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The behaviour of young children with social communication disorders during dyadic interaction with peers --Manuscript Draft--

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Abstract:	Children with social communication disorders are known to experience more problematic peer relations than typically-developing children. However, detailed observation of their behaviour and communication during interaction with peers has not previously been undertaken. Micro-analytic observational methods were used to analyse the audio-taped interaction of children (N = 80) selected from mainstream schools (ages 5-6 years-old) on a computerised collaborative task. Comparisons were made between children with high- and low-pragmatic language skill as measured by the researcher-administered Test of Pragmatic Skills. Consistently with their pragmatic language scores, low-skilled children were found to use more irrelevant directives and irrelevant responses and were more likely to ignore other children's questions and requests than were high-skilled children. When high-skilled children worked with low-skilled children, as opposed to with other high-skilled children, they showed some sensitivity and adaptation to these children's difficulties; they used more directives, clarification, explained reasons for disagreements and provided more information. Although it appears that the high-skilled children could provide support for the low-skilled children, there was a cost in terms of the emotional tone of these interactions; when working with low-skilled children, the high-skilled children expressed considerably more negative feelings towards their partners than when they worked with another high-skilled child. In conclusion, observation of the interaction of high- and low-skilled children suggests promise for peer-assisted interventions and specifies which communicative behaviours could be targeted. However, care should be taken to manage the affective climate of these interactions for the benefit of all children involved.

Title: The behaviour of young children with social communication disorders during dyadic interaction with peers

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SOCIAL COMMUNICATION DISORDER AND PEER COLLABORATION

Children with impairments in social communication and language skills are known to experience difficulties with peer relationships. Ketelaars, Cuperus, Jansonius and Verhoeven (2010) found that teachers rated these children as having more problems with peers and Conti-Ramsden and Botting (2004) reported that they were at greater risk of being bullied than typically-developing children. Long-term outcomes for such children also suggest that dealing with social relationships is an on-going struggle. Whitehouse, Watt and Bishop (2009) followed up a group of children diagnosed with developmental language disorders into young adulthood and found that, by comparison to a typically-developing group, they had markedly fewer friendships or romantic relationships.

The aim of the present study was to observe children with different levels of language skill interacting together in a naturalistic context and by doing so to investigate their behavioural and conversational characteristics. There are indications that peer-assisted social skills interventions may be more effective than adult-led ones (e.g. Kasari, Rotheram-Fuller, Locke & Gulsrad, 2012). If this is indeed the case, then observing and understanding the behaviour of children with communicative impairments in interaction with their peers has important implications for the design of clinical and educational interventions. Adams et al. (2012) have argued that there is considerable need to develop interventions targeting social communication disorders as these are currently under-diagnosed but are coming increasingly to the attention of clinicians.

Children who experience difficulties with communication are a highly heterogeneous group encompassing a number of diagnostic categories and social communication profiles. Pragmatic language skill can be defined as the use of social contextual cues to understand a speaker’s meaning and is a key communication skill for the attainment of social goals. Children experiencing difficulties with pragmatic language skill fall into three groups: Children diagnosed as having primary speech, language and communication needs, children with other

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conditions who experience communication problems as a secondary impairment and children whose language development has been limited by environmental causes, typically socioeconomic disadvantage (Lindsay, Dockrell, Desforbes, Law & Peacy, 2010).

The first of these groups, those with primary communication difficulties includes children identified as having specific language impairment (SLI), pragmatic language impairment (PLI) or high-functioning forms of autism spectrum disorder. Exact diagnostic criteria to differentiate between these terms is still very much a matter of debate, but there appears to be growing consensus that these should be regarded as dimensional, overlapping conditions rather than discrete diagnoses (Adams et al., 2012; Bishop, 2003; Norbury, Nash, Baird & Bishop, 2004; Reisinger, Cornish & Fombonne, 2011). There are also indications that these diagnoses can be subject to change over time as children age and develop (Whitehouse et al., 2009). SLI can impact a child's comprehension, grammar, phonology and other expressive and receptive language abilities. Children with PLI are differentiated from children with SLI by relatively intact syntax and phonology, but experience disproportionate difficulty with the *use* of language. They may show characteristics such as poor comprehension of non-literal language, difficulty with perspective-taking, unconnected speech, poor conversational turn-taking, limited application of inference and stereotyped phrases and intonation. Many of these characteristics are shared with children with autism spectrum disorders (ASDs). Proposed revisions for the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) include the addition of a new category entitled 'Social Communication Disorder' which would encompass PLI and some children currently diagnosed with ASD. Social communication disorder would be differentiated from the new ASD category by the absence of repetitive behaviours and restrictive interests. In practice, considerable overlap between SLI, PLI and high-functioning ASD is found. Children with SLI often present with considerable deficits in pragmatic language as well as structural difficulties, suggesting that basic linguis-

tic ability impacts on pragmatic language ability (Norbury et al., 2004). Children with PLI also present with some difficulties in structural language, although these may be milder in severity than children with SLI. In the present study we did not attempt to differentiate children with SLI, PLI or higher-functioning forms of ASDs from each other, or from those who experience pragmatic language difficulties as a secondary impairment or through environmental causes. Our aim was to observe children experiencing difficulties with pragmatic language for any reason who were being educated in mainstream schools where they would be interacting with peers with superior pragmatic language skills on a daily basis.

Although research specifically in the area of pragmatic language skill is relatively recent, indications are beginning to emerge that it is difficulties in the domain of pragmatic language that impact most on behaviour and social relationships, rather than more basic problems with structural language such as grammar and comprehension. For four-year-old children, Ketelaars et al. (2010) reported that pragmatic language impairments were highly correlated with behavioural problems, whereas structural language difficulties were not.

Whitehouse et al. (2009), in their study of young adults reported that those who had received a diagnosis of PLI or high-functioning ASD as children experienced more difficulties with their social relationships than those with a diagnosis of SLI. Laws, Bates, Feuerstein, Mason-Apps and White (2012) found that children attending language resource bases within mainstream schools were less accepted by peers than the children who did not attend these bases. Within this group, the children assessed as having more pragmatic difficulties received significantly more negative peer ratings.

Bearing in mind these research findings and the possibilities for involving peers in social skills interventions, there are important questions to be asked about the nature of typical daily interactions of children with low-levels of pragmatic language skill. Some of the questions we considered productive to explore were: Are low-skilled children provided with use-

ful model examples of good communication by high-skilled children to copy and learn from during exchanges? Are high-skilled children sensitive to the problems of low-skilled children and are they able and/or willing to modify their own communication accordingly to support low-skilled children? Finally, what is the emotional tone of such interactions? Do they tend to be characterised by positive or negative affect?

Another question arises as to which context is best for observation of the behaviour of children with pragmatic language communication difficulties, we chose a computerised collaborative problem-solving task for a number of reasons. Computer games are commonly played together by children of this age. To solve problems together, children need planning, perspective-taking and communication abilities, all of which are likely to be difficult for children with low-pragmatic language skills. To our knowledge, this is the first study to examine interactions between low- and high-skilled children in a joint problem-solving context.

Research in the area of children's collaborative tasks provides findings on which to base predictions; this literature has established that certain kinds of communication are linked with successful collaboration and lead to good learning outcomes for the children involved (e.g., Joiner, Faulkner, Littleton & Miell, 2000). During collaborative learning, productive relationships are characterised by conversation that incorporates effective questioning, explanation, clarification of ideas, direction, guidance and, particularly, constructive discussion of disagreements (Barron & Foot, 1991; Kruger, 1993). Collaboration between peer-rejected and -accepted children has also been observed (Markell & Asher, 1984; Murphy & Faulkner, 2006) and between children adopting different roles during bullying behaviour (Murphy & Faulkner, 2011). Similarly, these studies found that successful performance on dyadic tasks was related to use of guidance statements, explanations, directions and discussed disagreements, and that rejected children and children who took part in bullying were less likely to

use these forms of conversation than were peer-accepted children and those who did not participate in bullying.

In the present study, micro-analytic observational methods were used to investigate interactions between children with high and low scores on measures of pragmatic language skill. The children were observed whilst working together in pairs on a collaborative task.

Two types of dyad were organised: (a) Low-scoring children were paired with high-scoring children and these were compared with (b) Two high-scoring children working together.

Based on previous findings, we predicted that:

1. The task performance of dyads with one low- (LP) and one high-pragmatic-language-test-scoring (HP) child will be inferior to that of dyads with two high-pragmatic-language-test-scoring (HP) children.

2. A lower proportion of conversational features (guidance, explanation, discussed disagreements etc.) associated with effective collaboration will be observed for LP children paired with HP children than for HP children paired with each other.

3. There will be differences between the verbal communication of the HP children in dyads with other HP children as opposed to the HP children paired with LP children. The HP children would adapt to, and be influenced by, partners of differing skill level. However, there are presently too few indicators in the current literature for us to be able to predict the direction of these differences.

Method

Overview of Study Method

Children were identified as high-pragmatic-language-skilled (HP) or low-pragmatic-language-skilled (LP) by means of the Test of Pragmatic Skills (TPS, Shulman, 1986). A pool of children from mainstream schools was tested using the TPS, and from this, a sample comprising the highest- and lowest-scoring children were selected for the study. For the

study, children were organized into one of two types of dyad to work on a collaborative computer task; the dyads comprised either a LP child with a HP partner, or two HP children partnering each other. The rationale for this design being that (a) the communicative behaviour of LP and HP could be compared under similar conditions i.e. when both have a HP partner and (b) the behaviour of HP children could be compared according to whether they were working with a HP or LP partner. A performance measure was taken to assess the children's success at solving the computer task and the children's conversation was audio-recorded. Differences in the interaction of the two types of dyad were then examined through the use of a micro-analytic verbal communication coding system devised specifically for the task and applied by blind raters.

Participants

A total of 354 children from Year One classes in six U.K. schools were invited to participate. Children were recruited through active parental permission using an opt-in consent procedure, children's assent was also taken. A participation of rate of 61% was obtained, thus giving a total sample pool of 214 children (54% boys) aged between 5 years 0 months and 6 years 5 months ($M = 5$ years 6 months, $SD = 3.48$ months). Ethnicity was 52% White, 28.5% South Asian, 8.5% Black African or Caribbean, 7% mixed and 4% 'other'.

Sampling Procedures

A sample of children to participate in the study was selected from the main pool of 214 children. Teachers were consulted about suitability; they recommended that 13 children did not take part due to English not being their first language and of an insufficiently high standard. All remaining 201 children were individually interviewed by the third author to administer the Test of Pragmatic Skills (TPS, Shulman, 1986) and the British Picture Vocabulary Scale (BPVS, Dunn, Dunn, Whetton, & Burley, 1997). Interviews took place in a quiet area of the school and lasted approximately 20 minutes.

In addition to these measures, teachers were also asked to complete the Child Communication Checklist-2 (CCC-2, Bishop, 2003) for all children scoring one standard deviation below the mean on the TPS i.e. for 32 children. All teachers had known the children for at least 3 months as recommended by the manual, the response rate was 100%.

Selection Measures

Test of pragmatic Skills.

The Test of Pragmatic Skills (TPS, Shulman, 1986) has been devised to give a measure of pragmatic skill in relation to developmental norms in typically-developing children ages three- to eight-years-old. The TPS has been standardised on 650 children in USA with good test-retest reliability. It is an elicitation test assessing the child's use of different communicative functions in a standardised but natural setting, where test questions are embedded within an on-going conversation with guided play between an adult tester and the child. It is designed to assess the extent to which children select an appropriate message or interpretation in relation to communicative contexts (e.g. greeting, requesting, informing, rejecting, reasoning, closing conversation). With our pool of 201 children, the TPS produced a range of scores from 10 to 33 ($M = 26.11$; $SD = 4.13$) which were normally distributed.

British Picture Vocabulary Scale (BPVS).

The British Picture Vocabulary Scale II (BPVS II; Dunn et al., 1997) is a norm-referenced, standardised and widely-used assessment of receptive (spoken) vocabulary for Standard English for use with children ages 3 years, 0 months to 15 years, 8 months. For our pool of 201 children scores ranged from 56 to 128 ($M = 99.85$, $SD = 11.61$) and were normally distributed, the BPVS is normed at 100.

Child Communication Checklist-2 (CCC-2).

The Child Communication Checklist -2 (Bishop, 2003) is designed to provide a measure of impairment in pragmatic language. Its primary purpose is to describe the patterns of

impairment as opposed to the TPS which provides a measure of skill. The CCC-2 is not judged suitable for assessing variation among children who have average and above-average pragmatic skills (Bishop, 2003) and was not used for selecting the study sample. The CCC-2 was used here to provide information on the nature of impairment in the children who had received low scores on the TPS. The CCC-2 has been validated on 542 children in UK, 111 children in Australia, plus clinical samples.

Selection Procedures

Children were selected for participation in the computer task on the basis of their TPS and BPVS scores. We required a group of ‘pragmatic skill test low-scoring’ children (LP children), and a group of ‘pragmatic skill test high-scoring’ children (HP children).

Selection of pragmatic skill test low-scoring (LP) children.

According to the TPS manual, the expected score for children between 5 and 6 years of age is 28, the mean for our sample was slightly lower than this at 26.11. There were 32 children whose scores fell one standard deviation below the mean and these were selected for participation in the study. All 32 children were then rated by teachers using the CCC-2 with the exception of one child where the teacher completed items for all subscales bar one.

Selection of pragmatic skill test high-scoring (HP) children.

The BPVS was used as an additional selection screen for the children scoring over 28 on the TPS to exclude children who may have impairments with aspects of receptive verbal ability. Hence children were only selected from the initial pool of 201 as ‘high-scoring’ if they achieved both a score of 28 or over on the TPS and were within one standard deviation below the mean on the BPVS. High-scoring same-gender children who were in the same school were selected as partners to work on the computer task with the LP children. This gave us 32 dyads comprising a high-scoring and a low-scoring child (HP+LP dyads). Finally, as many gender-matched additional dyads as possible were composed from the

remaining HP children from the sample pool of 201. This gave us 24 dyads comprising two high-scoring children (HP+HP dyads). Children who participated were randomly selected and allocated to dyad-type.

Computer Task

The 'Maze Task' used in the present study was developed specifically by the authors to observe the behaviour and communication of 5-6 year-olds in collaboration. The Maze Task is a dyadic computer task in which one child directs another child through a maze with features such as houses, trees and ponds. The task includes obstacles (such as fallen trees, animals) to be negotiated and the aim is to find 'hidden treasure' such as coins, magic wands and stars which are then displayed in a visual hoard of 'prizes' or rewards on the screen for both children to see. The task is arranged over two inter-communicating laptop computers opposite each other, with each child using one laptop. The screen for each laptop gives a view of the maze and is not visible to the other child. The views on each laptop differ slightly from each other; the view on one laptop shows a map of the maze with the starting point, the available paths through the maze and the end point. The child seeing this view (the driver) will 'drive' a car through the maze using the keyboard arrow keys to move the car in steps. The view on the second laptop is identical to the first except that some additional privileged information is available; the location of the hidden treasure and obstacles. The child with the second laptop (the navigator) directs the child who is 'driving' around the maze with the object of avoiding the obstacles and collecting as many reward as possible. Both children can watch as the 'car' moves around the maze and succeeds or fails to secure the hidden treasure rewards. Different mazes were provided such that when a pair of children successfully completed one iteration of the maze, a new and more difficult maze appeared on screen until a series of several mazes was completed. The computer programme gives the children alternate turns at being the driver or navigator with each successive maze. A

problem that is frequently encountered in studies of collaborative problem-solving is that the children do not, in fact, collaborate. Tasks typically used, such as jigsaw puzzles, balance beam, Lego® modelling and paper and pencil versions of the Map task often result in one child completing the task alone with the other child excluded from participation, particularly when there is a large competence disparity. This problem was directly addressed in the current study; during the navigator's turn, the computer programme locked their keyboard and mouse so that they were unable to move the 'car'. The children were therefore obliged to communicate. Collecting the rewards (the object of the task) was not possible without collaboration. Performance on the task was measured in terms of the number of rewards collected. Design of the computer task is reported in detail elsewhere (under review).

Procedure for Computer Task

The 32 HP+LP dyads and the 24 HP+HP dyads were invited one dyad at a time to play the 'Maze Task' collaborative computer game. The children played the game at their own schools in an area where they were used to working but where interruptions by other children were minimised. The third author instructed and supervised the children.

The dyads were given a series of six mazes to practice to ensure that they had understood how to carry out the task. They were instructed in how to move the car around the maze; it was pointed out to them that each child had a different view of the maze and that only the navigator could see the 'hidden treasure' rewards and the obstacles. The game was designed to encourage co-operative behaviour; the difficulty of collecting prizes and avoiding obstacles without their partners' co-operation was highlighted to them. After the practice mazes, the children then played a series of 10 mazes unsupervised and their conversation was audiotaped as they did so. Generally this took around 10 minutes. For HP+LP dyads, taking the driver's turn first was alternated to control for order effects.

Task Measures

Performance measure.

The number of rewards ('hidden treasures') won by the children as described above was used as a measure of performance on the Maze Task.

Verbal observation measures.

The children's interaction was audio-taped, transcribed in full and analysed using a verbal coding system designed specifically to capture the features of interaction generated by the Maze Task. The total interaction for each dyad was used for verbal analysis. All speech was reproduced verbatim, with start and end of speakers' utterances marked in seconds. Transcripts were checked for accuracy against the audio-recordings by the coders and the audio-recordings and transcripts were used simultaneously for coding.

Micro-Analytic Verbal Communication Coding

Design of coding system.

The coding system incorporated codes and definitions from systems used in previous studies in collaborative learning and pragmatic language impairment (Anderson, Clark, & Mullin, 1994; Bishop, Chan, Adams, Hartley, & Weir, 2000; Gottman & Parker, 1986; Gottman & Parkhurst, 1980; Kruger, 1993, Lloyd, Boada, & Forns, 1992; Markell & Asher, 1984; Murphy & Faulkner, 2006, 2011; Radziewska & Rogoff, 1988).

Three researchers (including the first and third authors) worked in collaboration to devise the coding system. Codes were initially drawn from the other coding systems and included or excluded on the basis of discussion between the researchers. A small number of additional study-specific codes were also devised by consensus. All three researchers then coded recordings of the Maze Task from children who piloted the task but were not study participants. Inter-rater reliability between the coders was then calculated, and the codes more clearly described, refined or removed where this was necessary to capture features of

the interaction or to achieve satisfactory inter-rater reliability. This process continued until a coding system was devised and considered suitable by all three researchers. The final coding system contains 62 codes and is mutually exclusive and exhaustive; an abbreviated version is given in the Appendix. The full system is available on request from the first author.

Segmentation.

Talk was segmented into thought units. A thought unit is one expressed idea or fragment as defined by Gottman and Parkhurst (1980) and Gottman and Parker (1986). Transcripts were coded with each thought unit receiving a code.

Coding procedure.

Segments (as defined by thought units above) were then coded according to whether they were task-related or non-task-related (i.e. off-task talk, chatting about unrelated events). Off-task talk was then not coded further except if it occurred as an irrelevant response to a task-related directive or question. Task-related talk was then divided into main categories as follows: Directives, questions, responses, statements and 'other'. Directives were then divided into (a) 'navigational instruction', relating to directing the partner around the maze, and (b) other directives. Subcodes were then applied for both navigational instruction and other directives as per Murphy & Faulkner (2011). Questions were categorised as questions for clarification, questions checking understanding and questions for information. The quality of questions for clarification was then coded as per Lloyd et al. (1992) into high, medium or low. For example, 'What?' was rated as of lower quality than 'Which one of the houses do you mean?'. Responses to directives and questions were coded as: irrelevant, ignoring or non-responses, or, if a relevant response was given, it was coded as 'adequate' or 'inadequate'. In addition, responses that were agreements and disagreements were coded as agreements to act (compliance), disagreements to act (non-compliance) or agreements and disagreements on matters of fact (Murphy & Faulkner, 2011). Disagreements were then second-

arily coded to indicate whether they were accompanied an explanation or discussion, this has been found to be related to performance on collaborative tasks (Kruger, 1993).

Coding inter-rater reliability.

All transcripts were coded by the first author who was blind to the pragmatic status of the dyads (HP+HP or HP+LP), 10% of the videotapes were then coded by a researcher unconnected with the study, also blind, to test inter-rater reliability. For the coding of segmentation, the value of weighted Kappa was $k = .86$. Kappa values (k) for all verbal codes ranged from .60 to .97 with the exception of Question for Understanding Partner where $k = .50$, Non-Response $k = .31$ and Encourage $k = .50$. The total number of segments coded as ‘unclear’ (where neither transcribers nor coders could decipher what was said) was less than 1% for both HP and LP children.

Results

Data Analytic Strategy

Data for this study for the verbal coding were not normally distributed, therefore non-parametric tests were used. A series of planned comparisons was made to test the use of communication features according to our predictions. Hence two-way comparisons for verbal codes were carried out between:

(a) High-scoring children in the HP+HP dyads versus low-scoring children in the HP+LP dyads; (b) High-scoring children in the HP+HP dyads versus high-scoring children in the HP+LP dyads. As these were planned comparisons, Bonferroni’s adjustment was not used (Field, 2005).

Participant Characteristics

Before proceeding with the main analyses, we examined differences of age, gender and BPVS score between our three groups; High-scoring in HP+HP dyads (HP-h children), High-scoring in HP+LP dyads (HP-l children) and low-scoring children (LP children). Age

differences between the groups were non-significant (HP-h children $M = 5.38$, $SD = 0.33$, HP-l children $M = 5.50$, $SD = 0.26$, LP children $M = 5.48$, $SD = 0.24$). For BPVS scores, an ANOVA showed significant differences between the groups ($F_{2, 109} = 6.88$, $p < .002$), and *post hoc* tests indicated significant differences between LP children ($M = 93.70$, $SD = 12.75$) and HP-h ($M = 105.0$, $SD = 11.67$, $p < .001$) and between LP children and HP-l children ($M = 103.0$, $SD = 9.47$, $p = 0.037$). Likewise, for TPS scores, ANOVA again showed significant differences between the groups ($F_{2, 109} = 346.06$, $p < .001$), and *post hoc* tests indicated significant differences between LP children ($M = 19.30$, $SD = 2.96$) and HP-h children ($M = 29.85$, $SD = 1.57$, $p < 0.001$) and between LP children and HP-l children ($M = 29.52$, $SD = 1.16$, $p < .001$). Gender was not evenly distributed between the groups: HP-h children comprised 32 boys and 16 girls (16 male HP+HP dyads and 8 female HP+HP dyads) and HP-l and LP children comprised 13 boys and 19 girls (13 male HP+LP dyads and 19 female HP+LP dyads).

We also examined CCC-2 results for the LP children. The CCC-2 comprises 10 subscales and gives two composite scores; a General Communication Composite (GCC) identifying children likely to have a significant communication problems and a Social Interaction Deviance Composite (SIDC) indicating children with disproportionate pragmatic difficulties relative to their other language skills. As a recommendation to clinicians, the author of CCC-2 (Bishop, 2003) suggests that scores at or above the 15th percentile (GCC score of 60) should be regarded as within normal limits, whilst scores on two or more of the subscales below the 5th percentile suggest that the child has communicative problems of clinical significance. Furthermore a SIDC score of -15 or less is a possible indicator of an autism spectrum disorder even when a child has a GCC score within normal limits.

For the 31 children rated by teachers on the CCC-2, the mean GCC score was 60.58 ($SD = 19.14$, range 43 – 133). For 22 of these children, their GCC scores fell below 60. For

the one child whose CCC-2 questionnaire was not fully completed, it was not possible to calculate a GCC however scores for this child were below the 5th percentile on three of the completed scales, again indicating communicative problems in the clinical range. For the remaining 8 children, two had GCC scores below the 30th percentile, a further three below the 50th percentile and the final three above the 50th percentile. However, of the children with scores above the 50th percentile, one child received a SIDC score of -14, just one point away from the cut-off score of -15 suggesting the presence of an autism spectrum disorder. Therefore, it would appear that the TPS and the CCC-2 are reasonably consistent with one another; 32 children scored one standard deviation below the mean on the TPS, 24 of these children (75%) were at or very close clinical levels as indicated by validation data for CCC-2 (it should be noted that with large samples the TPS produces normally-distributed scores, whereas CCC-2 data is skewed towards higher scores). Thus, we were able to gain an indication of the likely impairment of our sample compared to clinically-recruited groups. According to CCC-2 proposed criteria for subscales scores, 13 children showed impairments of the SLI-type, 4 children impairments of the PLI-type, 2 children were at or one point away from the level suggesting high-functioning autism spectrum disorders and 5 children were intermediate between SLI and PLI. We did not seek information either from schools or parents to determine whether any of the children had been formally diagnosed or were receiving clinical attention. However it has been reported elsewhere (Bishop & McDonald, 2009) that language disorders are commonly under-diagnosed in the mainstream school population, particularly in children of low-socio-economic status. Results for all tests were shared with schools.

The sample of low-scoring children selected for this study consisted therefore of children with likely impairments primarily in pragmatic language competence and also of children with impairments in other areas of language functioning in addition to pragmatic

language impairments. Bishop (2003) and Norbury et al. (2004) have cautioned against use of the CCC-2 to distinguish between these groups as substantial overlap has been found.

Maze Task Performance

Performance was measured by the number of rewards that the dyads managed to collect. For each dyad, there were between 10 and 12 rewards available, and the proportion that they succeeded in obtaining was calculated. HP+HP dyads collected 92% of all available rewards ($M = 0.91$, $SD = 0.88$) and HP+LP dyads collected 85% ($M = 0.85$, $SD = 0.13$). This difference approached significance (Mann-Whitney $U = 294.0$, $p = 0.06$, $r = .20$) providing a degree of support for our first prediction, that is, that the performance of dyads with two high-scoring children will be superior to that of mixed-dyads. Distributions of scores were highly skewed; suggesting that in spite of extensive piloting, there was a ceiling effect on the task, particularly for HP+HP dyads.

Verbal Measures

The children's talk was segmented into thought units as described above. There were no significant differences in the total number of thought units used by HP-h children ($M = 81.31$, $SD 32.21$), HP-l children ($M = 83.61$, $SD = 39.29$), or LP children ($M = 74.61$, $SD 39.75$). In order to control for slight differences in the time for different dyads to complete the task, verbal interaction codes have been expressed as a percentage of the total number of the child's thought units in tables 1 and 2. Due to technical problems, we were unable to audio-record conversation for one of the HP+LP dyads, therefore, results are shown for 31 rather than 32 dyads. In total there were 62 codes in the verbal coding system, however, 29 of these codes occurred less than 1% of the time and differences were non-significant and these are therefore not reported.

Comparison of high-pragmatic-language-skilled versus low-pragmatic-language-skilled children.

Our second prediction aimed to investigate whether high-skilled children used more of the communication features associated with successful collaboration than did LP children (see Table 1).

The LP children employed significantly more irrelevant navigational directives, low-quality non-specific clarification questions (such as ‘Huh?’ ‘What?’) and ignoring responses (see Appendix for examples). They also gave more irrelevant responses, this difference approached significance. HP children’s communication showed evidence of perspective-taking and included significantly more questions that referred to the features on the maze such as houses and trees, more questions to check their partner’s understanding and more medium-quality clarification questions. They also used more encouragement to partners, although this did not reach significance. These findings are entirely consistent with the known characteristics of high- and low-pragmatic language skilled children. However, contrary to expectations, there were no significant differences between HP and LP children in the use of the high-quality (elaborating) clarification questions and high-quality navigational directives. Furthermore, although LP children did produce significantly more responses that ignored the previous speaker’s question or that were irrelevant, the proportion of their remaining responses that were adequate or inadequate was similar to those of the HP children.

Notably, there were also significant differences in the affective tone of these interactions; HP children working together were significantly more likely to express positive feelings towards their partners or about the game or themselves than were LP children. HP children were also more likely to partake in off-task talk when they were with each other, suggesting that they felt more comfortable, found the interaction easier and more enjoyable.

Comparison of high-pragmatic-language-skilled-children partnered with other high-pragmatic- language-skilled-children versus high-pragmatic-language-skilled-children paired with low-pragmatic-language skilled partners.

Our third prediction concerned differences between HP children with another HP partner versus HP children with a LP partner (see Table 2). HP children with LP partners used significantly more directives, and these were of the ‘hard’ overtly-commanding variety (e.g. ‘Do that’), rather than the more indirect, polite ‘soft’ variety (e.g. ‘Please could you help me?’). This difference showed the highest effect size of any of the verbal differences.

HP children working with an LP child showed evidence of adaptation to a less-competent partner, and used significantly more verbal communications to provide support. They used unsolicited clarification statements frequently and gave partners more information. Importantly, they used fewer non-discussed disagreements; in fact the proportion of discussed to non-discussed disagreements for HP with a LP partner was 65%, as opposed to 51% for HP children with a HP partner ($p = .04$). Discussed disagreements and avoidance of non-discussed disagreements have been shown to be particularly important to successful collaboration (Kruger, 1993). However, there also appeared to be costs to working with a LP child. To a certain extent, the HP child’s own communicative skills were compromised; similarly to their LP partners, they used more irrelevant navigational directives and more of the low-quality non-specific clarification questions. Again, differences in the affective climate of the interaction were evident; HP children paired with a LP child were much more likely to express negative feelings towards them than were HP children towards a HP partner and they were also much less likely to participate in off-task talk.

Asymmetry within high- and low- pragmatic-language-skilled dyads.

It is also worth noting that there were marked asymmetries between the partners’ communications within the HP+LP dyads. Largely, these reflected the differences observed

between HP and LP children already discussed i.e. HP children in these dyads used significantly fewer ignoring responses and more questions checking their partner's understanding than did their LP partners. There was also an imbalance in the use of 'hard' (but not 'soft') directives, with HP children using markedly higher levels. However, it is interesting to note that levels of agreements and disagreements, including those complying or not complying to directives (i.e. agree-act, disagree-act, see Appendix for examples) were similar for HP and LP children.

Severity of impairment.

As 24 of the 32 children in the study met criteria indicative of clinical levels of impairment on the CCC-2, results for this smaller group were also separately calculated to explore possible differences in severity. The comparisons between HP children versus LP children remained largely similar. There was a greater effect size and higher significance for the use of irrelevant navigational directives ($M = 0.35$, $SD = 0.89$, $R = -.24$, $p < .01$), other variables remained similar and questions on partner's understanding, maze features and self-positive feelings showed trends in a comparable direction but no longer reached significance, possibly a reflection of a reduced sample size ($M = 1.34$, $SD = 2.2$, $r = -.15$, $p = .09$; $M = 0.75$, $SD = 0.92$, $r = -.14$, $p = .11$; $M = 0.27$, $SD = 0.59$, $r = -.12$, $p = .13$ respectively). The picture for comparisons between HP children paired with either the clinical-level LP children or with other HP children also showed little change. The use of questions to check understanding by HP children rose ($M = 1.96$, $SD = 1.85$, $p = <.01$, $r = -.26$) and the use of negative feeling statements to partners reduced considerably, indicating that with this possibly more impaired group the HP children increased support still further. All other verbal communications remained similar.

Discussion

Our aim was to investigate differences in the behaviour and communication of children with high- and low-pragmatic language skills during collaborative problem-solving. This context was chosen because it incorporates important life skills and was also likely to be particularly demanding for children with low pragmatic language skill. We also endeavoured to create a setting that resembled a typical interaction for children of this age. Anecdotal evidence suggests that we achieved this aim; the children frequently asked to take the game home to play, and several commented that they already played the game with their friends even though it had been designed exclusively for our study and was unavailable elsewhere.

The study results showed significant differences between children with high- and low-pragmatic language skills in the use of irrelevant navigational directives, ignoring responses, low-quality clarification requests, questions checking partner's understanding and questions about features on the Maze maps. However, there were also some interesting similarities in the behaviour of the high- and low-pragmatic language skilled children; both used high-quality clarification questions and high-quality navigational directions to a similar extent.

There were two major factors impacting on the behaviour and performance of the LP children in this study: The first concerns characteristics incorporated in the task, the second relates to the support received from a high-skilled partner. These factors are considered below.

Authors of previous studies investigating children with pragmatic language impairments have argued that these children benefit particularly from interactions with a predictable structure as opposed to free-form, non-structured spontaneous social interaction. Under these conditions they maintain that low-skilled children will perform better on tasks, and that their difficulties will be less apparent (Bishop & Adams, 1991). Our task incorporated controlled turn-taking and some predictable question and answer sequences, such that the low-skilled children, whose primary difficulties lay in interpreting social contextual cues, were quite well-informed by these structures on how and when to initiate and respond. The most predictable

aspects of the task were giving partners navigational directions on where to find the ‘hidden treasures’ and querying these directions if they were not immediately comprehensible. Thus, it is perhaps unsurprising that the LP children performed at similar levels to the HP children on these elements of the task and used high-quality navigational directions and high-quality clarification questions. The greatest effect size difference between the HP and LP children related to the frequency of ‘ignoring’ responses. These were responses to questions where the LP child, rather than addressing a question, ignored it entirely and continued with navigational directions. LP children did this almost three times as often as HP children. Ignoring responses could occur repeatedly in one conversational sequence, much to the frustration of the HP children. Again, it seems that the structure of our task may have influenced this behaviour. In this case, it appears that the LP children may have been over-reliant on the cues given by the predictable sequence of alternating navigational directives and acknowledgements. When the HP children deviated from this structure with questions, the LP children appeared to be unable to deal with this and instead persisted with navigational directions. It is possible that the LP children perseverated in this way as they were unable to inhibit their adherence to the more predictable sequence of the game. Nilsen and Graham (2009) report that when tasks require a greater degree of inhibition, children tend to ignore their communicative partners’ perspective, they suggest that children’s inhibitory control skills allow them to inhibit their own perspective, enabling them to make use of their communicative partner’s perspective. Similarly Ciairano, Visu-Petra, and Settanni (2007) demonstrated that typically-developing children’s behaviour on a co-operative puzzle task was linked to executive inhibitory control as measured by a Stroop test.

The second factor influencing LP children’s behaviour on the task is that they were collaborating with a more communicatively-skilled partner. There was considerable evidence that the HP children were adapting their behaviour to the LP children. Pilot testing revealed that

the task was highly motivating to the children and they were keen to succeed. By comparison to HP children who were collaborating with another HP child, those with LP partners used substantially higher levels of spontaneous (i.e. not in response to a request) clarifications, provided more information (again, unsolicited) and the proportion of their disagreements that were discussed or explained was higher. All of these communications have been shown to be associated with successful problem-solving, particularly the latter (Kruger, 1993). Also, the frequency of questions to check partner's understanding by HP children was substantially higher than that of the LP children. Although these behaviours suggest a supportive attitude, there was also evidence of stress during the interaction. HP children used very high levels of 'hard' directives, when working with LP children. Use of directives is often considered an indication of the status experienced by children in the peer group, and authors have reported that other 'low-status' groups, such as children with learning-disabilities (Guralnick & Paul-Brown, 1989) and peer-rejected children (Markell & Asher, 1984, Murphy & Faulkner, 2006) are also the recipients of high levels of 'hard' directives. However, in spite of this, it did not appear that the LP children were adopting a submissive role, the levels of agreements and disagreements indicated that LP children were no more likely to comply with directives than the HP children. Other signs that the interaction between HP and LP children was more stressed than between two HP children were indicated by the codes relating to expression of affect. The HP children working with a LP child expressed more negative affect towards their partners and, within the dyad, less off-task talk took place. Furthermore, LP children in general made fewer positive statements either about themselves, the task or their partners. Our study investigated the affective climate of the interactions only by recording positive or negative verbal expressions. One area where further research could usefully inform future interventions employing peer-assistance would be to study children's emotional reactions during collaboration in greater detail.

A strength of the current study was that we were able assess pragmatic language ability with an observational measure (TPS) taken by an independent researcher and compare this with a teacher-report measure (CCC-2) for the lowest-scoring children of our sample. Another strength was recruitment within a narrow-age range (all participants were 5 or 6 years-old), studies frequently use wide age ranges thus limiting potential for informing future interventions targeted at specific age groups. We used observational methods; questionnaire methods typically involve retrospective global impressions, whereas micro-analytic coding aims to measure on-going, moment to moment processes. Finally, we used a task that was motivating to the children, and, crucially, that obliged the children to collaborate by rendering problem-solving by one child only virtually impossible. A limitation of the observational measures we used is that they provide only a ‘snap-shot’ in time, and it is possible that this may be an unrepresentative sample of the child’s usual behaviour. Another limitation of such measures is that they are labour-intensive and inevitably restrict the number of participants that can realistically be recruited. So, although we found significant differences consistent with previous studies and with the diagnostic profiles of these children, it is possible that some analyses in our study may be subject to Type II errors due to a lack of statistical power.

In conclusion, the findings of this study suggest that the computer task and the verbal coding system used here are suitable tools to develop further for investigating social communication disorders. There is accumulating evidence that clinical and educational interventions with peer-assistance can be very successful (Kasari et al., 2012). Evidence from the present study describes specific elements of communication that it may be useful to target and also highlights the importance of managing the affective aspect of these interactions to the benefit of all children involved.

- Adams, C., Lockton, E., Freed, J., Gaile, J., Earl, G., McBean, K., Nash, M., Green, J., Vail, A. & Law, J. (2012). The social communication intervention project: a randomized controlled trial of the effectiveness of speech and language therapy for school-age children who have pragmatic and social communication problems with or without autism spectrum disorder. *International Journal of Language and Communication Disorders*,47(3), 233-244.
- Anderson, A. H., Clark, A., & Mullin, J. (1994). Interactive communication between children: learning how to make language work in dialogue. *Journal of Child Language*, 21, 439-463.
- Barron, A., & Foot, H. (1991). Peer tutoring and tutor training. *Educational Research*, 33, 174–185.
- Bishop, D.V.M. (2003). *The Children’s Communication Checklist (2nd ed)*. Harcourt Assessment, London: UK.
- Bishop, D. V. M., & Adams, C. (1991). What do referential communication tasks measure? A study of children with specific language impairment. *Applied Psycholinguistics*, 12, 199-215.
- Bishop, D. V. M., Chan, J., Adams, C., Hartley, J., & Weir, F. (2000). Conversational responsiveness in specific language impairment: Evidence of disproportionate pragmatic difficulties in a subset of children. *Development and Psychopathology*, 12(2), 177-199.
- Bishop, D. V. M., & McDonald, D. (2009). Identifying language impairment in children: combining language test scores with parental report. *International Journal of Language and Communication Disorders*,44(5), 600- 615.
- Ciairano, S., Visu-Petra, L., & Settanni, M. (2007). Executive inhibitory control and cooperative behavior during early school years: A follow-up study. *Journal of Abnormal Child Psychology*, 35, 335–345.

- Conti-Ramsden, G., & Botting, N. (2004). Social difficulties and victimisation in children with SLI at 11 years of age *Journal of Speech, Language and Hearing Research*, 47, 145 – 161.
- Diagnostic and Statistical Manual of Mental Disorders (5th Edition), American Psychological Association.
- Dunn, L. M., Dunn, L. M., Whetton, C., & Burley, J. (1997). *British Picture Vocabulary Scale* (Rev. ed.). Windsor: NFER-Nelson.
- Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: Sage Publications.
- Gottman, J. M., & Parker, J. G. (Eds.) (1986). *Conversations of friends*. Cambridge: Cambridge University Press.
- Gottman, J. M., & Parkhurst, J. (1980). The development of friendship and acquaintanceship processes. In A. Collins (Ed.), *Minnesota symposia on child psychology* (Vol. 13, pp. 197–253). Hillsdale, NJ: Erlbaum.
- Guralnick, M. J., & Paul-Brown, D. (1989). Peer-related communicative competence of preschool children: Developmental and adaptive characteristics. *Journal of Speech and Hearing Research*, 32, 930-943.
- Joiner, R., Faulkner, D., Littleton, K., & Miell, D. (Eds.) (2000). *Rethinking collaborative learning*. London: Free Association Press.
- Kasari, C., Rotheram-Fuller, E., Locke, J., & Gulsrad, A. (2012). Making the connection: randomized controlled trial of social skills at school for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, 53(4), 431-439.
- Ketelaars, M. P., Cuperus, J., Jansonius, K., & Verhoeven, L. (2010). Pragmatic language impairment and associated behavioural problems. *International Journal of Language and Communication Disorders*, 45(2), 204–214.

Kruger, A. (1993). Peer collaboration: Conflict, co-operation or both. *Social Development*, 2, 165–182.

Laws, G., Bates, G., Feuerstein, M., Mason-Apps, E., & White, C. (2012). Peer acceptance of children with language and communication impairments in a mainstream primary school: Associations with type of language difficulty, problem behaviours and a change in placement organization. *Child Language, Teaching and Therapy*, 28(1), 73-86.

Lindsay, G., Dockrell, J., Desforges, M., Law J., & Peacy, N. (2010). Meeting the needs of children and young people with speech, language and communication difficulties. *International Journal of Language and Communication Disorders*, 45(4), 448 – 460.

Lloyd, P., Boada, H., & Forns, M. (1992). New directions in referential communication research. *British Journal of Developmental Psychology* 10, 385-403.

Markell, R., & Asher, S. (1984). Children's interactions in dyads: Interpersonal influence and sociometric status. *Child Development*, 55, 1412–1424.

Murphy, S., & Faulkner, D. (2006). Gender differences in verbal communication between popular and unpopular children during an interactive task. *Social Development*, 15(1), 82–108.

Murphy, S., & Faulkner, D. (2011). The relationship between bullying roles and children's everyday dyadic interactions. *Social Development*, 20(2), 272–293. doi: 10.1111/j.1467-9507.2010.00597.x

Nilsen, E. S., & Graham, S. A. (2009). The relations between children's communicative perspective-taking and executive functioning. *Cognitive Psychology*, 58, 220–249.

Norbury, C. F., Nash, M., Baird, G., & Bishop, D. V. M. (2004). Using a parental checklist to identify diagnostic groups in children with communication impairment: a validation of the Children's Communication Checklist-2. *International Journal of Language and Communication Disorders*, 39(3), 345-364.

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Radziszewska, B., & Rogoff, B. (1988). Influence of adult and peer collaborators on children's planning skills. *Developmental Psychology*, 24, 840–848.

Reisinger, L. M., Cornish, K. M., & Fombonne, E. (2011). Diagnostic differentiation of autism spectrum disorders and pragmatic language impairment. *Journal of Autism and Developmental Disorders*, 41(12), 1694-1704.

Shulman, B. B. (1986). *Test of pragmatic skills - revised*. Tucson, Arizona: Communication Skill Builders.

Whitehouse, A. J. O., Watt, H. J., Line, E. A., & Bishop, D. V. M. (2009). Adult psychosocial outcomes of children with specific language impairment, pragmatic language impairment and autism. *International Journal of Language and Communication Disorders*, 44, 511 – 528.

Table 1.

Verbal Communication Measures by Individual: Frequency of Observations Expressed as a Percentage of Total Number of verbal segments

		Pragmatic skill dyad in which		<i>U</i>	<i>P</i> ^c	<i>R</i>
		individual placed				
		High with High ^a	Low with High ^b			
		(HP+HP children)	(LP children)			
		<i>M (SD)</i>	<i>M (SD)</i>			
General directives	Hard directives	1.00 (1.65)	1.32 (2.19)	732.5	ns	-.01
	Soft directives	3.36 (3.01)	2.86 (2.74)	674.5	ns	-.07
Navigation directives	Standard	35.94 (13.66)	38.41 (21.84)	738.5	ns	>-.01
	Irrelevant	0.02 (0.17)	0.24 (0.74)	686.0	.06	-.17
	High-quality	11.62 (7.57)	9.82 (7.75)	632.5	ns	-.12
Clarification requests	Non-specific	0.37 (0.72)	1.47 (1.79)	473.5	<.01	-.35
	Specific	1.17 (1.74)	0.90 (2.49)	606.0	.05	-.18
	Elaborating	2.04 (2.49)	1.93 (2.01)	737.0	ns	>-.01
General questions	Understanding partner	1.62 (2.07)	1.08 (1.90)	561.0	.02	-.22
	Maze Features	1.71 (3.12)	0.74 (1.04)	599.0	.05	-.17
	Task Request	3.08 (3.33)	3.07 (3.49)	743.5	ns	>-.01
	Information	2.13 (2.12)	1.86 (1.95)	689.0	ns	-.06

Responses	Ignoring	0.99 (1.57)	2.85 (3.54)	527.5	.01	-.26
	Irrelevant	0.05 (0.25)	0.36 (1.09)	676.0	.06	-.16
	None	0.37 (1.43)	1.07 (4.32)	722.0	ns	-.05
	Acknowledge	5.16 (5.55)	4.79 (4.79)	737.0	ns	>-.01
	Inadequate	0.80 (1.27)	0.96 (1.81)	682.5	ns	-.08
	Adequate	13.76 (7.12)	13.68 (7.49)	738.5	ns	>-.01
Agreements	Agree-Fact	3.10 (3.02)	3.54 (3.35)	658.5	ns	-.06
	Agree-Act	1.17 (1.45)	1.58 (1.77)	690.0	ns	-.10
Disagree- ments	Disagree-Fact	3.69 (3.50)	4.04 (3.74)	718.5	ns	-.02
	Disagree-Act	1.68 (1.86)	1.29 (1.59)	657.0	ns	-.10
	Discussed	2.47 (2.36)	2.29 (2.10)	733.0	ns	-.01
	Non-discussed	2.31 (2.23)	1.74 (1.45)	685.5	ns	-.06
Statements	Task Intention	2.13 (2.56)	2.73 (3.87)	733.0	ns	-.01
	Clarification	1.82 (2.06)	1.47 (1.75)	681.0	ns	-.07
	Inform	14.84 (6.77)	14.53 (8.05)	722.0	ns	-.01
	Encourage	1.37 (2.38)	0.72 (0.88)	674.0	ns	-.08
Feeling codes	Negative-other	0.92 (1.88)	0.80 (1.35)	686.0	ns	-.08
	Positive-other	0.96 (1.72)	0.32 (0.70)	581.5	.02	-.22
	Negative-self	0.02 (0.55)	0.07 (0.27)	682.5	ns	-.13
	Positive-self	2.19 (2.81)	1.22 (1.85)	593.0	.05	-.18
	Off-task talk	2.85 (3.39)	1.41 (2.44)	540.5	.02	-.24

^a n = 48, ^b n = 31, ^c Results reported for differences where $p < .10$, ns = non-significant

Table 2.

Verbal Communication Measures by Individual: Frequency of Observations Expressed as a Percentage of Total Number of verbal segments

		Pragmatic skill dyad in which individual placed		U	P ^c	R
		High with High ^a (HP+HPchildren)	High with Low ^b (HP with LP children)			
		M (SD)	M (SD)			
General directives	Hard directives	1.00 (1.65)	2.53 (2.74)	473.0	<.01	-.32
	Soft directives	3.36 (3.01)	4.27 (4.32)	693.0	ns	-.06
Navigation directives	Standard	35.94 (13.66)	20.31 (12.43)	602.5	.08	-.16
	Irrelevant	0.02 (0.17)	0.23 (0.71)	663.5	.03	-.21
	High-quality	11.62 (7.57)	9.99 (6.60)	640.0	ns	-.11
Clarifi- cation requests	Non-specific	0.37 (0.72)	1.00 (1.39)	568.0	.02	-.24
	Specific	1.17 (1.74)	1.25 (2.32)	741.5	ns	>-.01
	Elaborating	2.04 (2.49)	1.49 (2.29)	623.5	ns	-.14
General questions	Understanding	1.62 (2.07)	1.89 (2.33)	725.5	ns	-.02
	Partner					
	Maze Features	1.71 (3.12)	1.59 (2.93)	672.0	ns	-.08
	Task Request	3.08 (3.33)	4.14 (5.65)	708.5	ns	-.04
	Information	2.13 (2.12)	1.69 (1.53)	683.0	ns	-.07

Responses	Ignoring	0.99 (1.57)	0.85 (1.38)	691.0	ns	-.07
	Irrelevant	0.05 (0.25)	0.10 (0.39)	726.0	ns	-.05
	None	0.37 (1.43)	0.29 (1.11)	731.5	ns	-.02
	Acknowledge	5.16 (5.55)	5.82 (7.70)	741.5	ns	>-.01
	Inadequate	0.80 (1.27)	1.23 (2.33)	737.0	ns	>-.01
	Adequate	13.76 (7.12)	11.94 (7.73)	630.5	ns	-.13
Agreements	Agree-Fact	3.10 (3.02)	2.87 (4.28)	604.0	.07	-.16
	Agree-Act	1.17 (1.45)	1.32 (1.30)	673.5	ns	-.08
Disagree- ments	Disagree-Fact	3.69 (3.50)	2.86 (3.66)	604.5	.07	-.16
	Disagree-Act	1.68 (1.86)	1.61 (1.81)	741.0	ns	>-.01
	Discussed	2.47 (2.36)	2.61 (2.04)	675.0	ns	-.08
	Non-discussed	2.31 (2.23)	1.48 (1.33)	580.0	.05	-.19
Statements	Task Intention	2.13 (2.56)	2.87 (2.78)	617.0	.09	-.15
	Clarification	1.82 (2.06)	3.27 (3.03)	537.5	.02	-.24
	Inform	14.84 (6.77)	16.97 (5.42)	574.5	.04	-.19
	Encourage	1.37 (2.38)	1.19 (2.17)	709.0	ns	-.04
Feeling codes	Negative-other	0.92 (1.88)	1.47 (2.52)	548.0	.01	-.25
	Positive-other	0.96 (1.72)	0.63 (1.71)	692.0	ns	-.07
	Negative-self	0.02 (0.55)	0.17 (0.53)	713.0	ns	-.06
	Positive-self	2.19 (2.81)	1.92 (2.88)	723.5	ns	-.02
	Off-task talk	2.85 (3.39)	1.43 (2.23)	538.0	.01	-.24

^a n = 48, ^b n = 31, ^c Results reported for differences where $p < .10$, ns = non-significant

Appendix: Abbreviated verbal coding system designed for computerised Maze Task

Segment code	Examples
<i>'Hard' directives (non-navigational):</i> Overtly commanding directives	'You take your turn now' 'Stop talking'
<i>'Soft' directives (non-navigational):</i> Directives requesting, suggesting or inferring	'It should be my turn now, please' 'That's not allowed'
<i>Standard navigational directives:</i> Relevant but no reference to maze features	'Go down, now up, up, stop there'
<i>Irrelevant navigational directives:</i>	'Go on the squares' (applies to all possible moves)
<i>High-quality navigational directives:</i> Includes reference to maze features e.g. houses or trees	'Go to the blue house' 'The prize is in the forest, go there'
<i>Low-quality non-specific clarification question:</i> Request merely asking for repetition	'Pardon?' 'Huh?' 'What?'
<i>Medium –quality specific clarification question:</i> request to repeat part of the directions or confirmation	'Go down to the bridge and then...' Q: 'Go to the bridge did you say?'
<i>High-quality elaborating clarification question:</i> Request for additional information than that provided	'Go to the church' Q: 'The big one or the little one?'
<i>Understanding partner:</i> Questions monitoring partner, checking understanding or partner's feelings	'Do you like this game?' 'Did you get that?'
<i>Maze Features question:</i> concerning partner's maze	'Have you got a red house on yours?'
<i>Task Request question:</i> request for directions	'Can you tell me where to go now?'
<i>Information question:</i> task-related information	'What's the arrow for?'
<i>Ignoring response:</i> ignores question and continues	Q: 'Have you got a house?'

with navigation	R: 'You go down, past the flowers'
<i>Irrelevant response:</i> off-task talk response to task-related question	Q: 'Have you got a house?' R: 'I like ice-cream'
<i>Acknowledgement:</i> brief, <3 words, driver role only	'Yeah' 'Uh-huh' 'Ok'
<i>Non-response:</i> No response when one expected	(silence, 2 seconds or more)
<i>Inadequate response:</i> fails to provide adequate requested information	Q: 'Where is it?' R: 'There' (when 'there' not visible to partner)
<i>Adequate response:</i> provides adequate information	Q: 'Have you got a church?' R: 'Yes'
<i>Agree-Fact:</i> Agreement with statement of fact	Q: 'It's the green one next, isn't it?' R: 'Yes, next to the yellow'
<i>Agree-Act:</i> agreement to act, comply to a directive	'Tell me where the treasure is' R: 'Ok'
<i>Disagree-Fact:</i> Disagreement with statement of fact	'That tree is big' R: 'No, it isn't'
<i>Disagree-Act:</i> non-compliance with a directive	'Do it now' R: 'No, I'm not doing it'
<i>Discussed Disagreement:</i> with explanation	'Let me drive now' R: 'No, it's my turn'
<i>Non-discussed Disagreement:</i> without explanation	'You let me drive now' R: 'No'
<i>Task Intention:</i> telling partner intentions	'I'm driving to the pond now'
<i>Clarification:</i> providing unsolicited clarification	'It's a bit further down, you'll see it'
<i>Inform:</i> All other information	'I don't know what you mean'
<i>Encourage:</i> support for partner	'Yeah, you're doing it right, that's it'
<i>Feeling negative other:</i> negative to/about partner	'You're stupid'
<i>Feeling positive other:</i> positive to/about partner	'We're friends' 'I like playing with you'
<i>Feeling negative self:</i> negative feelings about self/task	'I keep getting it wrong' 'I'm bored'
<i>Feeling positive self:</i> positive feelings about self/task	'Yay! I'm good at this' 'Another prize!'
<i>Off-task talk:</i> Chat unrelated to task	'I'm going swimming after school'

Disclosure of Interest Form

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Author Signature [Signature] Date 14th Nov 2012 during dyadic interaction with peers.

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Author Name Suzanne Murphy

Article Title The behaviour of young children with social communication disorders

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