Computer-mediated communication in adolescents with and without a history of specific language impairment (SLI)

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ABSTRACT

The various uses of computer-mediated communication (CMC) are transforming the nature of social interactions and human relations among adolescents. Little is known about engagement of exceptional youth with this technology. The present study investigated the implications of language and social factors for frequency of CMC use and its relationship to adolescent well-being in young people with and without a history of specific language impairment (SLI). Eighty six adolescents with a history of SLI and 90 typically developing 17 year olds participated. Participants completed standardized assessments of psycho-linguistic abilities and self-report measures of language motivations and social motivations for CMC use, as well as anxiety and depression. Results indicate that language abilities have a complex relationship with frequency of CMC use; social abilities have a more direct association and are predictive of frequency of CMC use. Both adolescents with SLI and typically developing adolescents were less shy online. No association was obtained between frequency of CMC use and reported emotional symptoms of anxiety and/or depression. It is argued that the characteristics of CMC, in terms of its less stringent language demands and its reduced-cues environment, can provide a medium for positive adaptation of adolescents with communication challenges.

1. Introduction

Computer-mediated communication (CMC) via the Internet is widely available and very popular with the young (Livingstone & Bober, 2005; Roberts & Foehr, 2008). Findings from the Pew Internet and American Life Project (Lenhart, Madden, & Hitlin, 2005) indicate that 87% of all youth between 12 and 17 years use computers, in particular the Internet. This figure is similar in Europe (83% of 16- to 17-year-olds, Eurobarometer, 2004). CMC use seems to be equally popular with both sexes (Sussman & Tyson, 2000; Whitley, 1997). Interpersonal contact and everyday social arrangements among teenagers are now routinely effected by CMC via the use of e-mail, instant messaging services, online game play, and similar media (Barak & Sadovsky, 2008; Boneva, Quinn, Kraut, Kiesler, & Shklovski, 2006; Bryant, Sanders-Jackson, & Smallwood, 2006; Lenhart, Arafeh, Smith, & Rankin Macgill, 2008a,b; Subrahmanyam & Greenfield, 2008).

The various uses of CMC are transforming the nature of social interactions and human relations, particularly among adolescents. Over 75% of young people's online interactions serve interpersonal functions (Baym, Zhang, & Lin, 2004; Gross, 2004). However, the effects are not unidirectional, i.e., technology affecting individuals, but interactive. Intrapersonal and contextual forces are likely to interact with communication technologies in complex ways (Barak & Suler, 2008; Hardy & Scheufele, 2005). Theoretical accounts of CMC suggest a number of intrapersonal factors that may affect young people's use of CMC, in particular cognitive and perceptual abilities, motivation and specific skills (Barak & Sadovsky, 2008; Spitzberg, 2006). In this study, we are particularly interested in examining two clusters of potential influences on frequency of CMC use: language and social abilities. We compared frequency of use by adolescents with and without a history of specific language impairment (SLI). Participants completed interviews and kept a diary of their uses of CMC. We measured language and social abilities and motivations, and adolescent well-being.

1.1. Language and CMC use in adolescence

Language abilities have received little attention in relation to CMC use, although research on the role of language-related abilities in new media use is emerging (Barak & Sadovsky, 2008; Durkin, Conti-Ramsden, Walker, & Simkin, 2009; Plester, Wood, & Joshi, 2009). For example, Barak and Sadovsky found that

adolescents with hearing impairments used the Internet more intensively than did peers with normal hearing, and this was the case for both personal and group communication. Working with adolescents with language impairments, Durkin and colleagues found that adolescents who used educational new media less often had poorer language and literacy skills. Plester et al. found, among typically developing adolescents, that those who used 'textisms' (abbreviations and modified vocabulary in text messages) had higher literacy skills.

Young people with SLI have deficits in language learning and use that cannot be explained by factors such as low nonverbal IQ, hearing impairment or neurobiological damage (Leonard, 1998). Comparing their use of new media with that of typically developing peers allows us to investigate the role of language-related abilities in two respects. First, it can tell us about the implications of having language impairments for the ways in which young people respond to new interpersonal opportunities provided by CMC. Second, it provides a distinctive comparison by which to enrich our evidence base concerning the role of language in CMC use among typically developing young people.

SLI has been estimated to affect 7.4% of children at school entry age (Tomblin et al., 1997). Whilst much research has detailed the effects and consequences in childhood, it is becoming increasingly apparent that the effects of SLI extend through adolescence and into adulthood and that a substantial proportion of children have persisting difficulties in a wide range of areas of functioning (Clegg, Hollis, Mawhood, & Rutter, 2005; Conti-Ramsden & Botting, 2008; Conti-Ramsden, Durkin, Simkin, & Knox, 2008; Durkin & Conti-Ramsden, 2007).

There are several reasons to expect that young people with linguistic impairments would be disadvantaged in the face of language-dependent modes of communication and interaction. Young people with SLI have difficulties with oral language; expressing their ideas and understanding the ideas of others (Leonard et al., 2007; Montgomery, 2006; Wetherell, Botting, & Conti-Ramsden, 2007). They also have difficulties in the production (Dockrell, Lindsay, Connelly, & Mackie, 2007; Mackie & Dockrell, 2004) and comprehension of written text (Bishop & Clarkson, 2003; Snowling, Bishop, & Stothard, 2000). Although CMC is evolving as a multimedia environment, the majority of interpersonal communication is text-dependent (Barak & Suler, 2008). Recent findings reveal that 85% of adolescents aged 12–17 engage at least occasionally in some form of written electronic personal communication, such as sending email, text messaging, instant messages, or posting comments on social networking sites (Lenhart et al., 2008a). Thus, the language- and literacy-based nature of much CMC raises the prospects that it could be a particularly challenging environment for young people with SLI.

There are, however, also compelling reasons to expect that CMC use could be appealing to young people with language difficulties. Not all linguistic requirements of CMC are necessarily stringent. For example, in peer-oriented uses of CMC, the rules of spelling and grammar appear to be considerably relaxed, internet talk is informal, and expressive mistakes are tolerated (Livingstone & Bovill, 2001; Plester et al., 2009; Volckaert-Legrier, Bernicot, & Bert-Erboul, 2009). Some forms of CMC, such as e-mail, allow for asynchronous, editable forms of interaction, which can offer young people with SLI more time to think, write, and re-write (edit) language (Madell & Muncer, 2007). In this respect, while language and literacy skills are certainly fundamental to CMC, they may not be as arduous as some more traditional modes of interaction for adolescents with SLI. Barak and Sadovsky (2008) argue that the communication-related characteristics of the Internet mean that it provides a special opportunity for people with disabilities that would otherwise impede interpersonal interactions; their findings indicate that this is the case for adolescents with hearing impair-

ments. Part of the purpose of this study was to investigate whether adolescents with SLI avoid or use the interpersonal communication facilities afforded by the Internet, and whether language factors can help explain their uptake.

1.2. Social factors and CMC use in adolescence

In contrast to language, social factors have been examined more extensively with regard to CMC use. Generally, young people appear to be socially motivated to use CMC as they perceive a number of benefits and gratifications (Barak & Sadovsky, 2008; Chou & Peng, 2007; Gross, 2004; Hunter & Allen, 1992; Livingstone & Bober, 2005). Among some adolescents with disabilities, electronic communication may be especially attractive. For example, Barak and Sadovsky obtained evidence that adolescents with hearing impairment found their disability less constraining in social interactions via the Internet, and hence were strongly motivated to use it as a medium of communication.

With respect to social factors, theoretical and empirical bases for predictions concerning young people with SLI again are somewhat mixed. On the one hand, social relations are another area of difficulty for these young people. Children with SLI tend to be less socially accepted and have fewer friends than do other children (Brinton & Fujiki, 2002; Rice, 1993). As a group, they tend to score higher on measures of shyness and reticence (Hart, Fujiki, Brinton, & Hart, 2004; Wadman, Durkin, & Conti-Ramsden, 2008). They are also more likely to be socially excluded (Savage, 2005). By early adolescence, they tend to have negative self-perceptions with respect to their own social competence (Jerome, Fujiki, Brinton, & James, 2002; Lindsay, Dockrell, & Mackie, 2008). In mid-adolescence, they are less likely than typically developing peers to have close friends and they report poorer friendship quality (Durkin & Conti-Ramsden, 2007).

On the other hand, difficulties with peer relations do not necessarily mean that adolescents with SLI have no desire to interact with peers. Although young people with SLI tend to be less skilled in interpersonal contact, they do seek to relate to other youth, they can be socially motivated, and many achieve satisfactory levels of friendship (Durkin & Conti-Ramsden, 2007; Wadman et al., 2008). One theoretical model of the relationship between social development and language ability (Redmond & Rice, 1998) holds that individuals with SLI develop negative adaptive social behaviours as a result of their difficulties with language in social situations. Some individuals with SLI may become withdrawn or less sociable in adolescence, given their experiences earlier in development. These processes are dependent not on fixed psychosocial deficits but on how the child deals with the communicative demands of different situations and the reactions of others. Different situations and modes of interaction make different demands – and offer different opportunities. Use of CMC may be one source of such opportunities, and it could provide a context for positive adaptation (Barak & Sadovsky, 2008). Hence, a second purpose of this study was to investigate whether social factors contribute positively or negatively to the uses of CMC by adolescents with SLI.

The higher levels of shyness among young people with SLI present another reason why CMC may be attractive to them for interpersonal purposes. Research with people suffering from shyness and social anxiety shows that online communication can be actively sought and experienced as beneficial (Caplan, 2003; Davis, 2001; Stritzke, Nguyen, & Durkin, 2004; Valkenburg, Schouten, & Peter, 2005). In particular, people who find face-to-face interaction uncomfortable or threatening may be drawn to CMC because it offers anonymity and social distance, or at least reduces the availability of unwelcome cues and negative evaluative feedback, such as nonverbal reactions (Saunders & Chester, 2008; Stritzke et al.,

2004; Valkenburg et al., 2005; Walther & Boyd, 2002). CMC can open up individuals' expressive potential and afford new opportunities for developing personal identity and forming relationships (Bargh, McKenna, & Fitzsimons, 2002; McKenna, Green, & Gleason, 2002; Walther, 1996). One possible outcome can be heightened social self confidence as a result of experiencing comfortable and successful social interactions online (Barak & Sadovsky, 2008; Stritzke et al., 2004). Saunders and Chester (2008), however, caution that while current evidence is consistent with these arguments, the majority of relevant research has been conducted with samples of university students and that there is a need for tests on a broader sample base. The present study provides the first comparison of offline and online shyness in a sample of adolescents with language impairment.

1.3. Psychological well-being, language impairment and CMC use in adolescence

Finally, we also examined the relationship between CMC use and psychological well being in adolescents with SLI. In general, evidence indicates that young people with SLI are more likely to experience poor emotional health than their peers. For example, Beitchman and colleagues followed up a cohort of children with SLI from 5 to 19 years of age, whom they assessed for psychiatric comorbidity. In adolescence, participants had higher rates of anxiety disorders (Beitchman et al., 2001), aggressive behaviour (Brownlie et al., 2004) and substance abuse (Beitchman et al., 2001). Clegg and colleagues (2005), following a cohort from 4-years-old to mid-adulthood, found an increased risk of psychiatric impairment (compared to both peers and siblings), particularly concerning, social anxiety and schizoform/personality disorders. Conti-Ramsden and Botting (2008) found higher anxiety and depressive symptoms amongst adolescents with SLI, regardless of the severity of their language and communication difficulties.

The relationship between time spent online and psychological well-being has been a controversial topic, leading to much debate regarding potential correlates and effects (Barak & Suler, 2008; Caplan, 2002; Kraut et al., 2002). Findings have been mixed. Gross (2004) found no association between CMC use and psychosocial well-being in adolescents. In a large scale survey of American 10- to 17-year-olds, Ybarra, Alexander, and Mitchell (2005) found that youth reporting minor to major levels of depressive symptoms were more likely to use the Internet frequently for e-mailing others, for interacting with strangers online, and had more intense patterns of use, but on most measures of Internet use could not be differentiated from peers with no depressive symptoms. Valkenburg and Peter (2007), in a large sample of 10- to 17-year-olds, found that online communication, particularly instant messaging was positively associated with well-being and argued that this is because instant messaging tends to be used to support and extend communications among friends. Ohannessian (2009) found no association between communicative uses of new media (including e-mailing, IMing, text messaging) and anxiety or depression in a large sample of 14- to 16-year-olds. Little is known about patterns of use among exceptional youth, but Barak and Sadovsky (2008) found that hearing impaired adolescents who did use CMC were similar in level of psychological well-being to hearing peers, while non-user hearing impaired adolescents scored lower. The characteristics of adolescents with SLI make them an interesting group of individuals with regard to the examination of the relationship between CMC use and psychosocial well-being.

The overall goals of this investigation, then, were to investigate the extent to which adolescents with SLI engage with the interpersonal communication opportunities of the Internet, and to examine the influence of linguistic and social factors on their usage. We predicted:

- H1: Severity of impairment would affect willingness to use CMC, such that less linguistically-able young people would be least frequent users.
- H2: Among adolescents with SLI who do use CMC, the language-related advantages of the medium (compared to spoken language) would be a motivating consideration, and more so than for typically developing peers.
- H3: Participants with SLI would report greater shyness, both offline and online, than would typically developing adolescents.
- H4: Participants in both groups would report lower shyness online than offline.

There were less clear grounds, in theoretical accounts or previous findings, for predictions in respect of whether or not social factors motivated CMC use differentially in adolescents with SLI versus adolescents with typical development. Similarly, previous research has led to mixed results and conflicting interpretations concerning the relationship between patterns of use and well-being in adolescents. Hence, we addressed these two latter issues as exploratory questions.

2. Method

2.1. Participants

2.1.1. Adolescents with a history of SLI

The adolescents with a history of SLI in this investigation were originally part of a wider longitudinal study: the Conti-Ramsden Manchester Language Study (Conti-Ramsden & Botting, 1999a, 1999b; Conti-Ramsden, Crutchley, & Botting, 1997). This initial cohort was recruited from 118 language units attached to English mainstream schools. These language units provided a list of year two children attending for at least 50% of the week. Across England, approximately 500 children met this criterion. All language units were asked to participate and two declined this invitation. Subsequently, approximately half of the eligible children in each unit were randomly sampled. This resulted in an initial study cohort of 242 children. The age range was 7;5 years to 8;9 years and consisted of 186 males and 56 females (females forming 23.1% of the cohort). These children were reassessed as part of the original study at 8, 11, 14 and 16 years of age.

From the original cohort of 242 children described above, 111 (45.9% of the original cohort) were approached to participate in the present study. Longitudinal data showed that all of these adolescents met criteria for SLI at least at one time point (7, 8, 11, 14 or 16 years) prior to the data collection for the present study. These criteria comprised:

1. Performance IQ (PIQ) of 80 or more and at least one concurrent standardized language test score $> 1SD$ below the population mean at one of the longitudinal assessment stages.
2. No sensory-neural hearing loss.
3. English as a first language.
4. No record of a medical condition likely to affect language.

Of the 111 adolescents invited to take part 90 agreed to participate. Of the 90 young people with SLI, 29 had their own computer (32%), 52 had access to one at home that was shared with other members of the household (58%), 8 had access to a computer outside the home (9%) and 1 never used a computer (1%). However, given the nature of the present study, only data from those participants who reported using a computer and using the Internet

were included. This left a final sample of 86 adolescents with a history of SLI (70.9% male/29.1% female) aged between 16 years 2 months and 18 years 2 months (mean age 17;1 years).

2.1.2. Typically developing (TD) adolescents

A comparison group of adolescents from a broad background participated in the study. They had no history of special educational needs or speech and language therapy provision, had participated in the Manchester Language Study at the 16 year phase, and had access to a computer at home. The Manchester Language Study used Census data as per the 2001–2002 General Household Survey (Office of National Statistics) to target adolescents who would be representative of the range and distribution of households in England in terms of household income and maternal education. Ninety-one TD adolescents agreed to participate. Of the 91 typically developing adolescents, 31 owned a computer (34%), 54 had access to one at home (59%) and 6 had access to one outside the home (7%). One young person reported not using the computer and the Internet. This left a final sample of 90 adolescents (60% male/40% female), aged between 15 years 11 months and 17 years 10 months (mean age 16;10 years), who formed part of the present study.

Most adolescents in both groups (90% for SLI and 93% for TD) either owned or had home access to a computer. This is the pattern that would be expected of teenagers in the UK (Livingstone & Bober, 2005; Valentine, Marsh, Pattie, & BMRB, 2005).

2.2. Participants' socio-economic status background

TD adolescents were matched in terms of age and socio-economic status (SES) to the sample with SLI described above. As part of the assessment at 16 years of age, data were collected from both sets of participants' parents in order to ascertain levels of maternal education (minimal to degree level) and household income (<£5200 to > £52,000 per annum), as measures of SES. No significant differences were found between the adolescents with SLI and TD adolescents, who participated at the present stage of the study, in maternal education levels, $\chi^2(2, N = 167) = 4.01$, $p = .134$, or household income bands, $\chi^2(3, N = 169) = 2.81$, $p = .421$. Importantly, therefore, the adolescents with SLI were similar to the TD adolescents in terms of socio-economic status indicators. Further, the household income of both groups ranged from the lowest bracket found in the 2001–2002 General Household Survey (Office of National Statistics) to the highest bracket and thus was representative of the range of household income distribution found in England as a whole.

2.3. Participant PIQ and language profiles

All 176 adolescents had psycholinguistic data available from the present stage of the study (see Table 1). As expected, TD adolescents performed significantly better than adolescents with SLI on tests measuring performance IQ, language and literacy. Adolescents with SLI were classed as currently impaired if, at the time of the study, they met the following criteria for SLI: performance IQ (WASI; Wechsler, 1999) of 80 or more and concurrent expressive or receptive language index score (CELF-4 Semel, Wiig, & Secord, 2003) less than 85.

Fifty-nine of the adolescents with SLI (68.6%) were classified as meeting criteria for SLI at the time of the study. Recall that the remaining 31.4% had all met the established SLI criteria at some point in the last ten years. Of this group, 14 (16.3% of the total) demonstrated concurrent normal nonverbal and language ability and 13 (15.1% of the total) showed nonverbal and language ability in the impaired range. None of the adolescents had impaired nonverbal abilities but normal language scores. Therefore, at the time of the study, a total of 72/86 of the adolescents (83.7%) had concurrent language difficulties.

Of the TD adolescents, 75/90 (83.3%) had normal PIQ and language scores (as defined above), 14/90 (15.6%) had normal PIQ but low expressive or receptive language, and 1/90 (1.1%) had normal language but low PIQ. None of the TD adolescents had both low PIQ and language. Thus, regardless of PIQ, 76/90 (84.4%) of the TD adolescents had normal language functioning and none met the criteria for classification as having SLI. It is to be expected that a representative sample of TD adolescents without a history of special education or language problems drawn from the full range of the socio-economic spectrum would include some adolescents who obtain poor scores on language or other psycholinguistic measures.

2.4. Tests and materials

2.4.1. Psycholinguistic abilities

1. IQ was assessed using the full form of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). The WASI is a battery of four tests (Vocabulary, Block Design, Similarities, and Matrix Reasoning) and is used to provide a brief measure of a person's intellectual ability. It can be used with people aged 6–89 years. The Block Design and Matrix Reasoning subtests were used to derive performance IQ. This test has been shown to have good reliability for performance IQ (.94 to .96) as well as validity (.76 to .84).
2. Language abilities were assessed using the Clinical Evaluation of Language Fundamentals – Fourth edition (CELF-4; Semel et al., 2003). The CELF-4 is an individually administered language test designed for 5–21 year olds. The core language score provides an overall assessment of language ability and is derived using the following subtests: Recalling Sentences, Formulated Sentences, Word Classes 2 (both receptive and expressive parts), and Word Definitions. The CELF-4 has been shown to have good reliability with stability coefficients for the above composite scores ranging from .88 to .92 as well as good validity as demonstrated by high correlations with other independent language measures (correlations of .80 to .87).

Table 1
Profiles for adolescents with SLI and TD adolescents.

	Adolescents with SLI (N = 86)		TD adolescents (N = 90)		Effect-size r
	M	SD	M	SD	
Psycholinguistic variables					
Performance IQ	94.6	15.7	106.4	11.0	0.40
Language	69.7	18.5	102.6	13.8	0.71
Literacy	82.0	14.5	102.1	9.9	0.63

Note: all comparisons $p < .001$.
Note: some N values may differ slightly due to missing data.

3. Literacy abilities were assessed using the reading and spelling subtests of the Wide Range Achievement Test – Third edition (WRAT-3; Wilkinson, 1993) to provide an overall literacy score. This test can be used with people aged 5–75 years. The WRAT-3 has been found to have good reliability (.92 to .93) and validity (.83 to .87).

2.5. Shyness

Shyness was assessed using the Shyness12-item Revised Cheek and Buss Shyness Scale (Stritzke et al., 2004; adapted from Cheek, 1983). This scale consists of 12 questions, adapted from the 13-item Revised Cheek and Buss Shyness Scale, which has been used widely in empirical studies of shyness. It was designed to measure tension and inhibition when with others (Cheek, 1983). Participants respond to the questions on a five-point scale, from 1 (very untrue) to 5 (very true). The maximum score is 60 and a score of 34 or above indicates shyness. The 12-item version has been shown to have high internal consistency in a sample of university students, with a Cronbach's α of .86 (Stritzke et al., 2004). The 12-item version was also found to have good internal consistency with the sample used in this study (Cronbach's α of .89). The scale has adequate convergent validity, with moderate to strong correlations with other measures of shyness and social anxiety (Hopko, Stowell, Jones, Armento, & Cheek, 2005; Jones, Briggs, & Smith, 1986). Some evidence of discriminant validity is provided by the small correlations with somatic anxiety and depressive symptomatology (Hopko et al., 2005). This 12 question scale was administered twice: once regarding shyness offline and once regarding shyness online.

2.6. Computer-mediated communication measures

1. Frequency of use. This was the key outcome measure for this study and was examined using both interview and diary methods. Two main areas were examined: e-mail and MSN. Participants were first asked whether or not they used the application. If they responded positively, then they were asked about the number of e-mails they sent and received per day; responses were coded on a five-point scale from zero (no e-mails per day) to high use (more than 20 e-mails per day). They were also asked how often they used MSN; responses were coded on a four-point scale: less than once a week, once a week, two to three times a week, every day. In addition, a one week diary of computer use was devised to record the time (in minutes) that the participant spent using the different text-based CMC forms during a typical week. This booklet contained separate pages for each day of the week, a separate row on each page for part of the day (morning, afternoon and evening), and a separate column on each page for each application (send/receive an e-mail, and use MSN) as well as an "other" category. There was a separate box at the bottom of each page for the participant to tick if he or she did not use the home computer that day. Participants were required to write down how long they spent on the computer for each application at each part (morning/afternoon/evening) of the day (e.g., 15 min/30 min/1 h, etc.).

2. Motivations for use. Two variables were examined. Language-related motivation involved statements related to the informal and linguistically less demanding nature of e-mail and MSN (see Table 2). Social motivation included statements related to the desire to interact with others including peers via e-mail and MSN. Reponses were coded on a five-point scale from 1 (not at all true of me) to 5 (very true of me). Cronbach's alphas indicated high reliabilities. A CMC composite motivation measure (e-mail and MSN combined) also yielded high reliability (Cronbach's α = .89 for language-related motivation and .94 for social motivation).

2.7. Adolescent well-being

1. Child Manifest Anxiety Scale (CMAS-R; Reynolds & Richman, 1978). This is a 28-item questionnaire designed to measure anxiety symptoms in young people aged 6–18. Participants indicated whether statements were 'true' or 'not true' for the previous 3 months. A Cronbach's α of .88 was found for the sample in the present study.

2. Short Form Moods and Feelings Questionnaire (MFQ; Costello & Angold, 1988). This is a 13-item questionnaire for depressed mood, designed for young people aged 8–18. Participants indicated whether statements about their feelings were 'definitely true' 'somewhat true' or 'not true' over the previous 3 months. A Cronbach's α of .85 was found for the sample in the present study.

2.8. Procedure

Participants were assessed and interviewed either at home or at school on the above measures, as part of a wider battery. Testing took place in a quiet room with only the participant and a trained researcher present and was completed within either a morning or afternoon session. The diary was either left with or posted out to the participant with instructions to fill it in for a week and then post it back. For each adolescent this was the week immediately following the face-to-face interview.

Table 2
Motivations for use.

Language-related	Social
E-mail (Cronbach's α = .89)	*E-mail (Cronbach's α = .82)*
I use e-mail because I do not have to worry about spelling	I use e-mail to keep in touch with friends I hardly ever see
I use e-mail because I can type instead of talk	I use e-mail to keep in touch with friends I see regularly
I use e-mail because I can have lots of time to write messages before I send them	I use e-mail to keep in touch with family
I use e-mail because I can have lots of time to read messages	I use e-mail to keep in touch with my boy/girlfriend
	I use e-mail because people cannot see me
MSN (Cronbach's α = .89)	*MSN (Cronbach's α = .95)*
I use MSN because I do not have to worry about spelling	I use MSN to keep in touch with friends I hardly ever see
I use MSN because I can type instead of talk	I use MSN to keep in touch with friends I see regularly
	I use MSN to keep in touch with family
	I use MSN to keep in touch with my boy/girlfriend
	I use MSN because people cannot see me
	I use MSN because I can use images/pictures to communicate my feelings
	I use MSN because I can be introduced to new people
	I use MSN because I always know who is online
	I use MSN because I can block people I do not want to interact with

3. Results

The analysis involved a number of comparisons. In order to take this into account, the results were interpreted as statistically significant if the *p*-value level was <.01.

3.1. Non-users of CMC

The numbers of participants in each group who reported that they used e-mail and/or MSN are presented in Table 3. Adolescents with SLI were less likely than TD peers to use either mode of CMC. A total of 30 adolescents (17%) reported not using any CMC examined. Of these participants, 25 (83%) were adolescents with SLI and 5 (17%) were TD adolescents. This pattern of results was replicated when the diary data were examined. In total, 36 adolescents (29%) reported not using any CMC during the week of the diary. Of these participants, 26 (72%) were adolescents with SLI and 10 (28%) were TD adolescents.

Taking the interview and diary measures together, a total of 48 participants were identified as non-users; of these 36 (75%) were participants with SLI. Non-user status was significantly different between groups, $\chi^2(1, N = 176) = 18.04$, $p < .001$.

Characteristics of users versus non-users were examined. Results revealed that users performed significantly better than non-users on tests measuring performance IQ, language, and literacy, with large effect sizes for the language and literacy abilities (see Table 4). There were no significant differences between the users and non-users on offline shyness (at $p < .01$ level). In short, those participants who reported using CMC had better language and literacy abilities than those who reported not using any of the CMC applications examined.

Table 3
Adolescents' Engagement with Different Types of Text-Based CMC.

	Adolescents with SLI		TD adolescents	
	N	Percentage (%)	N	Percentage (%)
E-mail	60	69.8	80	88.9[**]
MSN	43	50.0	70	77.8[***]

[**] $p < .01$.
[***] $p < .001$.

Table 4
Profiles for Users versus Non-Users of CMC.

	Users (N = 128)		Non-users (N = 48)		Effect size r
	M	SD	M	SD	
Psycholinguistic variables					
Performance IQ	102.9	13.4	94.6	16.2	0.27
Language	92.5	20.8	70.5	21.5	0.46
Literacy	96.5	13.8	81.0	15.9	0.46

Note: all comparisons $p \leqslant .001$.

3.2. Users of CMC

3.2.1. Frequency

For this and all subsequent analyses, data are based on participants who reported that they were users of CMC. Among users, there were similarities between groups for frequency of use of CMC applications. Adolescents with SLI and TD adolescents sent and received, on average, between one to five e-mails per day ($M = 2.1$, $SD = 0.6$ for SLI; and $M = 2.0$, $SD = 0.7$ for TD). The number of e-mails sent was correlated with the number of e-mails received ($r = .61$, for SLI, and .59, for TD, $ps < .001$). Both groups report that, on average, they used MSN at least two or three times per week ($M = 3.2$, $SD = 1.0$ and $M = 3.1$, $SD = 1.0$, respectively).

During a typical week, adolescents spent, on average, over eight hours using text-based CMC (in minutes, $M = 502$, $SD = 682$ and $M = 512$, $SD = 914$, respectively). The standard deviations for both groups indicate large individual differences in time spent in these types of activities. An examination of the median for each group also revealed similarities between groups (medians = 205 and 203 min, respectively).

3.2.2. Motivations for use

Motivations for use of e-mail and MSN are presented in Table 5. Separate 2 (group: SLI versus TD) × 2 (type of motivation: language versus social) ANOVAs were conducted for each application, with the latter factor as a repeated measure. Results revealed a significant interaction between type of motivation and group for e-mail, $F(1, 135) = 9.12$, $p = .003$, $\eta^2_p = .06$, and for MSN, $F(1, 111) = 7.35$, $p = .008$, $\eta^2_p = .06$. Further analysis revealed significant differences across groups in language-related motivation for use of both e-mail ($M = 3.0$, $SD = 1.0$ and $M = 2.3$, $SD = 1.1$, respectively), $t(135) = 4.04$, $p < .001$, effect-size $r = 0.33$, and MSN ($M = 3.1$, $SD = 1.2$ and $M = 2.4$, $SD = 1.3$, respectively), $t(111) = 3.08$, $p = .003$, $r = 0.29$. In respect of each application, adolescents with SLI reported being more motivated by the linguistic features of the CMC than did TD peers. There were no significant differences between groups in social motivation for either application.

3.2.3. Shyness online and offline

Mean shyness scores were submitted to a 2 (group: SLI versus TD) × 2 (context: online versus offline) analysis of variance, with repeated measures on the latter factor. This analysis yielded two significant main effects. As expected, adolescents with SLI were significantly more shy overall ($M = 30.9$, SD = 6.4) than the TD group ($M = 25.9$, SD = 6.6), $F(1, 132) = 19.52$, $p < .001$, $\eta^2_p = .13$. Participants recorded lower shyness online ($M = 25.8$, SD = 7.3) than offline ($M = 30.2$, SD = 8.7), $F(1, 132) = 40.99$, $p < .001$, $\eta^2_p = .24$. The group by context interaction was not significant, $F(1, 132) = 1.02$, $p = .32$.

3.2.4. Understanding frequency of use: patterns of associations

We examined what is associated with frequency of use. Total frequency of use (as reported in the interview) was computed by summing e-mail and MSN frequency. There was no gender difference on this measure, $t(123) = 1.13$, $p = .26$. Frequency of use was

Table 5
Motivation for use: means and SDs for e-mail and MSN for the adolescents with SLI and TD adolescents.

	Adolescents with SLI				TD adolescents			
	E-mail		MSN		E-mail		MSN	
	M	SD	M	SD	M	SD	M	SD
Social motivation	2.5	0.8	3.2	0.7	2.2	0.7	2.9	0.8
Language-related motivation	3.0	1.0	3.1	1.2	2.3	1.1	2.4	1.3

not correlated with either maternal education, $r = -.04$, or household income, $r = .08$.

Cognitive and psycholinguistic profiles (performance IQ, language, and literacy), shyness, and motivation for use (language-related and social) were examined. There were a number of strong correlations across the psycholinguistic variables (see Table 6), in particular across the language and literacy assessments. In addition, there were medium to strong correlations amongst the social variables. With regards to relationships with frequency of use, there were only a few small to medium correlations involving shyness online, as well as the two motivation variables.

Given the similarities in frequency of use between the two groups, a multiple regression was conducted involving all participants. The outcome variable, frequency of CMC use, was the composite variable described above. Those variables significantly correlated with the outcome variable were entered in the regression model, as was the shyness variable which approached significance ($p = .052$). The regression model is presented in Table 7. The model was significant, $F(3, 114) = 14.14$, $p < .001$, with a medium effect size, and explaining 25% of the variance in frequency of CMC use. In this model, both social motivation and online shyness were significant predictors of frequency of CMC use. We also considered the possibility that group × social and/or group × language interactions might impact on usage; however, hierarchical regression analyses including the interaction terms at Step 2 revealed that these did not contribute additionally to the prediction of frequency of use.

3.2.5. Frequency of use and adolescent emotional well-being

Analysis of time spent by users revealed no relationship between frequency of CMC use and anxiety and depression symptoms for either the adolescents with SLI or the TD adolescents (correlations ranged from .01 to .19). This was the case for both the interview data and the diary data (as measured in minutes). Comparison of users versus non-users revealed no significant differences across groups in anxiety ($M = 8.2$, $SD = 5.6$, and $M = 8.9$, $SD = 6.8$, respectively) or depression symptoms ($M = 4.8$, $SD = 4.2$, and $M = 4.9$, $SD = 4.4$, respectively). For each measure, we dichotomised around the recommended cut-off point for clinical diagnosis

and then compared non-anxious with anxious, and non-depressed with depressed; neither comparison approached significance.

4. Discussion

The present study aimed to investigate the implications of language and social factors for frequency of CMC use in young people with and without a history of specific language impairment. We also examined CMC use in relation to adolescent well-being. The findings reveal that language abilities have a complex relationship with frequency of CMC use. Social motivations have a more direct association and are predictive of frequency of CMC use in adolescents who engage with this type of new media. We obtained no association between frequency of CMC use and reported emotional symptoms of anxiety and/or depression in either group of young people, and there was no difference between users and non-users of CMC on these measures.

4.1. Language and CMC use

We predicted (H1) that severity of impairment would affect willingness to use CMC among young people with SLI. This hypothesis was supported. Approximately one in six adolescents participating in this study were non-users or very low frequency users of CMC. As a group, these young people had significantly lower language and literacy skills than users of CMC, with mean standard scores well below what would be expected from the majority of typically developing adolescents of their own age. A substantial proportion of these non-CMC using adolescents (approximately three quarters), not surprisingly, were adolescents with a history of SLI.

However, the majority of adolescents with SLI were users of CMC and, despite their lower language and literacy abilities, were very much like their TD peers in the use of these new media. Users in both groups sent and received a similar number of e-mails per day and spent similar amounts of time using MSN. The majority of participants were motivated to use CMC. Consistent with our H2, compared to the typically developing adolescents, the SLI users of CMC had higher linguistic motivation scores. The informal,

Table 6
Correlation matrix across the variables examined for both groups of adolescents.

Variable	2	3	4	5	6	7	8
1. Frequency of CMC use	−.12	−.07	−002	.03	−.18[#]	.31[***]	.49[***]
2. Performance IQ		.61[***]	.55[***]	−.27[***]	−.25[**]	−.37[***]	−.24[**]
3. Language			.83[***]	−.35[***]	−.34[***]	−.45[***]	−.27[***]
4. Literacy				−.28[***]	−.28[***]	−.35[***]	−.15
5. Shyness offline					.51[***]	.38[***]	.19
6. Shyness online						.23[**]	.05
7. CMC language-related motivation							.57[***]
8. CMC social motivation							

[#] $p = .052$.
[**] $p \leqslant .01$.
[***] $p \leqslant .001$.

Table 7
Multiple regression analysis predicting frequency of text-based CMC use.

Variable	M	SD	Unadj R^2	Adj R^2	f^2	B	SE B	β
			.271	.252	0.37			
Online shyness	25.6	7.0				−.076	.026	−.236[**]
Social motivation	2.7	0.7				1.315	.321	.426[***]
Language-related motivation	2.5	1.1				.204	.229	.095

[**] $p < .01$.
[***] $p < .001$.

relaxed nature of the medium, where expressive mistakes are tolerated and there is time to review messages (Livingstone & Bovill, 2001; Madell & Muncer, 2007), seemed to appeal to adolescents with poor language and literacy skills. Thus, the present study provides new evidence of the role of language abilities on frequency of CMC use in adolescence.

The evidence suggests, however, that this relationship is not linear and continuous whereby better language skills are related to more frequent engagement with CMC and vice versa. The findings point to a more binary pattern. On the one hand, there is a group of non-users with very poor language and literacy skills. On the other hand, there is a substantial group of users of CMC, among both adolescents with SLI and TD adolescents, who have a wide range of language and literacy abilities (from poor to very good), and this wide range of ability is not directly associated with, nor predictive, of frequency of use. In a way, severity of language and literacy deficits appears to act as a gating mechanism for engagement versus non-engagement with CMC. Some young people – those with more severe language impairments – do not (presently) make it through the gate. Others, who do have language difficulties but not as severe, proceed through the gate, and use CMC regularly. Once they do use CMC, language-abilities themselves are not predictive of frequency of use – but language-related motivation is. This suggests that young people with language difficulties are able to find in CMC means of text-based interaction that are attractive and helpful to them, similar to findings reported for adolescents with hearing impairments (Barak & Sadovsky, 2008).

That adolescents with SLI are more strongly motivated by the language-related advantages of e-mail and MSN is an important practical finding in respect of the provision of CMC to exceptional populations. It may also indicate a foundation on which still greater access (i.e., for those with more severe impairments) could be constructed. For example, it may be that suitably tailored instruction and support could enable more of the young people currently precluded from use of CMC to increase their participation, which in turn could nurture their confidence with new media and enrich their skills. However, an important qualification needs to be borne in mind: namely, that the new media themselves are constantly evolving and increasingly involve audio and audiovisual dimensions (e.g., web-connected telephones, webcams; Barak & Suler, 2008; Peter, Valkenburg, & Schouten, 2007). Hence, while the predominantly text-based nature of much CMC currently offers some attractions to young people with language impairments, it remains to be seen whether technological advances will in due course undermine these benefits or whether adolescents with SLI and other disabilities will adapt by sustaining preferred modes of peer interaction.

4.2. Social factors and CMC use

Two social factors had a clear direct association with frequency of CMC use for adolescents who did engage with this type of new media: online shyness and, in particular, social motivation. As expected (H3) adolescents with SLI were more shy than the TD comparison group. Consistent with H4, both groups were less shy online than offline. There was no group × context interaction, indicating that both groups profit equally from the features of CMC that make for less inhibition in interpersonal communication. The correlational and regression analyses revealed a negative relationship between online shyness and frequency of CMC use. In line with previous research, this investigation found that adolescents who are less shy online are more frequent users of CMC (Caplan, 2003; Stritzke et al., 2004). While most previous research on shyness and CMC has been based on young adult (usually, undergraduate student) samples, this study complements previous findings by demonstrating that similar benefits are reported by teenagers

with known language and literacy limitations. It appears that CMC may indeed be an environment for positive adaptation for a substantial proportion of adolescents with SLI who are shyer than their typically developing peers.

We cast as an exploratory question whether or not social motivations bore on the uses of CMC in adolescents with SLI. The findings reveal that both groups were socially motivated to use CMC, with no differences between groups in level of social motivation. Adolescents who were more socially motivated were more frequent users of CMC. Adolescents with SLI were as aware as their peers of the social benefits of CMC in terms of keeping in touch with family and friends and meeting new people in a reduced-cues environment that filters many of the features present in face-to-face communication (Barak & Suler, 2008; Sheeks & Birchmeier, 2007; Walther, 1996). CMC offers invisibility for the difficulties adolescents with SLI often experience. In this sense, the characteristics of CMC in terms of its less stringent language and literacy demands and the absence of potentially problematic features of face-to-face interactions provide a powerful combination that can lead to new communicative opportunities for adolescents with a history of language impairments. Consistent with Barak and Sadovsky (2008), we found that young people with a disability were in many cases attracted to features of the Internet for communication purposes. CMC can therefore be an empowering experience for a substantial proportion of young people with linguistic limitations.

4.3. CMC use and well-being

Another exploratory question in this investigation concerned the possible links between frequency of CMC use and psychological well-being. We found no evidence of associations between frequency of CMC use and measures of anxiety and depression in either the participants with SLI or the typically developing participants. We found no differences on these psychosocial measures between non-users and users. Previous debate and research had resulted in mixed findings concerning possible links between CMC use and mental health in adolescents, though recent studies and reviews concur that for the vast majority of Internet users there is no harmful effect of time online on well-being (Ohannessian, 2009; Spitzberg, 2006; Ybarra et al., 2005). The negative effects, if any, appear to be concentrated on a very small percentage of problematic users (Caplan, 2002), and in at least some cases and for some new media, it is the non-users that are more disadvantaged (Durkin & Barber, 2002). We also found similar levels of emotional well-being in users and non-users of CMC. Findings in the same vein have been reported for other communication challenged individuals, such as adolescents with hearing impairments (Barak & Sadovsky, 2008).

5. Concluding remarks

There is a need to develop our understanding of the multitude of factors influencing engagement with CMC technology in adolescents. To this end, the patterns of use and motivations for use among young people with exceptional development are of particular interest. They underline the contribution of certain capacities, such as language, to the adoption of technology and shed light on the affordances that the new media can provide to a wider spectrum of the population. The fact that a substantial majority of adolescents with a history of SLI engage with CMC illustrates the priority individuals attach to interpersonal communication and the benefits that these new media can bring to young people who face communication challenges. The evidence available so far suggest that educators and counsellors who are involved in

the area of language and communication impairments can exploit this medium to support young people's learning and development.

References

Barak, A., & Sadovsky, Y. (2008). Internet use and personal empowerment of hearing-impaired adolescents. *Computers and Human Behavior, 24*, 1802–1815.

Barak, A., & Suler, J. (2008). Reflections on the psychology and social science of cyberspace. In A. Barak (Ed.), *Psychological aspects of cyberspace. Theory, research, applications* (pp. 1–12). Cambridge, UK: Cambridge University Press.

Bargh, J. A., McKenna, K. Y. A., & Fitzsimons, G. J. (2002). Can you see the real me? The activation and expression of the 'true self' on the Internet. *Journal of Social Issues, 58*, 33–48.

Baym, N. K., Zhang, Y. B., & Lin, M.-C. (2004). Social interactions across media. *New Media & Society, 6*, 299–318.

Beitchman, J. H., Wilson, B., Johnson, C. J., Atkinson, L., Young, A., Adlaf, E., et al. (2001). Fourteen year follow-up of speech/language impaired and control children: Psychiatric outcome. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*, 75–82.

Bishop, D. V. M., & Clarkson, B. (2003). Written language as a window into residual language deficits: A study of children with persistent and residual speech and language impairments. *Cortex, 39*, 215–237.

Boneva, B. S., Quinn, A., Kraut, R. E., Kiesler, S., & Shklovski, I. (2006). Teenage communication in the instant messaging era. In R. Kraut, M. Brynin, & S. Kiesler (Eds.), *Computers, phones, and the Internet: Domesticating information technology* (pp. 201–218). Oxford: Oxford University Press.

Brinton, B., & Fujiki, M. (2002). Social development in children with specific language impairment and profound hearing loss. In P. K. Smith & C. H. Hart (Eds.), *Blackwell handbook of childhood social development* (pp. 588–603). Malden: Blackwell.

Brownlie, E. B., Beitchman, J. H., Escobar, M., Young, A., Atkinson, L., Johnson, C., et al. (2004). Early language impairment and young adult delinquent and aggressive behaviour. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 32*, 453–467.

Bryant, J. A., Sanders-Jackson, A., & Smallwood, A. M. K. (2006). IMing, Text messaging, and adolescent social networks. *Journal of Computer Mediated Communication, 11*, 577–592.

Caplan, S. E. (2002). Problematic Internet use and psychosocial well-being: Development of a theory-based cognitive-behavioral measurement instrument. *Computers and Human Behavior, 18*, 553–575.

Caplan, S. E. (2003). Preferences for online social interaction. *Communication Research, 30*, 625–648.

Cheek, J. M. (1983). *The revised Cheek and Buss shyness scale*. Unpublished manuscript, Wellesley College, Wellesley MA 02181.

Chou, C., & Peng, H. (2007). Net-friends: Adolescents' attitudes and experiences vs. teachers' concerns. *Computers in Human Behavior, 23*, 2394–2413.

Clegg, J., Hollis, C., Mawhood, L., & Rutter, M. (2005). Developmental language disorders – A follow-up in later adult life. Cognitive, language and psychosocial outcomes. *Journal of Child Psychology and Psychiatry, 46*, 128–149.

Conti-Ramsden, G., & Botting, N. (1999a). Classification of children with specific language impairment: Longitudinal considerations. *Journal of Speech, Language and Hearing Research, 42*, 1195–1204.

Conti-Ramsden, G., & Botting, N. (1999b). Characteristics of children attending language units in England: A national study of 7-year-olds. *International Journal of Language and Communication Disorders, 34*, 359–366.

Conti-Ramsden, G., & Botting, N. (2008). Emotional health in adolescents with and without a history of specific language impairment (SLI). *Journal of Child Psychology and Psychiatry, 49*, 516–525.

Conti-Ramsden, G., Crutchley, A., & Botting, N. (1997). The extent to which psychometric tests differentiate subgroups of children with SLI. *Journal of Speech, Language and Hearing Research, 40*, 765–777.

Conti-Ramsden, G., Durkin, K., Simkin, Z., & Knox, E. (2008). Specific language impairment and school outcomes I: Identifying and explaining variability at the end of compulsory education. *International Journal of Language and Communication Disorders*.

Costello, E. J., & Angold, A. (1988). Scales to assess adolescent depression. *Journal of the American Academy of Child and Adolescent Psychiatry, 27*, 726–737.

Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior, 17*, 187–195.

Dockrell, J., Lindsay, G., Connelly, V., & Mackie, C. (2007). Constraints in the production of written text in children with specific language impairments. *Exceptional Children, 73*, 147–164.

Durkin, K., & Barber, B. (2002). Not so doomed: Computer game play and positive adolescent development. *Journal of Applied Developmental Psychology, 23*, 373–392.

Durkin, K., & Conti-Ramsden, G. (2007). Language, social behavior, and the quality of friendships in adolescents with and without a history of specific language impairment. *Child Development, 78*, 1441–1457.

Durkin, K., Conti-Ramsden, G., Walker, A., & Simkin, Z. (2009). Educational and interpersonal uses of home computers by adolescents with and without specific language impairment (SLI). *British Journal of Developmental Psychology, 27*, 197–217.

Eurobarometer (2004). *Illegal and harmful content on the Internet*. Brussels: European Commission. http://europa.eu/int/information_society/programmes/iap/docs/pdf/reports/eurobarometer_survey.pdf.

Gross, E. F. (2004). Adolescent Internet use: What we expect, what teens report. *Journal of Applied Developmental Psychology, 25*, 633–649.

Hardy, B. W., & Scheufele, D. A. (2005). Examining differential gains from Internet use: Comparing the moderating role of talk and online interactions. *Journal of Communication, 55*, 71–84.

Hart, K. L., Fujiki, M., Brinton, B., & Hart, C. H. (2004). The relationship between social behavior and severity of language impairment. *Journal of Speech, Language, and Hearing Research, 47*, 647–662.

Hopko, D. R., Stowell, J., Jones, W. H., Armento, M. E. A., & Cheek, J. M. (2005). Psychometric properties of the Revised Cheek and Buss Shyness scale. *Journal of Personality Assessment, 84*, 185–192.

Hunter, J., & Allen, M. (1992). Adaptation to electronic mail. *Journal of Applied Communication Research, 20*, 254–274.

Jerome, A., Fujiki, M., Brinton, B., & James, S. L. (2002). Self-esteem in children with specific language impairment. *Journal of Speech, Language and Hearing Research, 45*, 700–714.

Jones, W. H., Briggs, S. R., & Smith, T. G. (1986). Shyness: Conceptualisation and measurement. *Journal of Personality and Social Psychology, 51*, 629–639.

Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V., & Crawford, A. (2002). Internet paradox revisited. *Journal of Social Issues, 58*, 49–74.

Lenhart, A., Arafeh, S., Smith, A., Rankin Macgill, A. (2008a). *Writing, technology and teens*. Washington, DC: Pew Internet & American Life Project. http://www.pewinternet.org.

Lenhart, A., Kahne, J., Middaugh, E., MacGill, A., Evans, C., & Mitak, J. (2008b). *Teens, video games and civics: Teens gaming experiences are diverse and include significant social interaction and civic engagement*. http://www.pewinternet.org/PPF/r/263/report_display.asp.

Lenhart, A., Madden, M., & Hitlin, P. (2005). *Teens and technology*, Washington, DC: Pew Internet and American Life Project. http://www.pewinternet.org.

Leonard, L. B. (1998). *Children with specific language impairment*. Cambridge, MA: MIT Press.

Leonard, L. B., Ellis Weismer, S., Miller, C. A., Francis, D. J., Tomblin, J. B., & Vail, R. V. (2007). Speed of processing, working memory, and language impairment in children. *Journal of Speech, Language and Hearing Research, 50*, 408–428.

Lindsay, G., Dockrell, J. E., & Mackie, C. (2008). Vulnerability to bullying in children with a history of specific speech and language difficulties. *European Journal of Special Needs Education, 23*, 1–16.

Livingstone, S., & Bober, M. (2005). *UK Children go online: Final report and key project findings*. London: London School of Economics. LSE Research Online. http//eprints.lse.ac.uk/archive/00000399.

Livingstone, S., & Bovill, M. (2001). *Families and the Internet: An observational study of children and young people's Internet use* Final report to BT. London: London School of Economics.

Mackie, C., & Dockrell, J. (2004). The nature of written language deficits in children with SLI. *Journal of Speech, Language and Hearing Research, 47*, 1469–1483.

McKenna, K. Y. A., Green, A. S., & Gleason, M. J. (2002). Relationship formation on the Internet: What's the big attraction? *Journal of Social Issues, 58*, 9–32.

Madell, D. E., & Muncer, S. J. (2007). Control over social interactions: An important reason for young people's use of Internet and mobile phones for communication? *CyberPsychology & Behavior, 10*, 137–140.

Montgomery, J. W. (2006). Real-time language processing in school-age children with specific language impairment. *International Journal of Language and Communication Disorders, 41*, 275–291.

Ohannessian, C. M. (2009). Media use and adolescent psychological adjustment: An examination of gender differences. *Journal of Child and Family Studies, 18*, 582–593.

Peter, J., Valkenburg, P. M., & Schouten, A. P. (2007). Precursors of adolescents' use of visual and audio devices during online communication. *Computers in Human Behavior, 23*, 2473–2487.

Plester, B. A., Wood, C. P., & Joshi, P. (2009). Exploring the relationship between children's knowledge of text message abbreviations and school literacy outcomes. *British Journal of Developmental Psychology, 27*, 145–161.

Redmond, S. M., & Rice, M. L. (1998). The socioemotional behaviours of children with SLI: social adaptation or social deviance. *Journal of Speech, Language and Hearing Research, 41*, 688–700.

Reynolds, C. R., & Richman, B. O. (1978). What I think and feel: A revised measure of children's manifest anxiety. *Journal of Abnormal Child Psychology, 6*, 271–280.

Rice, M. (1993). Don't talk to him he's weird: A social consequences account of language and social interactions. In A. P. Kaiser & D. B. Gray (Eds.), *Enhancing children's communication: Research foundations for intervention* (pp. 139–158). Baltimore, MD: Paul H. Brookes Publishing Company.

Roberts, D. F., & Foehr, U. G. (2008). Trends in media use. *The Future of Children, 18*, 11–37.

Saunders, P. L., & Chester, A. (2008). Shyness and the internet: Social problem or panacea? *Computers in Human Behavior, 24*, 2649–2658.

Savage, R. (2005). Friendship and bullying patterns in children attending a language base in a mainstream school. *Educational Psychology in Practice, 21*, 23–36.

Semel, E., Wiig, E. H., & Secord, W. (2003). *Clinical evaluation of language fundamentals* (4th ed.). San Antonio, TX: The Psychological Corporation.

Sheeks, M. S., & Birchmeier, Z. P. (2007). Shyness, sociability, and the use of computer-mediated communication in relationship development. *CyberPsychology & Behavior, 10*, 64–70.

Snowling, M., Bishop, D. V. M., & Stothard, S. E. (2000). Is preschool language impairment a risk factor for dyslexia in adolescence? *Journal of Child Psychology and Psychiatry, 41*, 407–418.

Spitzberg, B. H. (2006). Preliminary development of a model and measure of computer-mediated communication (CMC) competence. *Journal of Computer-Mediated Communication, 11*, 629–666.

Stritzke, W. G. K., Nguyen, A., & Durkin, K. (2004). Shyness and computer-mediated communication: A self-presentational theory perspective. *Media Psychology, 6*, 1–22.

Subrahmanyam, K., & Greenfield, P. M. (2008). Communicating online: Adolescent relationships and the media. *The Future of Children; Children and Media Technology, 18*, 119–146.

Sussman, N. M., & Tyson, D. H. (2000). Sex and power: Gender differences in computer-mediated interactions. *Computers and Human Behavior, 16*, 381–394.

The General Household Survey (2001–2002). Office of National Statistics, Social Survey Division.

Tomblin, J. B., Records, N. L., Buckwalter, P., Zhang, X., Smith, E., & O'Brien, M. (1997). Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language and Hearing Research, 40*, 1245–1260.

Valentine, G., Marsh, J., Pattie, C., & BMRB (2005). *Children and young people's home use of ICT for educational purposes: The impact of attainment at Key Stages 1–4.* Research Report No. 672, University of Leeds.

Valkenburg, P. M., & Peter, J. (2007). Online communication and adolescent well-being: Testing the stimulation versus the displacement hypothesis. *Journal of Computer-Mediated Communication, 12*, 1169–1182.

Valkenburg, P. M., Schouten, A. P., & Peter, J. (2005). Adolescents' identity experiments on the internet. *New Media & Society, 7*, 383–402.

Volckaert-Legrier, O., Bernicot, J., & Bert-Erboul, A. (2009). Electronic mail, a new written-language register: A study of French-speaking adolescents. *British Journal of Developmental Psychology, 27*, 163–181.

Wadman, R., Durkin, K., & Conti-Ramsden, G. (2008). Self-esteem, shyness and sociability in adolescents with specific language impairment (SLI). *Journal of Speech, Language and Hearing Research, 51*, 938–952.

Walther, J. B. (1996). Computer-mediated communication: impersonal, interpersonal and hyperpersonal interaction. *Communication Research, 23*, 3–43.

Walther, J. B., & Boyd, S. (2002). Attraction to computer-mediated social support. In C. A. Lin & D. Atkin (Eds.), *Communication technology and society: Audience adoption and uses.* Cresskill, NJ: Hampton Press (pp. 153–188).

Wechsler, D. (1999). *Wechsler abbreviated scale of intelligence.* San Antonio, TX: The Psychological Corporation.

Wetherell, D., Botting, N., & Conti-Ramsden, G. (2007). Narrative in adolescent specific language impairment (SLI): A comparison with peers across two different narrative genres. *International Journal of Language and Communication Disorders, 42*, 583–605.

Whitley, B. E. Jr., (1997). Gender differences in computer-related attitudes and behavior: A meta-analysis. *Computers and Human Behavior, 13*, 1–22.

Wilkinson, G. S. (1993). *Wide range achievement test* (3rd ed.). Wilmington, DE: Jastak Associates.

Ybarra, M. L., Alexander, C., & Mitchell, K. J. (2005). Depressive symptomatology, youth Internet use, and online interactions: A national survey. *Journal of Adolescent Health, 36*, 9–18.