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The Role of Language, Social Cognition and Social Skill in the Functional Social
Outcomes of Young Adolescents With and Without a History of SLI

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cognition, language and social skill in social outcome

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Abstract

Social skill and language are known to relate, not least in the example of those with Specific Language Impairment (SLI). However most of the research examining this trend has been conducted on young primary-school age children and the nature of the relationships is unclear. Furthermore, little is known about which young people in general have social difficulties and whether language, social cognition and social skills are directly associated at this age. In this study, a large cohort made up of young people with a history of SLI (n=134) and a typically developing (TD) group (n=124) of the same age were followed up in their final year of compulsory schooling (aged 16). Language, social cognition, social skills and functional social outcomes (friendships and levels of social activity) were assessed using tasks and questionnaires. Modest associations were found between social cognition, language and social behaviours, the strongest being between language and social cognition. Regression analyses showed that as a combined group the adolescents' functional social outcomes were most associated with expressive language, social skill and social cognitive ability. However the patterns differed when groups were analysed separately, with social cognition playing more of a role for those with SLI. These findings suggest that poor language may play a complex role in adolescents' social development.

The Role of Language, Social Cognition and Social Skill in the Functional Social Outcomes of Young Adolescents With and Without a History of SLI

Adolescence is a time in which young people make the transition from childhood to adulthood and from compulsory schooling to a wider choice of lifestyles. The social outcomes of young people during this time are of great interest, particularly for services facilitating this transition and for providers of social and leisure activities for this group. However, little is known about the developmental pathways and related skills that are inherent in social outcome, especially in clinical populations. In particular, the role of language, social cognition and social skills are not yet fully understood.

This study examines the social outcomes of young people known to have had clinical language difficulties or Specific Language Impairment (SLI). SLI is a developmental disorder that affects between 5 and 7% of the general population. Although exclusionary criteria are used to define SLI, such that the language impairment must not be 'explained' by general cognitive or physical impairments, recent research has shown that SLI is more long term (e.g., Clegg, Hollis, Mawhood & Rutter, 2005; Stothard, Snowling, Bishop, Chipchase & Kaplan, 1998) and pervasive than previously thought. In particular various wider difficulties appear to be common in those with diagnoses of SLI including cognitive processes (e.g., Gathercole & Baddeley, 1990; Hick, Botting & Conti-Ramsden, 2005; Bavin, Wilson, Maruff & Sleeman, 2005) and social skills. Indeed social skills have been reported as less favourable for those with poor language in numerous studies (e.g., Cantwell & Baker, 1987; Redmond & Rice, 1998; Conti-Ramsden & Botting, 2004, Clegg et al., 2005; Fujiki, Brinton, Isaacson & Summers, 2001). These include studies indicating that younger children with language impairment are poorer at conflict resolution

(Horowitz, Jansson, Ljungberg & Hedenbro, Monica, 2006); less responsive to social initiation (McCabe & Marshall, 2006); more withdrawn in the playground (Brinton, Fujiki, Isaacson & Summers, 2001) and have ongoing social problems even when language difficulties appear to resolve (Glogowska, Roulstone, Peters & Enderby, 2006) Nevertheless the factors that may be involved in these social impairments, and the ways in which they impact on functional social outcomes has not been investigated fully. The role of social cognition (such as Theory of Mind, and understanding emotions) especially, has not been explored in older children in relation to these behavioural outcomes. One reason for this may be that social cognition is an ‘umbrella term’ which can refer to a wide range of behaviours. Because the detailed nature of such skills are not fully understood, we have adopted this term to apply to any cognate understanding of another’s emotional or mental state. However, it is worth noting that the implications of the studies discussed, and of the present study, may vary according to different aspects of social cognition and the measures one uses to assess this skill.

Social Cognition, Social Skill and Social Outcome in Typical Adolescent Development

These three concepts have a number of features in common, not least their social element. For typically developing youngsters, the well known ‘Isle of Wight’ study (Rutter et al., 1976) concluded that adolescent social turmoil was not as widespread as had once been imagined either socially or emotionally, although anxiety about peer relationships may peak at this time (e.g., Coleman, 1980). However, whilst social outcomes in adolescence have been detailed extensively in the literature (e.g., Brown, 2004 for a more recent overview), social cognition in this age group has not been as thoroughly investigated. Exceptions include the review by Herba and Phillips (2004) on recognition of facial expressions from childhood to

adolescence. These authors conclude that emotion recognition continues to develop in adolescence both in terms of accuracy and speed of processing. In addition, a recent study by Blakemore and Choudhury (2006) on the development of the adolescent brain suggests that brain maturation during adolescence is likely to affect social cognitive skills making the brain more sensitive to input during this developmental period. They speculate that adolescence may be a sensitive period for social cognition. These studies underline the need for further investigation of adolescents' socio-cognitive skills. Moreover, the nature of the relationships between social cognition, social skills and social outcomes have not been fully addressed yet. Is it possible for an individual to have good social cognition skills, but poor social skills? If so, does the presence of poor social skills *automatically* equate to impaired social outcome? In this paper, the term functional social outcome will be used to refer to the more concrete and visible features of social life, including quality of friendships and level of social activity.

Social Cognition in Relation to Social Skill and Language in Communication

Disorders

There is a mixed body of research into social cognition in the population of individuals with language disorder. Some studies have found that children with SLI show typical development on theory of mind tasks (Baron-Cohen et al., 1985; Ziatas, Durkin & Pratt, 1998; Shields, Varley, Broks & Simpson, 1996) whilst others have shown distinct deficits in this area (Norbury, 2005; Farmer, 2000). Because we also know more now about the development and changing diagnoses of those with communication impairments (see Conti-Ramsden, Simkin & Botting, 2006), the decision to include or exclude of children with some autistic features (including those with Pragmatic Language Impairment; PLI) can affect the findings of any particular study. Indeed the issue of primary versus secondary pragmatic difficulties in

communication disorders is the subject of much debate especially as to whether children with primary difficulties in this area might be better described as having ASD.

As with the studies on typical populations, despite the interest in these aspects of development, only a handful of investigations have assessed all three together in groups with communication disorder. These include a study by Farmer (2000). Although only a small number of children participated in her study, the investigation was able to explore the relationships between the three skills. Theory of Mind (ToM) tasks were found to correlate well with social behaviour difficulties, but not with language ability. Furthermore, Rutter and colleagues also examined language and social outcome (Howlin, Mawhood & Rutter, 2000) and later all three aspects of development (Clegg et al., 2005) in their longitudinal follow-up of children with severe communication disorders. These authors also found that language ability showed a complex relationship with social outcomes, showing no relationship in late adolescence (except for the autism group), and finding in adulthood that sociocognitive skill related to language, and language related to social adaptation, but socio-cognitive skill was not associated directly with social adaptation. Thus this study also suggested a complex pathway of interactions in development in atypical groups.

Indeed, the development of language and social cognitive impairments, and how they interact over time is not well understood. Some have suggested that language difficulties cause an impairment in social cognition (e.g., de Villiers & de Villiers, 2000) and there is some compelling intervention work to support this (Hale & Tager Flusberg, 2003). On the other hand, the wealth of research showing that those with SLI have social difficulties (e.g., Cantwell & Baker, 1978; Redmond & Rice, 1998; Conti-Ramsden & Botting, 2004; Fujiki et al., 2001), also opens the

question as to whether these could arise from either inherent (co-morbid) social cognitive impairments or psychosocially as a result of poor language opportunities. Thirdly, language difficulties may in fact alter interpersonal development to such a degree that the emergence of social cognition is delayed or even disordered. At the same time as these positions, tasks that measure social cognition are often linguistically demanding and at least some of the relationship observed is likely to be due to task effects. Miller (2004) for example showed that children with language impairment performed at a similar level to peers on false belief tasks when linguistic complexity was low, although the relationship between language ability (on sentential complements) and ToM was still evident.

Recent work into those with autism spectrum disorders (ASD), has begun to widen the focus of social cognition and communication impairment partly in an attempt to address this issue. For example, studies on very young children have found a stronger link between early socio-cognitive skills and language outcome at 42 months in those with ASD than between non-verbal IQ and language (Charman et al., 2003). Retrospective (pre-diagnosis) home videos have also shown that similar behaviours are less frequent at age 1 in those later diagnosed with autism (Maestro et al., 2002). At the other end of the age range, researchers have developed increasingly sensitive measures of social cognition for adolescents and young adults with Asperger's disorder, such as the 'Eyes Task' (Baron-Cohen et al, 2001) and the 'Awkward Moments Task' (Heavey et al., 2000). Such tasks have revealed important social cognition impairments even in bright individuals who have learned to compensate substantially in every day life. Nevertheless, these studies have not included measures of social outcome itself.

Much less work is evident outside of school age in those with SLI. A notable exception is the pioneering work by Chiat and Roy (2005). Their ongoing Very Early

Processing Study (VEPS) includes measures of social cognition alongside measures of pragmatic language and social skill. However, to the authors' knowledge, ToM tasks have not been examined in older adolescents with SLI (although see Norbury's (2005) study which assessed children up to 15 years of age). It is now known that SLI is not just an 'early years' difficulty and that around half of the children with pre-school language difficulties carry these into adulthood (Stothard et al., 1998; Clegg et al., 2005). Studies into SLI could now benefit from a focus on not just social difficulties or even social cognition differences at older ages, but also at how these relate to both language, social skill and social outcome.

Within this context, the present study aims to address four central questions:

- a) What are the language, social cognition and social skills profiles of **older adolescents** with and without SLI?
- b) Do functional social outcomes differ across the groups?
- c) What role do language, social cognition and social skill play in the functional social outcome of this wide range of adolescents?
- d) Within the SLI group, what predicts poor functional social outcomes?

Method

Participants

Young people with SLI. 139 children with a history of SLI originally recruited at 7 years of age as part of a wider study (the Conti-Ramsden Manchester Language Study, Conti-Ramsden & Botting 1999a; 1999b; Conti-Ramsden, Crutchley & Botting, 1997) were invited to participate at 16 years of age. The original cohort of 242 children represented a random sample of children attending key stage 1 language units across England. Language units are specialist classes usually attached to mainstream schools, in which there is regular speech and language therapist input as

well as specialist teachers and high teacher: pupil ratio. The cohort has been followed up previously at 8 years of age (n=234), 11 years of age (n=200) and at 14 years of age (n=130). The 134 adolescents who participated in this study at 16 years of age were not found to be different on any early variables of language, cognition, SES or emotional/social measures compared to those who did not participate. The children showed a variety of different language profiles with the majority described as having both receptive and expressive difficulties. The longitudinal data available on these children revealed that in adolescence, some individuals no longer meet criteria for SLI because of changes in their language and performance IQ scores. With this in mind, young people with SLI were classed as currently impaired if, at the time of the study (16 years of age) they met the following criteria for SLI: performance IQ (WISC-III; Wechsler, 1992) of 80 or more and concurrent expressive or receptive language standard score (CELF-R Expressive language (Recalling Sentences) /Receptive language (Word Classes); Semel, Wiig & Secord, 1987) less than 85. Half the adolescents with SLI were classified as meeting criteria for SLI. Of the remaining half, 13% demonstrated concurrent normal non-verbal and language ability and 35% showed non-verbal and language ability in the impaired range. It is now documented that a subgroup of children with SLI has declining performance IQ across time (Botting, 2005). Thus, the profile of some of the adolescents (non-verbal and language ability in the impaired range) was likely to be due to their performance IQ scores dropping since they were recruited to the study. There is evidence to suggest that children with this profile (low performance IQ and language ability) perform in important ways much like children with SLI with non-verbal IQ within the normal range (Leonard, 2003). In addition, 3% of the adolescents had impaired non-verbal abilities but normal language scores. Therefore, at the time of the study, a total of

85% of the adolescents had current language difficulties indicated by scores at least 1SD below the mean on standardised tests of expressive and/or receptive language.

In addition, as a group, the families showed a wide spread of SES which roughly matched the general population and showed no significant difference with the typical development (TD) group described below. The mean age of the SLI group was 15;10 (SD=0;5).

TD young people. A comparison group of adolescents from a broad background participated in the study. In total, 124 TD young people were recruited aged between 15 years 2 months and 16 years 7 months (mean age 15;11 years; SD=0;4). Census data as per 2001-2002 General Household Survey (UK Office of National Statistics) was consulted in order to target adolescents who would be representative of the range and distribution of households in England in terms of household income and maternal education (i.e. a sample stratified to the general UK population). In post-hoc analysis, there was also no significant difference between TD adolescents and adolescents with SLI in maternal education levels ($\chi^2(2,234)=1.756$, $p=.416$) or household income bands ($\chi^2(3,235)=4.391$, $p=.222$). Importantly therefore, the TD adolescents were similar to the adolescents with SLI in terms of key socio-economic status indicators. The TD participants had no history of special educational needs or speech and language therapy provision.

At the time of the study, all adolescents were attending the last year of compulsory secondary education. There were no significant differences in the proportions of girls in each group (SLI=42/139; TD=47/124; Fishers exact $p=0.20$).

Measures

Social cognition measures. Two tasks were central to this study: The revised 'Eyes Task' (Eyes Task-R; Baron-Cohen et al., 2001) and the Strange Stories Task (Happé,

1994). We acknowledge that the term ‘social cognition’ covers a wide range of divergent behaviours. These tasks were chosen because they appear to functionally represent quite different aspects of the same skill i.e. The ability to understand another person’s emotional or mental state, because they have been well used in other studies of clinical populations, and because they were likely not to produce ceiling results even in young people nearing adulthood.

The child version of the revised Eyes Task was used. This assessment comprises 28 pictures of only the ‘eyes’ of people expressing different emotions. The young person is given four emotion words and they are asked to choose the one that best describes the picture. The child version was used as a conservative measure, because of the language limitations of some participants in the study. In addition all four words were also read aloud to the young people. The Revised Eyes Task has found to be a sensitive discriminator of adults and young people with Asperger’s syndrome (Baron-Cohen et al., 2001) but has not been used previously with a language impaired group. Responses from this task are coded as correct or incorrect.

The Strange Stories task involves understanding social-cognitive events within story contexts. In this study, the young person was read the story aloud as well as having the text available. Once the story has been read, the young person is asked two questions, one to check they had understood the general text and another to assess their understanding of the social-cognitive content. The task was modified from Happé’s original so that only 6 target stories and 2 physical control stories were presented to participants. No pictures were used due to the age of the participants. The physical control stories present similar vignettes in terms of linguistic complexity and contextual setting. However they contain no social-cognitive content. Data from the young people who could not answer the control questions on these two stories were not used in subsequent analyses, as this indicates that language comprehension

difficulties have confounded the task. In total the Strange Stories data from 16/139 young people with a history of SLI and 4/124 young people with typical development were not used. These proportions were significantly different across groups (Fishers exact $p=0.011$). For the purposes of this report, the responses from this task are coded as ‘correct (mentalising)’ - given for answers which correspond with the social-cognitive content of the story or ‘incorrect’ which included answers that gave an appropriate answer that did not acknowledge the social-cognitive elements of the story, answers that included a social-cognitive element but were not factually correct, or answers that were incorrect on both accounts.

Social skills measures. The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) was used to assess social skill. Although this measure is largely a screening tool, we felt that it had good ‘value’ in terms of its ease of completion for this population and its validity in identifying those individuals with potential social difficulties. It is also one of the few measures with norms for adolescence and has been used widely in the literature. The SDQ is a twenty-five item questionnaire using positive and negative questions to assess social-behavioural status. Items take the form of statements such as ‘considerate of other people’s feelings’ and are scored as ‘not true’, ‘somewhat true’ and ‘certainly true’. However, scoring follows the positive/ negative patterns so that a score of ‘0’ represents the most favourable response and ‘2’ the most problematic response (except for the ‘pro-social scale’ see below). Thus higher scores relate to poorer outcome. There are 5 subscales of the SDQ: conduct problems, emotional problems, hyperactivity, peer problems (difficulties with friendships) and pro-social behaviour (actively altruistic and friendly behaviours). The pro-social subscale is the only exception to the negative scoring scales and is scored positively so that high scores are preferable. This subscale is not included in the total difficulties score. The young people’s self-ratings are used in this

study. The total difficulties score is provided as a background measure of overall emotional behavioural difficulties but only the socially focussed subscales of peer problems and pro-social skill are used in the analyses of social skills.

Concurrent language and nonverbal IQ. To assess concurrent language one expressive subtest (Recalling Sentences) and one receptive subtest (Word Classes) from the Clinical Evaluation of Language Fundamentals -revised were used (CELF-R; Semel, Wiig & Secord, 1987). Thus, receptive and expressive language skills were measured by single tasks which formed part of a longer assessment, i.e., CELF-R. These specific subtests were chosen as they are used widely in the literature and are considered good indicators of these skills (Conti-Ramsden, Botting, & Faragher, 2001; Gillon & Dodd, 2005; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). We were also mindful of the length of the sessions for the TD participants. The adolescents with SLI did receive a full CELF-R assessment including all the subtests for both the expressive scale (Formulated Sentences, Recalling Sentences and Sentence Assembly) and the receptive scale (Oral Directions, Word Classes and Semantic Relationships). Given the availability of these data, we examined the correlations between the chosen subtests and the full composites and there were found to be strongly correlated for expressive ($r=0.81$) and receptive ($r=0.85$) language. Nonverbal IQ was also examined. It is known that nonverbal IQ is related to a number of behaviours including language and was used in this study descriptively and to provide the opportunity to control for its potential influence on the variables of interest. Nonverbal IQ was recorded at 16 years for all TD participants and either at 14 ($n=92$) or 16 ($n=44$) for those with a history of SLI, using a full WISC III battery (Wechsler, 1992). For ease of reading this cognitive score will be referred to as ‘Nonverbal IQ at 16’.

Earlier language, nonverbal IQ and social skills (SLI group only). For the SLI group, data on earlier cognitive, language, nonverbal IQ and social skills were also available at 7 years of age. For language at 7, the Bus Story narrative recall task (Renfrew, 1991) was used to assess expressive language and the Test for Reception of Grammar (TROG; Bishop 1982) was used to measure receptive language. Nonverbal IQ at 7 was measured using the Raven's Coloured Matrices (Raven, 1986). Social skill was assessed using the Rutter Questionnaire (Rutter, 1967 at 7 years of age).

Functional social outcome measures. Questions from our own semi-structured interview were asked of the young people. This was a comprehensive interview covering a number of different areas, some of which are outside of the scope of this paper (e.g., see Conti-Ramsden and Durkin, in press, for independence). The interviewer used probe questions to elicit specific examples/scenarios that were then coded following the detailed guidelines provided. Two measures were devised from these questions: One related to Friendship (following Durkin & Conti-Ramsden, in press) and one a more general and broader measure of a variety of Social Activities. The Friendships Scale was based on 3 questions originally used as part of the Social-Emotional Functioning Interview (SEF-I; Howlin et al., 2000). Two of these questions are score 0 to 3, and one is scored 0 to 2, making a possible scoring range of 0-8. Cronbach's alpha for these three items was .84. The second measure consisted of a wider set of questions indicating atypical Social Activities covering a variety of domains. Thus, these items were not expected to be highly correlated or represent a single unidimensional latent construct. The items included difficulties getting on with adults or other young people at school, not having a best friend, never having had a boyfriend or girlfriend, going out less than once a fortnight and going out mainly with family. These five items were all scored 0 or 1 and summed to create a general

‘functional social outcome index’ with a range of 0-5. This index was significantly correlated with the SDQ peer problem subscale in the SLI group ($r=.44$) suggesting that this composite measure was indeed tapping problem areas in social functioning. Both measures consisted of responses made by the young people themselves. Thus the measures tap into perceptions of social outcome from the young people which we feel is a valid body of opinion in its own right. However, the same questions were also asked of parents, with similar results. The measures were scored with 0 as the most favourable option, leading to skewed data. Thus for analyses, data from both measures have undergone square root transformations. Appendix 1 lists the questions used in each of the outcome measures.

Procedure

The young people were seen individually at school by a researcher and interviewed / tested in a quiet area. All assessments were completed in one session. Assessments were read out loud to the young people in both groups because of anticipated literacy difficulties in the SLI group. Ethical approval for the study was gained from the University of Manchester. Informed written consent was gained from the school and from both parents and the young people themselves. BPS ethical guidelines were followed throughout and the young people could withdraw at any time.

Results

Aim a: Language, Social Cognition and Social Skill Profiles in Adolescents With and Without SLI

Differences between groups on language, social cognition and social skill

As expected *language scores* were lower as a group for those with a history of SLI compared to those with TD. Nonverbal IQ was also lower (see Table 1 for details).

[Table 1 about here]

Social cognition also showed an impaired pattern of performance for those with a history of SLI. Both the Eyes Task ($F(1, 256) = 40.6, p < 0.001$, Cohen's $d = -0.80$) and the Strange Stories task ($F(1, 235) = 48.3, p < 0.001$, Cohen's $d = -0.94$); revealed poorer performance from adolescents with a history of LI compared to age – matched peers. See Table 2 for means and SDs.

These differences remained after controlling for concurrent receptive language skill and nonverbal IQ (Eyes Task: $F(1, 247) = 5.7, p = 0.02$); Strange Stories correct mental total: $F(1, 244) = 9.8, p = 0.002$). The correlations between the two tasks were low to moderate for both groups: Group with LI Pearson's $r = 0.36$ ($p < 0.001$); TD group Pearson's $r = 0.25$ ($p = 0.007$).

[Table 2 about here]

Furthermore, when *social skill* was examined the Peer: $F(1, 261) = 40.5, p < 0.001$, Cohen's $d = 0.79$ and Pro-social: $F(1, 261) = 13.0, p < 0.001$, Cohen's $d = 0.45$) subscales were rated less favourably by the young people with SLI indicating generally poorer social skill. Examination of the SDQ total score for the two groups revealed significant differences across groups also ($F(1, 258) = 40.1, p < .002$, Cohen's $d = 0.79$) suggesting that adolescents with SLI report more emotional/behavioural difficulties as compared to their TD peers. See Table 3 for means and SDs.

[Table 3 about here]

Relationships between language, social cognition and social skill

The intra-relationships between language, nonverbal IQ, social skills and social cognition are shown in Tables 4a and 4b. The SLI and TD groups showed

strikingly similar patterns of relationships. Neither the peer nor prosocial subscales of the SDQ were associated with either language task (all $r < 0.20$). Furthermore, only one significant (but modest) association was found between tests of social cognition and social skill: For the SLI group, Strange Stories score related to the SDQ peer subscale ($r = 0.26$; $p = 0.005$). In contrast, the social cognition tasks correlated significantly with all language and IQ measures in both groups. These relationships were stronger in the SLI group. Language and nonverbal IQ also correlated in both groups, but again much more strongly in the SLI group.

[Tables 4a and 4b about here]

Aim b: Functional Social Outcomes Across Groups

The groups were significantly different on both the friendships scale ($F(1,258) = 77.1$, $p < 0.001$, Cohen's $d = 1.1$) and the social activities measure, ($F(1,259) = 52.2$, $p < 0.001$, Cohen's $d = 0.90$) with less favourable scores for the group with a history of SLI. For the SLI group the outcome measures were highly correlated ($r = 0.54$) but for the TD group, no association was seen ($r = -0.02$). See Table 5.

[Table 5 about here]

Aim c : Concurrent Relationships Between Language, Social Cognition, Social Skills and Functional Social Outcomes

The relationship between social outcomes and the profile factors above was explored using correlational analysis with both groups separately. For this analysis, the groups showed quite different patterns of relationship (see table 5). In order to tease out the relative role of the different factors, two regression analyses were performed for the entire participant set (SLI and TD combined), and for each group separately. The dependent variables indexing functional social outcomes were friendship scale and the social activities measure. The independent variables were

entered stepwise in four steps: i) nonverbal IQ ii) expressive and receptive language iii) SDQ peer and prosocial skill subscales and iv) social cognition tasks.

Friendship scale regression – both groups combined then separate

For the *Friendships scale* the final model when both groups were combined comprised (in order of entry): Non-verbal IQ, Expressive language, SDQ peer subscale, SDQ prosocial subscale and Strange Stories score explaining 35% of the variance ($F(5,221)=25.4, p<0.001$; adjusted $r^2=0.35$). All except nonverbal IQ ($p=0.20$) remained significant in the final model. When groups were examined separately using exactly the same method, the SLI group final model included expressive language, SDQ peer subscale and SDQ prosocial subscale explaining 26% of the variance ($F(3,104)=13.5, p<0.001$; adjusted $r^2=0.26$). For the TD group, only the SDQ prosocial subscale entered the model, which explained only 4% of the variance ($F(1,117)=5.8, p=0.02$; adjusted $r^2=0.04$).

Measure of social activities regression – both groups combined then separate

For the *Social Activities measure* the final model when both groups were combined comprised: Nonverbal IQ, Expressive language (both non-significant in final model; $p=0.20$ and 0.18 respectively) and SDQ peer problems score explaining 21% of the variance ($F(3,223)=20.9, p<0.001$; adjusted $r^2=0.21$). When groups were examined separately using exactly the same method, for the SLI group peer problems was the only predictor entered, which on its own explained 22% of the variance ($F(1,106)=30.9, p<0.001$; adjusted $r^2=0.22$). For the TD group, the final model was significant but only explained 3% of the variance ($F(2, 117)= 4.5, p=0.036, \text{adj. } R^2=0.03$). Receptive language was the only predictor entered.

[Table 6 about here]

Regressions examining the role of social cognition

Exploring the role of social cognition further. As social cognition is a factor rarely examined at this age in relation to functional social outcome, the contribution of this skill was examined further. In the above *Friendships* regression analyses, Strange Stories added uniquely 2% of the variance to the combined (SLI+TD) group friendships model.

Analyses were also run again with the social cognition tasks entered in step one. For *Friendships* using the combined group, both social cognition tasks entered in the first step accounting jointly for 19% of the variance (Eyes Task was not significant in the final model – $p=0.08$; expressive language, peer and prosocial skills entered subsequently and were still significant predictors in the final model which explained 36% of the variance in functional outcome). For the SLI model, both the Strange Stories task and the Eyes Task entered and jointly explained 10% of the variance. Peer and prosocial skills also entered later and were the only significant predictors in the final model which explained 25% of the variance. For the TD group, no social cognition tasks entered, even when placed in the first step.

For *Social Activities* using the combined group, both Strange Stories and Eyes Task entered in the first step accounting jointly for 7% of the variance. Peer problems entered the model in a later step. Only the peer problems measure was still significant in the final model which explained 21% of the variance on functional outcome. For the SLI model, just the Strange Stories task entered and explained 4% of the variance. Peer skills also entered the model and was the only significant predictor in the final model which explained 22% of the variance. For the TD group, no social cognition tasks entered, even when placed in the first step.

Aim d: To Examine What Predicts Poor Functional Social Outcome in Those With a History of SLI

For the SLI group only, assessments of language, nonverbal IQ and social skill were available from previous stages of the study. Table 7 shows the correlations between the social outcome and social cognition tasks with previous language, nonverbal IQ and social skills.

Regressions similar to those in Aim c) were conducted, with early nonverbal IQ, expressive and receptive language, and social skill all taken from 7 year assessments entered as independent variables in the first 3 steps, followed by 16 year social cognition tasks in the final step. The two functional social outcome measures (friendship and social activity) were again the dependent variables. For *Friendships* early non-verbal IQ, early receptive language, early emotional/behavioural score and Eyes task entered, but only early receptive language and Eyes Task were significant predictors in the final model ($F(4,99)=5.7, p<0.001$; adj. R square =0.15). For the *Social Activities measure*, only Strange Stories (i.e. none of the early stage variables) entered the final model which was significant and explained 6% of the variance ($F(1,102)=7.5, p=0.007$; adj. R square=0.06). This information is presented in Table 8.

[Table 8 about here]

SLI individuals with the poorest social outcome. When the *Friendships* scale and *Social Activities measure* were summed (giving a possible score range of 0 to 13) none of the 124 individuals in the TD group scored more than 3, compared to 43/134 of the SLI group. Thus the SLI group was further examined to see which factors differentiated best between these 43 individuals with very poor functional social outcome (scores >3) and the remaining SLI group. A logistic regression was performed in five steps based on earlier regressions: i) Early nonverbal IQ ii) Early

receptive and expressive language iii) Concurrent receptive and expressive language iv) Concurrent peer problems and prosocial skill and v) Concurrent social cognition tasks. Early receptive language, concurrent peer problems and concurrent social cognitive skill as measured by the Eyes Task were all entered but only peer problems remained a significant predictor in the final model, (with Eyes task just falling short at $p=0.051$) . The final model explained approximately (using Nagelkerke approx. r square) 36% of the variance ($\chi^2(3)=29.56$, $p<0.001$). See table 9 for details.

[Table 9 about here]

Discussion

This study has made a number of important observations about social outcome, social cognition, social skills and language. Firstly, in addressing aims a) and b) the study shows that as young people reach adulthood, language appears to have a complex relationship with social cognition and social skill. For social cognition, language was convincingly associated, but few direct associations were found in either group between language and social skill. On the other hand, the functional outcomes relating to friendship and social activity – those issues frequently raised by parents, educators and the young people themselves (Pratt, Botting & Conti-Ramsden, 2006; Conti-Ramsden, Botting & Durkin, in press) - were not only different across distinct language status groups, but were also predicted by concurrent language, social skill and social cognitive ability. Importantly, this last component of the model made a significant contribution even after other factors had been entered. For those with persistent language difficulties, earlier language was also seen to predict functional social outcome in some respects, in both a linear and logistic manner.

Language Group and Social Outcome

These findings support a large literature on younger children with impaired language showing that social outcomes are at risk in populations with communication impairment (Fujiki et al., 2001). The study also lends support to other studies which report that those with language impairments (but not autism) have subtle social cognition impairments (e.g., Farmer, 2000). Of course more marked social cognitive impairments may in fact lead to a diagnosis of autism rather than language impairment. In addition, relating to aims c) and d), whilst relationships between language and social skill were similar across all adolescents, the findings here suggest that qualitatively different relationships might be at play in the different groups when functional social outcome is considered: namely that language and social cognitive ability may have substantially more of a role for those with clinical language difficulties.

The Roles of Language, Social Cognition and Social Skill in Functional Social Outcomes

In the present study, when those with a history of language impairment and those with typical development were analysed separately, social skill emerged as the most significant predictor of social *outcome* in both groups. When the SLI group was examined alone including longitudinal variables, poor early receptive language, impoverished social cognition, as well as low social skill were predictive of those with the poorest social outcomes. And yet language did not show a strong direct relationship with social *skill* in either group. These results are interesting in three key respects.

First, they suggest that social *skill* and functional social *outcome* are not entirely the same thing. Although social skills are a key predictor of social outcomes, this study provided evidence of other skills being associated with such outcomes, e.g.

social cognition. In addition the groups seemed to differ on the relationship between friendships and social activities, so that in the TD group, it was more possible to have friends but not go out much, and vice versa whereas for those with a history of SLI, these outcomes were linked. This may also suggest other mediating factors in clinical populations. Secondly, the findings provide some evidence for qualitatively different pathways to *outcomes* in the two groups. Thus, this may suggest a developmental ‘point’ at which different interactions between variables exist between the two groups. Evidence from the present study suggests that social cognition may play a larger role on the social outcomes of young people with a history of SLI than those without. Thirdly, there is the question of the role of language. In the absence of a strong direct relationship between language and social skills but clear associations between language and social cognition, what is likely to be the role of language on functional social outcomes? Two possibilities arise. On the one hand, it is likely to be the case that specific aspects of language are influential in the development of social understanding. These are likely to include the acquisition of certain language content (e.g. mental state verbs) or alternatively the mastery of structural aspects of language (e.g. complementation). The presence of poor language as is the case in SLI, exacerbates the contribution of language in the relationship between language and social cognition. Indeed our correlational findings evidence a much stronger association between language measures and the strange stories task in the SLI group than in the TD group. Nonetheless, controlling for language in the analysis revealed a consistent pattern of findings in our study.

Thus, a second possibility needs to be considered. It has been suggested that competent conversational skills, i.e., language, are instrumental in the development of social understanding (Lohmann & Tomasello, 2003). It follows from this position that poor language or a history of SLI may be directly causal in lack of social

competence through impoverished social or conversational opportunity (e.g., Harris, 2005; Redmond & Rice, 1998). Once again, recall the correlational analysis with the two groups. Only in the SLI group is concurrent language (or social cognition) related to the functional social outcomes measures. Moreover, early language skill also emerged as a significant predictor of friendship outcome in this group. However the fact that social cognition is also making a unique contribution, (and ‘soaking up’ a substantial part of the variance if entered into regression first) may suggest that social cognition and language are co-developed skills and that both have some independent association with social outcome. This may be more marked in those with lower language skill. To support this more complex picture is the fact that social skill in itself was not clearly associated with either language or social cognition. Instead social skill, which is evidently predictive of social outcome, appears to be making its own contribution from a seemingly separate pathway (not tapped into by the measures used here).

It is plausible, thus, that other factors are more central in shaping social skill as young people reach adulthood or alternatively that our measures of social cognition and language may not have been sensitive enough to pick up the associations. In particular, measures of pragmatic language or adult tasks of social cognition may have improved the predictive power. Future research needs to model language, social cognition and social skill over time to establish these developmental pathways more clearly.

A Note About Social Cognition and the Tasks Used to Measure This Skill

There is some concern both in research and clinical settings that tests of social cognition tap inherently into language impairments and therefore may reflect unfairly on those with SLI and other communication disorders. Indeed this study also saw moderate correlations between receptive language and social cognition. However, we

have also controlled for this in a number of ways. First, the tasks used are designed to be accessible for those of much younger ages and therefore the content and complexity should fall easily within the SLI group's competence. We also chose to read out items aloud to participants to further enhance understanding although we acknowledge that this may not compensate for inherent language processing difficulties. Second, on the strange stories task we have not used data from young people who appeared not to understand the physical control stories, thus ensuring participants had the ability to understand the linguistic complexity and contextual setting of the stories. Thirdly, the group differences remained after statistically controlling for concurrent receptive ability. Thus we are reasonably confident that the findings presented here are not *solely* a task artefact confounded by receptive language skill. However as mentioned previously, this does not rule out the possibility that earlier receptive language difficulty has led to an impairment in social cognitive skill, either through the specific language mechanisms noted above or other means. Future studies need to have earlier receptive language available for both TD and SLI groups so that this can be investigated comprehensively. Furthermore, as mentioned earlier, 'social cognition' is a somewhat vague term which is open to differing interpretations. The potential implications of this study need to be considered in light of the fact that this skill is not yet fully understood and is likely an amalgam of a number of independent but related skills. We use the term social cognition here for ease, but it should be noted that our tasks probably tap into quite different aspects of this composite ability and there is no compelling evidence in the literature to suggest that these tasks all measure the same construct.

Implications for Young People

The role of language in functional social outcomes may be one that is not a primary awareness of services that are in regular contact with adolescents. Although

only a relatively small difference was found, it represents a robust finding of disadvantage in this skill for those with language impairment. Thus this study indicates that language, social cognition and social skill need to be on the agenda for anyone involved in the functional social outcomes of young people as they reach adulthood, particularly in the areas of quality of friendships and levels of social activity. This appears to be especially true of populations with clinically impaired communicative skills such as young people with a history of SLI.

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Appendix 1

Friendships Scale

1) 'How easy do you find it to get on with other people?

For example, if you were at a party or social gathering, would you try to talk to people you had not met before? What would you talk about? Do you have any acquaintances in the neighbourhood that you talk to? What about in shops or on buses?

0 – Normal range of friendships

1 – Limited or overly wide scope of friendships

2 – No making of friendships

2) 'Do you have any particular friends whom you see?

Who are they? Are they the same age as you? So these people ever come to your house or do you usually meet them a club, centre etc.?'

0 – Normal range of friendships

1 – Friendships but with poor friendship quality and /or no spontaneous socialising

2 – Few or no friends with whom respondent shares activities

3) 'What is special about friends? What does being a friend mean?

What is different about a friend? What do you talk about when you are together? Would you ever confide in a friend about how you are feeling or if you are worried?' Has the friend ever done anything to give you particular pleasure?'

0 - Definite qualities of shared enjoyment or exchanged confidences as well as selectivity of the relationship

1 – Limited sharing of activities and feelings of enjoyment

2 - People with whom they shared activities but no evidence of shared enjoyment or exchange of feelings

3 - No indication of concept of friendship and no evidence of pleasure in people's company or exchange of feelings.

Appendix 1 (cont.)

Social activities measure

1) Do you have a best friend?

0- Yes

1- No

2) Have you ever had a boyfriend or girlfriend?

0- Yes

1- No

3) How often do you go out?

0- at least once a fortnight

1- less than once a fortnight

4) When you go out is it mainly:

0 – on own or with friends

1- with family / not at all

5) Do you have difficulty getting on with children or adults at school?

0- No

1 – Yes

Table 1

Language and Cognition Across Groups (Means and SDs)

	Nonverbal IQ	CELF Exp subtest	CELF Rec subtest at
	at 16	at 16	16
SLI	84.1 (18.8)	74.1 (11.0)	83.9 (16.9)
TD	99.9 (15.8)	97.2 (15.0)	99.5 (13.2)
Statistics	F(1, 254)=52.7	F(1, 256)=204.2	F(1, 257)=62.4
P value	<0.001	<0.001	<0.001
Effect size	-0.91	-1.76	-1.03
(Cohen's <i>d</i>)			

Table 2

Means and (SDs) For Eyes Task and Strange Stories Tasks

	SLI Group	TD Group
Eyes Task –R total (out of 28)	17.0 (4.0)	20.0 (3.4)
Strange Stories correct mentalising response score (out of 6)	3.6 (2.0)	5.3 (1.6)

Table 3

SDQ Scores for Adolescents with SLI and TD adolescents

		<i>N</i>	Mean	Std. Deviation
SDQ Peer problems	SLI	139	2.47	1.87
	TD	124	1.24	1.14
SDQ Prosocial score	SLI	139	7.81	1.89
	TD	124	8.57	1.47
SDQ Total difficulties	SLI	138	13.33	5.92
	TD	122	9.16	4.50

Table 4a

Correlations Between Concurrent Language, Cognition, Social Cognition and Social Skill for the SLI Group

	CELF	WISC	SDQ	SDQ	SDQ peer	Eyes	SS Correct
	Rec	NVIQ	total	prosocial	problems	task	mentalising
CELF Exp	0.60**	0.27	-0.06	-0.12	-0.15	0.17*	0.51**
CELF Rec		0.56**	-0.16	-0.10	-0.08	0.32**	0.43**
WISC NVIQ			-0.01	0.02	-0.03	0.43**	0.36**
SDQ total				-0.13	0.62**	-0.05	-0.01
SDQ prosocial					-0.05	0.09	-0.07
SDQ peer problems						-0.15	-0.26**
Eyes Task							0.36**

Table 4b

Correlations Between Concurrent Language, Cognition, Social Cognition and Social Skill for the TD Group

	CELF	WISC	SDQ	SDQ	SDQ peer	Eyes	SS Correct
	Rec	NVIQ	total	Prosocial	problems	Task	mentalising
CELF Exp	0.36**	0.07	-0.13	-0.07	-0.15	0.22*	0.24**
CELF Rec		0.25**	-0.18	0.11	-0.11	0.32**	0.19*
WISC NVIQ			-0.25**	0.04	0.03	0.43**	0.27**
SDQ total				-0.12	0.39**	-0.16	-0.16
SDQ prosocial					-0.13	0.14	-0.05
SDQ peer						-0.04	0.09
Eyes Task							0.25**

Table 5

Correlations with Functional Social Outcomes in Adolescents with SLI and TD adolescents

	Social Activities Measure	Friendships Scale
CELF Exp	-0.02	-0.26**
	0.09	-0.07
CELF Rec	-0.01	-0.17
	0.17	-0.05
WISC NVIQ	-0.02	-0.18*
	-0.13	-0.03
SDQ total	0.26**	0.09
	0.14	0.08
SDQ prosocial	-0.11	-0.21*
	-0.04	-0.24**
SDQ peer problems	0.44**	0.40**
	0.10	-0.09
SS correct mentalising	-0.25**	-0.30**
	0.10	-0.16
Eyes Task	-0.12	-0.29**
	0.00	-0.01
Social Activities Measure	.	0.54**
	.	-0.02

Note. The top value in each cell denotes the adolescents with SLI and the bottom denotes the TD adolescents

Table 6

Regression Analysis for Concurrent Variables Predicting Functional Social Outcome in Adolescents at 16 Years

	<i>B</i>	<i>Std Error</i>	<i>Beta</i>	<i>t</i>	<i>Sig.</i>
Friendship scale – combined groups					
Non verbal IQ	-0.00	0.00	-0.08	-1.29	0.198
Expressive language	-0.00	0.00	-0.21	-3.20	0.002
Peer problems	0.13	0.03	0.28	4.83	<0.001
Prosocial skill	-0.10	0.03	-0.21	-3.90	<0.001
Strange Stories social cognition	-0.07	0.03	-0.17	-2.63	0.009
Friendship scale – SLI group					
Expressive language	-0.02	0.01	-0.25	-2.93	0.004
Peer problems	0.18	0.04	0.38	4.50	<0.001
Prosocial skill	-0.10	0.04	-0.21	-2.51	0.014
Friendship scale – TD group					
Prosocial skill	-0.05	0.02	-0.22	-2.41	0.017
Social Activities Measure – combined groups					
Non verbal IQ	-0.00	0.00	-0.08	-1.29	0.197
Expressive language	-0.00	0.00	-0.09	-1.32	0.188
Peer problems	0.16	0.02	0.41	6.46	<0.001
Social Activities Measure – SLI group					
Peer problems	0.16	0.03	0.48	5.56	<0.001
Social Activities Measure – TD group					
Receptive language	0.01	0.00	0.19	2.12	0.036

Table 7

Correlations for Early Language, Cognition and Social Skill for Adolescents with SLI

	Social Activities Measure	Friendships Scale
Bus Story at 7	-0.03	-0.26**
TROG at 7	-0.07	-0.36**
Ravens PIQ at 7	-0.06	-0.22*
Rutter score at 7	0.13	-.017*

Table 8

Early Predictors and Concurrent Social Cognition for Adolescents With SLI

	<i>B</i>	<i>Std</i>	<i>Beta</i>	<i>t</i>	<i>Sig.</i>
	<i>Error</i>				
Friendship scale – SLI group only					
Non verbal IQ at 7	0.00	0.01	0.02	0.20	0.84
Rutter emotional / behavioural score at 7	0.03	0.01	0.18	1.96	0.05
Eyes Task social cognition at 16	-0.05	0.02	-0.20	-2.00	0.05
Social Activities Measure – SLI group only					
Strange Stories social cognition at 16	-0.09	0.03	-0.26	2.73	0.01

Table 9

*Early and Concurrent Predictors of Adolescents With SLI Who Have the Poorest
Functional Social Outcome*

	<i>B</i>	<i>Std Error</i>	<i>Wald</i>	<i>df</i>	<i>Sig</i>	<i>Exp(B)</i>
Receptive language at 7	-0.03	0.02	1.25	1	0.264	0.97
Peer problems at 16	0.53	0.15	13.25	1	<0.001	1.70
Eyes Task social cognition at 16	-0.14	0.07	3.82	1	0.051	0.87