

23   emotional states of others are likely to have an adverse impact on their relationships.

24   Results from the final 'Conflict resolution abilities' task showed that the most frequent

25   conflict resolution strategies for children with SLI were getting help from an adult, doing

26   nothing and being submissive or physically aggressive when conflicts arose. When

27   compared to the two control groups, children with SLI reported that they would use

28   reconciliation significantly less in conflict scenarios, and that they would not use language-

1   based strategies such as asking for clarifications, to make sense of a conflict situation (see

2   also Brinton et al., 1998b; Marton et al., 2005; Stevens & Bliss, 1995). Statistically significant

3   differences were found between the three groups on the Total Conflict Resolution Strategies

4   Score with the SLI group scoring significantly lower than both matched groups.

5   In relation to teachers' ratings of children's socio-emotional functioning, participants

6   with SLI were reported to have raised levels of difficulties in all aspects of their socio-

7   emotional functioning, as identified by the SDQ in comparison to national norms (see also

8   Lindsay et al., 2007). As predicted in our second hypothesis, when the children's scores

9   were compared with both control groups, who attended the same schools, all scales of SDQ

10 varied significantly between groups, with the SLI group being rated as exhibiting significantly

11 more problems than both control groups according to previous studies (Beitchman, Wilson,

12 Brownlie, Walters, Inglis, & Lancee, 1996; Clegg et al., 2005; Lindsay & Dockrell, 2012a).

13 Teachers' ratings indicated that 28.6% of children with SLI rated as 'abnormal' in the Total

14 Difficulties scale, compared to 2.4% from the CA group and none from the LA group.

15   Our results also confirm the importance of examining different types of behavioural,

16 emotional and social difficulties, as opposed to only considering a composite of socio-

17 emotional functioning or a general diagnosis of psychiatric disorder supporting warnings

18 from earlier studies about the generic nature of the term (Lindsay & Dockrell, 2012a; 2012b),

19 and thus extend our understanding by providing a detailed description of these children's

20 behavioural, emotional and social needs. Examination of specific types of behavioural,

21 emotional and social difficulties revealed that teachers reported fewer emotional symptoms

22 and conduct problems, in accordance to previous research (Lindsay et al., 2007; Lindsay &

23 Dockrell, 2012a; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004; Redmond & Rice,

24 2002). By contrast, reports of hyperactivity were very high in the school setting (35.7%) (see

25 also Lindsay et al., 2007; Lundervold et al., 2008; Marton, 2008). Teachers also raised

26 significant concerns about the children's prosocial behaviour (47.6%). Poor prosocial

27 behaviour is expected to affect children's social relationships and interactions with peers.

28 Children with higher levels of prosocial skills show greater empathy, are more likely to be

1   popular, and are less likely to be rejected (Findlay, Girardi, & Coplan, 2006; Ladd, 2005;

2   Warden & Mackinnon, 2003). In the present study, lower levels of prosocial behaviour were

3   associated with greater problems with peers (28.6%), reflecting the significant difficulties

4   children with SLI are reported to have with social integration and peer acceptance (Brinton &

5   Fujiki, 1999; Lindsay et al., 2007; McCabe & Marshall, 2006).

6   The present study also addressed the lack of consistency in the literature of the

7   importance of developmental phase by examining a population based sample with a large

8   age range and thus allowing for within group comparisons between the younger (below 8

9   years) and older (8 years and above) SLI participants. In response to the developmental

10   pattern noted in the literature, we hypothesised that a) younger SLI participants would

11   perform more poorly than the older SLI participants in tasks of social cognition and that b)

12   teachers would rate older SLI participants as experiencing more difficulties with socio-

13   emotional functioning in comparison to younger SLI participants. Although there was a trend

14   for the older SLI participants to score higher on all social cognition tasks in comparison to

15   the younger group, the differences between the age groups were not statistically significant

16   contrary to our research prediction. Also, teachers rated the group of younger children with

17   SLI as presenting with more difficulties in all the areas of socio-emotional functioning, but

18   again the differences between groups did not reach statistical significance, and thus our age-

19   group prediction was not confirmed. These findings are also in contrast with recent research

20   showing an increase in behavioural, emotional and social difficulties for older primary aged

21   children (Lindsay & Dockrell, 2012a; 2012b).

22   A unique feature of the present study was also the potential to investigate the

23   relationships between socio-emotional functioning, verbal ability, non-verbal cognitive ability,

24   prosocial behaviour and social cognition and therefore to examine the predictors of socio-

25   emotional functioning for the three participant groups. For all three groups, reported

26   difficulties with socio-emotional functioning by teachers were significantly correlated with

27   children's performance on social cognition tasks and their prosocial behaviour. The greater

28   the level of difficulties with socio-emotional functioning reported by the teachers, the more

1 likely it was for children of all three groups to experience difficulties with their understanding

2 of others' mental states and their prosocial behaviours. Verbal and non-verbal cognitive

3 measures were not found to have any relationship with reported behavioural, emotional and

4 social difficulties, with the exception of the LA group where non-verbal cognitive ability was

5 significantly positively correlated with measures of socio-emotional functioning.

6   Regression analyses demonstrated that for children with SLI, performance on social

7 cognition tasks and prosocial behaviour emerged as significant predictors jointly explaining

8 about half of the variance (44% of the variance). Social cognition was also the most

9 significant predictor of the socio-emotional functioning of LA group children. In contrast, for

10 the CA group, prosocial behaviour, and not social cognition, predicted socio-emotional

11 functioning. These results suggest that the way children encode, interpret and reason about

12 social information plays an important role in their ability to interact with others (Crick &

13 Dodge, 1994), and set as a reminder of the importance of considering not only language

14 skills but also social cognition skills in relation to children's socio-emotional functioning. The

15 absence of a relationship between social cognition and socio-emotional functioning for the

16 CA group could be explained by a hypothesis whereby, once certain features are in place

17 (such as competent language ability), other features may enhance and play a role in general

18 socio-emotional functioning. In the present study, the relationships between language and

19 non-verbal cognitive ability with social cognition were not as predicted. An absence of a

20 relationship between language and measures of socio-emotional functioning may reflect the

21 low language scores for the SLI group and the relatively high scores for the CA group. In

22 both groups, differentiation of scores would be difficult which would make relationships

23 between language and socio-emotional functioning hard to identify.

24 *4.2 Limitations*

25   A number of methodological issues need to be considered. In the present study, social

26 cognition was conceptualised as a multi-faceted construct that refers to the mental

27 operations underlying social interactions. These mental operations include perceiving,

1   interpreting and generating responses to the emotional states, intentions, and behaviours of

2   others (Fiske & Taylor, 1991; Kunda, 1999). As mentioned earlier, social cognition is a

3   somewhat ambiguous 'umbrella' term of a construct not fully understood in research (Botting

4   & Conti-Ramsden, 2008). The implications of our study, and the tasks we used to assess

5   this skill, need to be considered with regard to the fact that social cognition is a composite

6   ability which includes a number of independent but related skills. Although we use the

7   general 'social cognition' term, it should be noted that our tasks tap into specific aspects of

8   this composite ability. Future studies, using different measures, could tap into different

9   aspects of the social cognition construct and therefore maybe reveal different patterns in

10   social cognition development of children with SLI and its relationship to children's socio-

11   emotional functioning.

12   Furthermore, there is some concern in research that social cognition tasks tap into

13   language impairments and therefore children with SLI are disadvantaged by the linguistic

14   load evident in those tasks (Miller, 2001; Timler, 2008). We have controlled for this by using

15   tasks designed for children of younger age but also by including a LA group so as to

16   elucidate the role of language level on task performance.

17   The present study explored associations between children's receptive and expressive

18   language, their non-verbal cognitive ability and ratings of socio-emotional functioning; we did

19   not find any association between language measures and ratings of socio-emotional

20   functioning. However, no measure of pragmatic language skills was collected. Evidence from

21   previous studies suggests that difficulties with socio-emotional functioning may be due to

22   problems relating to the pragmatics of language (Conti-Ramsden & Botting, 2004; Olswang,

23   Coggins, & Timler, 2001; St Clair, Pickles, Durkin, & Conti-Ramsden, 2011). Future studies

24   should include a broader range of language measures to include both structural and

25   pragmatic language so that the association between language measures and ratings of

26   socio-emotional functioning can be investigated comprehensively.

1   Equally, there may be other factors beyond the scope of the present study, in addition to

2   specific language dimensions, that may impact on the socio-emotional functioning and/or

3   social cognition skills of children in SLI. For example, literacy problems (Carroll, Maughan,

4   Goodman, & Metlzer, 2004), children's self-esteem (Wadman, Durkin, & Conti-Ramsden,

5   2008), social and economic status (Mistry, Biesanz, Chien, Howes, & Benner, 2008) or a

6   lack of rich conversational opportunities (Farmer, 2000) could be further investigated in

7   future studies as potential factors.

8   While considering the relationship between language impairment and difficulties with

9   socio-emotional functioning, this study considered children's profiles at school. It would be

10   important to also investigate their parents' perceptions, developing previous research that

11   shows inconsistencies across different environments (Lindsay et al., 2007). Future studies

12   could explore both within-child factors (verbal ability, non-verbal cognitive ability and social

13   cognition) and the influence of the environment (home and school) in engendering,

14   maintaining and altering behavioural, emotional and social difficulties.

15   *4.3 Conclusions and Implications*

16   The present study has advanced our understanding of the relationship between

17   language impairment and socio-emotional functioning by investigating the role of children's

18   social cognition skills as a possible mediating factor in the relationship (Clegg et al., 2005;

19   Farmer, 2000), and by considering some methodological issues not deeply addressed

20   before. Firstly, it was crucial to understand the relationship between social cognition and

21   socio-emotional functioning in a mainstream population-based sample, like that employed in

22   the present study. The study involved a relatively large sample of language-impaired and

23   typically-developing children, who were all selected from mainstream primary schools and

24   individually matched on objective and consistent criteria for age, language and non-verbal

25   cognitive ability. Additionally, the age range of children with SLI (6 to 11 years) has not been

26   extensively studied in the literature in relation to this subject and it was interesting to

1   investigate whether there are any within group differences between younger and older

2   primary aged children with SLI.

3   The present study showed that the difficulties in socio-emotional functioning experienced

4   by children with SLI could not be totally explained by a single factor in their profile of abilities.

5   However, the study indicated that performance on social cognition tasks and prosocial skills

6   were significant predictors of teachers' ratings of socio-emotional functioning. Children's

7   impaired expressive and receptive language abilities were not found to be associated with

8   poor socio-emotional functioning, suggesting that factors other than expressive and

9   receptive language ability are at play in this group of children. Provision for children with SLI

10   should therefore take into account their likelihood of needing support to develop prosocial

11   skills and social cognition skills, as well as targeting their language weaknesses.

12   **Acknowledgements**

15   **Declaration of interest**

16   The authors report no conflicts of interest. The authors alone are responsible for the content

17   and writing of the paper.

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14

15

1   Table 1

2   *Raw score means (M) and Standard Deviations (SDs) for children's chronological age in*
3   *months, along with the Raven's CPM and CELF-R measures used for matching.*
4

Group	SLI	CA	LA	Significance
	n = 42	*n = 42*	*n = 42*	
	M	*M*	*M*	
	(SD)	*(SD)*	*(SD)*	
Age (in months)	94.81	95.21	68.88	SLI = CA > LA
	(20.15)	(21.02)	(6.40)	F(2,123)=32.25, *p*<.001
Raven's CPM	61.43	63.14	70.41	SLI = CA = LA
(centile)	(23.74)	(24.37)	(28.26)	*F*(2,118)=1.62, *n.s*
	25-95	25-95	25-95	
Linguistic Concepts	12.26	17.62	12.26	SLI = LA < CA
	(2.72)	(2.14)	(2.72)	*F*(2,123)=62.0, *p*<.001
Sentence Structure	19.29	22.88	19.29	SLI = LA < CA
	(2.28)	(1.92)	(2.28)	*F*(2,123)=38.27, p<.001
Oral Directions	7.38	15.98	7.38	SLI = LA < CA
	(3.90)	(3.97)	(3.90)	*F*(2,123)=67.14, *p*<0.001
Receptive Language Standard	17.33	17.33	27.86	SLI = LA < CA
Score	(3.55)	(3.55)	(3.33)	*F*(2,123)=134.94, *p*< .001
Expressive Language	16.74	32.36	31.14	SLI < CA = LA
Standard Score	(2.93)	(5.73)	(5.18)	*F*(2,123)=120.72, *p*<.001
Sum of Standard Scores	34.07	63.71	59.00	SLI < CA = LA
	(5.96)	(9.60)	(7.38)	

5   *Note*. The Raven's CPM score is percentile score.
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1   Table 2

2   *Task 1 Percentage of Correct Emotion Labelling and Correct Emotion Identification across*
3   *Group and Means (SD) of Total Emotion Labelling and Total Emotion Identification Scores*

	Emotion Labelling			Emotion Identification		
	SLI	*CA*	*LA*	*SLI*	*CA*	*LA*
	(n = 42)	*(n = 42)*	*(n = 42)*	*(n = 42)*	*(n = 42)*	*(n = 42)*
Happiness	97.6	100	100	97.6	100.0	100.0
	(n = 41)	*(n = 42)*	*(n = 42)*	*(n = 41)*	*(n = 42)*	*(n = 42)*
Sadness	90.5	92.9	85.7	69.0	95.2	95.2
	(n = 38)	*(n = 39)*	*(n = 36)*	*(n = 29)*	*(n = 40)*	*(n = 40)*
Anger	76.2	97.6	88.1	76.2	95.2	83.3
	(n = 32)	*(n = 41)*	*(n = 37)*	*(n = 32)*	*(n = 40)*	*(n = 35)*
Fear	26.2	57.1	35.7	71.4	78.6	73.8
	(n = 11)	*(n = 24)*	*(n = 15)*	*(n = 30)*	*(n = 33)*	*(n = 31)*
Total Mean Scores	2.88	3.43	3.10	3.10	3.67	3.55
(SD)	*(.80)*	*(.77)*	*(.69)*	*(1.12)*	*(.65)*	*(.80)*

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1 Table 3

2 *Task 2 Frequencies and Percentage of Correct Responses for Inferring the Causes of*
3 *Emotion-Eliciting Contexts by Age Group within the SLI Group*

	< 8 years (*n* = 25)		>8 years (*n* = 17)	
	n	%	*n*	%
Happiness	19	76.0	16	94.1
Sadness	13	52.0	9	52.9
Anger	14	56.0	10	58.8
Fear	9	36.0	3	17.6

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1   Table 4

2   *Task 2 Frequencies and Percentage of Correct Responses for Inferring the Causes of*
3   *Emotion-Eliciting Contexts across Groups*

	SLI (*n = 42*)		CA (*n = 42*)		LA (*n = 42*)	
	n	*%*	*n*	*%*	*n*	*%*
Happiness	35	83.3	40	95.2	40	95.2
Sadness	22	52.4	33	78.6	29	69.0
Anger	24	57.1	38	90.5	29	69.0
Fear	12	28.6	35	83.3	22	52.4

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1   Table 5

2   *Task 3 Frequencies and Percentages of Conflict Resolution Strategies across Groups for all*
3   *Scenarios and Means (SD) for Total Conflict Resolution Strategies Score*

	SLI (n = 42)		CA (n = 42)		LA (n = 42)	
	n	*%*	*n*	*%*	*n*	*%*
No response	23	13.6	0	0.0	1	0.5
Physical Retaliation	25	14.8	2	1.2	19	11.3
Verbal Retaliation	19	11.3	11	6.5	10	15.9
Involving an Adult	54	32.1	31	18.4	38	22.6
Being Submissive	23	13.7	33	19.6	27	16.0
Situations Responses	9	5.3	26	15.4	30	17.8
Asking for clarifications	15	8.9	65	38.6	43	25.5
Total Mean Score *(SD)*	11.50 *(5.61)*		18.26 *(4.29)*		16.19 *(5.76)*	

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1   Table 6

2   *Means (SDs) of Social Cognition Scales and Social Cognition Composite Scores by Age*
3   *Group within the SLI Group*

	<8 years (*n* = 25)		>8 years (*n* = 17)	
	M	*(SD)*	*M*	*(SD)*
Total Emotion Prediction Score	8.11	(2.44)	8.71	(2.56)
Total Conflict Resolution Strategies Score	10.28	(5.08)	13.29	(4.72)
Social Cognition Composite Score	18.39	(6.10)	22.0	(7.52)

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1   Table 7

2   *Means (SDs) of Social Cognition Scales and Social Cognition Composite Scores across*
3   *Groups*

	SLI (*n* = 42)		CA (*n* = 42)		LA (*n* = 42)	
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Total Emotion Prediction Score	8.31	(2.82)	11.43	(2.38)	10.98	(2.43)
Total Conflict Resolution Strategies Score	11.50	(5.61)	18.26	(4.29)	16.19	(5.76)
Social Cognition Composite Score	19.81	(6.90)	29.69	(7.16)	27.17	(9.44)

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1   Table 8

2   *SDQ Raw Score Means (SDs) by Age Group for the SLI Group*

	< 8 years (*n* = 25)		>8 years (*n*=17)	
	M	*(SD)*	*M (SDs)*	*(SD)*
Total Difficulties	13.60	(7.58)	11.06	(8.26)
Emotional Symptoms	2.96	(2.59)	2.47	(2.98)
Conduct Problems	1.96	(2.40)	1.82	(2.48)
Hyperactivity	5.44	(2.45)	4.35	(2.80)
Peer Relationship Problems	3.24	(2.35)	2.41	(2.34)
Prosocial Behaviour	4.48	(2.66)	4.94	(2.65)

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1   Table 9

2   *SDQ Raw Score Means (SDs) Across Groups including the National Average*

	SLI (*n* = 42)		CA (*n* = 42)		LA (*n* = 39)		National	
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Total Difficulties	12.57	(7.89)	4.45	(4.42)	5.82	(4.71)	6.6	(6.0)
Emotional Symptoms	2.76	(2.73)	.95	(1.36)	.97	(1.73)	1.4	(1.9)
Conduct Problems	1.90	(2.40)	.60	(.93)	.92	(1.28)	0.9	(1.6)
Hyperactivity	5.00	(2.62)	1.98	(2.19)	3.10	(2.40)	2.9	(2.8)
Peer Relationship Problems	2.90	(2.35)	.95	(1.24)	.82	(1.23)	1.4	(1.8)
Prosocial Behaviour	4.67	(2.63)	8.36	(1.46)	7.33	(2.00)	7.2	(2.4)

3   Note. *p* < .001 and CA = LA < SLI in all cases

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1 Table 10

2 *Partial Correlations controlling for age between Measures of Socio-Emotional Functioning,*
3 *Prosocial Behaviour, Social Cognition, Non-Verbal and Language Ability for the SLI Group*

	1	2	3	4	5	6
1. Sum of Receptive SS	-					
2. Sum of Expressive SS	.53**	-				
3. Raven's CPM	.39**	.03	-			
4. Social Cognition Composite	.11	.04	.16	-		
5. Prosocial Behaviour	-.02	-.05	-.07	.24	-	
6. Total Difficulties Score	.09	-.03	.04	-.56**	-.54**	-

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1   Table 11

2   *Partial Correlations controlling for age between Measures of Socio-Emotional Functioning,*
3   *Prosocial Behaviour, Social Cognition, Non-Verbal and Language Ability for the CA and LA*
4   *Matched Groups*

	1	2	3	4	5	6
1. Sum of Receptive SS	-	.48**	.17	.21	.14	-.14
2. Sum of Expressive SS	.66**	-	.38**	.61**	.46**	-.36
3. Raven's CPM	.09	.31*	-	.64**	.34*	-.49**
4. Social Cognition Composite	.21	.00	.01	-	.62**	-.79**
5. Prosocial Behaviour	.12	.24	.11	.15	-	-.65**
6. Total Difficulties Score	-.10	-.21	-.02	-.41**	-.43**	-

5   *Note.* Partial correlations between measures for the CA Matched Group are presented below
6   the diagonal, and partial correlations for the LA Matched Group are presented above the
7   diagonal.

1 Table 12

2 *Regression analyses for concurrent variables predicting Total Difficulties Score SDQ*

	B	*SE B*	*B*	*t*	*Sig.*
SLI Group					
Chronological Age	-.13	.03	.24	4.38	.195
Social Cognition Composite	-.49	.13	-.43**	-3.64	.001
Prosocial Behaviour Scale	-1.33	.36	-.44**	-3.71	.001
Raven's CPM	-.00	.00	-.07	-1.94	.189
Sum of Receptive SS	-.00	.00	-.19	2.06	.073
Sum of Expressive SS	-.00	.00	-.21	-2.98	.188
CA Matched Group					
Chronological Age	-.21	.04	.25	4.50	.187
Social Cognition Composite	-.05	.02	-.22	-2.44	.079
Prosocial Behaviour Scale	-.77	.39	-.25*	-1.97	.05
Raven's CPM	-.00	.00	-.08	-1.96	.186
Sum of Receptive SS	-.00	.00	-.24	2.32	.075
Sum of Expressive SS	-.00	.00	-.22	-2.89	.191
LA Matched Group					
Chronological Age	-.27	.08	.31	4.39	.179
Social Cognition Composite	-.37	.05	-.79**	-7.20	.001
Prosocial Behaviour	-1.25	.63	-57	-2.69	.135
Raven's CPM	-.00	.00	-.06	-1.86	.196
Sum of Receptive SS	-.00	.00	-.18	2.03	.070
Sum of Expressive SS	-.00	.00	-.27	-2.74	.156

3 ** p < .05, ** p < .005*

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