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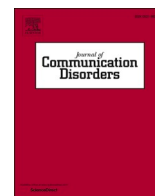
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It's about more than just talking; Exploring computer-mediated communication in adolescents with selective mutism

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ABSTRACT

Introduction: Selective mutism (SM) is an anxiety disorder categorized by a persistent failure to speak in specific situations. In an attempt to facilitate interaction with individuals with SM, other forms of communication (e.g. computer-mediated communication; CMC) are often tried. However, CMC is understudied in individuals with SM, while, especially since the COVID-19 pandemic, the importance of CMC for education and social purposes only increased.

Methods: In this study, we explored CMC in 79 adolescents with either selective mutism ($n = 34$), or typical development ($n = 45$). All participants completed a survey concerning verbal and written CMC in three contexts (friends, family, and school).

Results: Results showed that adolescents with SM used not only verbal but also written CMC less frequently than the comparison group across contexts. While the comparison group preferred Face-to-Face communication over CMC, adolescents with SM were divided, especially in the school context. With family and friends, the majority of the SM group preferred Face-to-Face communication, even though this provoked more feelings of tension than CMC for part of the group.

Conclusion: These findings support anecdotal reports that SM affects not only speech but extends to other communicative venues and includes written communication in many situations. This underlines the importance of addressing not just speaking behavior but also writing and CMC in the diagnostic evaluation and treatment plans for adolescents with SM.

1. Introduction

Individuals suffering from Selective mutism (SM) experience severe speaking difficulties in specific social situations despite unimpeded communication in other situations (American Psychiatric Association, 2013). Although SM is sometimes regarded as a childhood condition that many children outgrow spontaneously (Wong, 2010), there are also studies showing that SM may persist into adolescence or adulthood despite treatment (Steinhausen and Juzi, 1996; Steinhausen et al., 2006; Remschmidt et al., 2001).

Whether SM may be better classified as a neurodevelopmental disorder than as an anxiety disorder is still under debate (Kearney & Rede, 2021). However, research has shown that SM is highly associated with (social) anxiety (Driessen et al., 2020) and can be linked

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to behavioral inhibition (Gensthaler et al., 2016a; Muris et al., 2016). Behavioral inhibition is a temperament trait characterized by a tendency to withdraw in the presence of unfamiliar social situations (Kagan et al., 1984).

The persistent lack of speech in social situations interferes with educational achievement and social interaction (Bergman et al., 2002; Manassis, 2009). Adolescents with SM have reported lower levels of social competence than age-matched peers without psychiatric problems (Kristensen, 2001). Also, higher levels of withdrawn behavior and social problems were reported by adolescents with SM in comparison to adolescents with Social anxiety disorder (SAD) and adolescents with other internalizing problems (Gensthaler et al., 2016b). The inability to speak in certain situations can be very frustrating to individuals with SM, not being able to express their needs or to perform to their ability (Albrigtsen et al., 2016), but also to their communication partners, who often attempt various strategies to connect (Davidson, 2012; Kovac & Furr, 2019; Longobardi et al., 2019).

One of the strategies recommended to communicate with children with SM is to ask them to write their answers down or by sending an email (Davidson, 2012; Manassis, 2009; Omdal & Galloway, 2007). Although anecdotal clinical evidence suggests that this helps some individuals, others seem to avoid written communication as well. Sutton and Forrester (2016) described the experiences of adults with SM and concluded that "While SM principally affects speech, all venues of communication can be involved" (p. 15).

Our venues of communication have changed fundamentally due to technology (Pinchot et al., 2011). Computer-mediated communication (CMC) (i.e., conversational interaction mediated through computers or mobile devices) encompasses both written (e.g., emailing, texting, SMS), and verbal communication (e.g., spoken messages, video calling). Especially for adolescents, CMC is part of their social norm and used to maintain contact with friends and family when they are physically apart (Favotto et al., 2019; Manago et al., 2020). Not surprisingly, when physical distancing measures and distance education were implemented during the COVID-19 pandemic, a vast increase was reported in the use of CMC to reach out to family and friends and to take part in education (Drouin et al., 2020; Iivari et al., 2020; Nguyen et al., 2020).

For individuals with social anxiety, CMC may be a preferred way of communicating, because it does not require mingling in real-life gatherings. In fact, social anxiety in undergraduate students predicted a preference for online social interaction (Caplan, 2007). However, other studies found similar cognitive and behavioral processes in individuals with social anxiety engaging in online and offline communication. As in real-life interactions, these individuals showed negative interpretation biases and safety-seeking behaviors to prevent others from evaluating them negatively, when using CMC (Carruthers et al., 2019; Kingsbury & Coplan, 2016). The lack of non-verbal cues in (text-based) CMC may create greater ambiguity and thereby increase social anxiety (Miers et al., 2020; Stuifjand et al., 2018).

The use of CMC has not yet been investigated in individuals with SM. It is important to examine to what extent they use written or verbal CMC tools and whether they find CMC appealing or stressful. The focus of the present study is on adolescents since to them CMC is vital for socializing with peers and communicating with others. Limited CMC may therefore hamper social connectedness and well-being in adolescents (Manago et al., 2020; Spies Shapiro & Margolin, 2014). In addition, adolescents with SM are an understudied group, and very little is known about their needs and challenges within verbal and written CMC. The Covid-19 lockdown provided a unique opportunity to study CMC in adolescents with SM, since all were urged to use such tools for school, and social life. Knowledge about the benefits or challenges of CMC for individuals with SM will contribute to a deeper understanding of this debilitating disorder and may inform teachers, parents, and clinicians interacting with students with SM.

The purpose of this paper is to explore differences between adolescents with and without SM in the frequency and the form (verbal versus non-verbal) of CMC and the perception of CMC. First, we explore the CMC-usage of adolescents with, and without SM within three social contexts (i.e., friends, family, and school). Second, we explore differences in the perception of CMC between adolescents with and without SM. Third, we investigate differences in the usage of verbal and non-verbal CMC between adolescents with and without SM. Based on the anecdotal clinical evidence and the link between behavioral inhibition and SM, we expected both verbal and nonverbal CMC to be challenging for adolescents with SM. However, since CMC does not require direct contact in real-life situations, it may also be easier or preferred by adolescents with SM. Since this study is explorative in nature, we refrain from formulating directed hypotheses.

2. Method

2.1. Participants

In total, 91 adolescents and their caregivers responded to the online survey study. Despite outlining the age range in the recruitment and participant information, we received two questionnaires filled out by 9 years old participants with SM. Upon examining their responses, it was evident that they owned digital devices and had access to the CMC-tools under study. We decided not to exclude them, firstly because volunteering to the study, and completing the questionnaire, showed that they had insightful CMC-experiences to share, and secondly, in order to maintain the sample size. Originally, we aimed to include three groups: selective mutism (SM), social anxiety disorder (SAD), and a non-clinical comparison group. Assignment to each group was based on caregiver-reported clinical diagnosis (i.e. a DSM classification given by a child- and adolescent psychiatrist or psychologist) or absence of such. Among the 38 respondents with caregiver-reported clinical diagnoses, 82 % had a primary diagnosis of SM and 18 % had a diagnosis of SAD. Fifty-three adolescents without a clinical diagnosis responded to the survey.

The selective mutism questionnaire (SMQ; Bergman et al., 2008) was used to indicate symptom severity. Low scores reflect lower frequencies of speaking. The mean score on the SMQ in individuals with a caregiver-reported diagnosis with SM was 15.70 ($SD = 5.08$). After initial grouping the following combination of criteria was used to ensure the inclusion of only adolescents with severe speaking anxiety in the SM group; a) a low SMQ score (i.e., scores within 3SD of the SM group mean), b) meeting all severity criteria as used by

Diliberto and Kearney (2018).

These severity criteria are defined as a “seldom” or “never” score on all four of the following SMQ items: speaking with most teachers/staff (item 5), in groups or in front of the class (item 6), with other unfamiliar children (item 13), and to store clerks and/or waiters (item 16). There were two outliers who scored more than 3SD above the SM group mean and did not meet all the severity criteria. Therefore, their mutism was considered ‘in remission’ and these respondents were excluded from the data analyses.

Unfortunately, too few adolescents ($n = 7$) with a primary diagnosis of SAD responded to the survey. However, five of these respondents reported significant speaking difficulties and met the inclusion criteria for the SM group, as shown by low total SMQ scores (i.e., within 3 SD of the SM group mean), scoring “seldom/never” on the severity criteria items and were reported to be moderately/extremely hampered by not speaking in social situations (item 20). Therefore, these five adolescents were included in the SM group. Taken together the SM group included 34 participants. There were eleven participants with SM with reported co-occurring autism spectrum disorders (ASD).

Inclusion criteria for the comparison group (CG) were a) a caregiver reported absence of a developmental or mental condition, b) no signs of social speaking difficulties based on the SMQ (i.e., SMQ total score more than 2SD above SM group mean). Eight of the 53 respondents without a clinical diagnosis reported speaking difficulties on the SMQ and reported being moderately/extremely hampered by not speaking in social situations (item 20). They were not included in the present study, leaving 45 adolescents fulfilling the criteria for inclusion in the CG group. The mean score on the SMQ of adolescents in the comparison group was 38,66 ($SD=5,85$). Higher scores correspond to fewer behavioral problems concerning speech.

The final sample consisted of 79 participants from 13 provinces throughout the Netherlands and Flemish Belgium: 34 participants (73,5% female) in the SM group ($M_{age} = 13.15$, $SD = 2.65$, range 9–18) and 45 participants (53,3% female) in the CG ($M_{age} = 13.29$, $SD = 1.78$, range 10–18). In accordance with the population ratio, a higher percentage of females participated in the SM group than in the CG.

The differences in age ($t(77) = -0.27$; $p = .79$). and gender ($t(77) = 1.88$; $p = .06$) did not reach significance. Additionally, there were no significant differences in parental education level ($t(77) = -0.02$; $p = .98$) or marital status ($t(77) = 0.81$; $p = .42$). Information on the participants’ language background was not collected, thus it is not known whether they were L1 or L2 speakers of Dutch. However, they had sufficient Dutch proficiency to fill out the questionnaires. Almost all respondents ($n = 76$) had access to at least one private tool for digital communication, most often a mobile phone ($n = 70$). The three adolescents that did not possess a private tool, used a family-owned laptop/tablet.

2.2. Procedure

Participants were recruited for this study through snowball sampling via a national online network of clinicians specialized in selective mutism, social media, parent group, a website for parents, and clinicians on selective mutism and via the personal network of the authors. Written informed consent was electronically provided by adolescents over 11 years of age and all parents. The surveys were administered using Qualtrics, an online survey tool. Parents were able to complete their survey in approximately 5–10 min and adolescents in 25–30 min. All could be completed at home on a computer or smartphone/tablet. The study was granted approval by the Ethics Committee of the Department Child and Education Studies at Leiden University, The Netherlands (ECPW-2020/269).

2.3. Measures

2.3.1. Selective mutism symptoms (Parent report)

The Selective Mutism Questionnaire (SMQ; Bergman et al., 2008) consists of 17 statements that describe typical situations at home, school, and in public/social settings where speaking is expected. These are scored on a four-point Likert scale from “never” to “always”. One item, “My child speaks to at least one babysitter”, was scored as not applicable by most parents and was eliminated from the total score calculation. Lower total scores reflect lower frequencies of speaking. The SMQ has shown good reliability and validity (Bergman et al., 2008; Letamendi et al., 2008). Cronbach α was excellent ($\alpha = 0.96$) in the present sample. Only if parents reported, on one or more items, that their child did not ‘always’ (i.e., often, sometimes, or never) speak, were they presented with six additional interference items. Based on these items, the global interference score was calculated with higher scores representing greater interference of SM on daily life. In Table 1 the descriptive statistics for the comparison group, as well as the SM group are presented.

Table 1
Symptoms of selective mutism per group.

Characteristics	<i>n</i>	Mean	<i>SD</i>	Range	<i>t</i> (<i>df</i>)	<i>p</i>
SMQ (17 items)						
SM	34	15.70	5.08	4–26	– 18,26 (77)	<0.001
CG	45	38.66	5.85	29–48		
Global interference score SMQ (6 items)						
SM	34	16.68	3.12	13–24	11,84 (62)	<0.001
CG	30	7.6	2.99	6–12		

2.3.2. Frequency of computer-mediated communication (CMC; self-report)

The frequency of usage of CMC was assessed in three contexts: “family/relatives (not living in the same house)”, “friends/peers” and “school”. Regarding family/relatives and friends/peers, seven ways of CMC were explored (i.e., calling, video-calling, texting, chatting, emailing, gaming, and social media usage). In addition, five means of CMC with school were assessed; online classes, emailing, calling, video-calling, and chatting. The frequency of usage of these means was scored on a six-point Likert scale from “never” to “daily”, with higher scores indicating more frequent use of CMC. In the school context daily was formulated as: every school day. The distinction between verbal and written communication was possible because adolescents were asked how they used inconclusive tools, such as chatting and gaming, and we coded scores accordingly.

2.3.3. Perception on computer-mediated communication (self-report)

Through forced-choice items adolescents were asked whether they preferred face-to-face communication or computer-mediated communication per context, and which one of those two they perceived as easier, less tension provoking, and more enjoyable. These four questions were asked for three different contexts: family, friends, and school. The items ‘most enjoyable’ highly correlated with the items ‘most preferred’ (0.91 - 0.93) and could not be distinguished based on their content. Therefore, these items were removed from further analyses.

Because the CMC questionnaire was a newly developed questionnaire, we refrained from presupposing a scale structure and used a principal component analysis (PCA) to decide which subscales to use. The PCA indicated which items could be combined into more global indicators of perception concerning CMC (Jolliffe & Cadima, 2016). The Kaiser-Meyer-Olkin measure (KMO) was 0.61 which indicated that the data was moderately suited for performing a PCA analysis. We included all nine variables in a PCA and inspected the results based on a varimax rotation. Two items loaded on more than one component (i.e., ease of communication with friends and ease of communication with family) complicating a theoretical interpretation of the components, and were removed. After that, three components could be clearly distinguished statistically, as well as theoretically. The explained variance of this solution was 82.07 %. The first component covered ‘Perception on communication with school’ and consisted of three items (i.e. preference, easiness, and feelings of tension at school Cronbach’s Alpha = 0.80), with possible mean proportions values: 0, 0.33, 0.67, and 1. The second component covered ‘Preference in communication with friends and family’ (constructed from the items representing preference with family and friends, $r = 0.73$). The last component covered ‘Feelings of tension during communication with friends and family’ (constructed from two items representing Feelings of tension with family and friends, $r = 0.50$). These last two components could have a mean proportion of 0, 0.5, and 1. Higher mean proportion scores represent a more positive perception of CMC interactions.

2.3.4. Verbal and written use of computer-mediated communication

To calculate one score for verbal CMC across contexts, and one score for written CMC across contexts, two non-linear principal component analyses (CATPCA) were performed. This way we could select the best indicator variables, keeping in mind the ordinal nature of the data. For verbal communication, we entered 11 variables (e.g. calling with friends and video calling with family) in the analysis based on one component. Two variables stood out because of their low variance accounted for (verbal gaming friends, VAF = 0.09; verbal gaming family, VAF = 0.02). These variables were therefore deleted from the solution. The best-fitting model was selected based on the variance accounted for, and the inspection of transformation plots. For verbal communication, the final solution was an ordinal solution with nine variables, a total VAF of 4.00, and component loadings between 0.40 and 0.84. The scores of verbal CMC were calculated by taking the average of the transformed variables from this best-fitting solution. This final score ranged between -1.06 and 1.27, with higher scores representing more frequent use of CMC. Cronbach’s alpha for this solution was 0.84.

For written communication, we entered ten variables (e.g. social media with friends and email with family) in the analysis based on one component. One variable showed a low VAF (emailing with friends, 0.06 %) and was therefore deleted from the solution. In a second step, another variable with a low VAF was removed (email with family, VAF = 0.102). The best fitting model for written communication was an ordinal solution, with eight variables, a total VAF of 2.67, and component loadings between 0.15 and 0.57. The scores of verbal CMC were calculated by taking the average of the transformed variables from this best fitting solution. This final score ranged between -1.15 to 1.47 for written CMC with higher scores representing more frequent use of CMC. Cronbach’s alpha for this solution was 0.72.

2.4. Statistical analyses

First, the frequency of use of CMC with friends, family, and school was explored by reporting the descriptive percentages of these ordinal variables for the two groups separately. Then, Mann-Whitney tests were performed, and correlation coefficients based on the formula $r = z / \sqrt{N}$ were reported as effect sizes (Rosenthal, 1991) to support the descriptive exploration.

Second, to examine CMC experiences, the distributions of the three perception components were inspected. Chi-square tests were performed to check whether the observed mean proportions of the CMC-perception components differed significantly from the expected mean proportions (under the null hypothesis that CMC and face-to-face were evenly distributed). Also, the distributions of proportions between both groups were compared to examine the association between the perception and group membership.

Third, we explored the associations between the written and verbal components of CMC (based on CATPCA) and the absence or presence of SM. Correlation coefficients and Cohen’s d values are reported as an indication of the strength of these associations (Kelley & Preacher, 2012; Cohen, 1988).

To make sure that the results of our exploration were not purely due to the adolescents that had SM with co-occurring ASD, we rerun analyses without this specific group and explored possible differences in results. This study contains a large number of statistical

tests. Due to the exploratory nature, we refrained from using techniques that assume direction based on theoretical frameworks. Further steps to control the study-wise alpha were not taken. Both *p* values and effect sizes are reported.

3. Results

3.1. CMC usage

3.1.1. Friends context

The results of the explorations show that adolescents in the comparison group (CG) often used chatting (e.g., WhatsApp) and social media as means of communicating with friends; 87 % indicated chatting daily, and 56 % used social media on a daily basis. Adolescents with SM also used these tools, however, less frequently; 29 % indicated chatting on a daily basis and 15 % used social media daily. These differences were confirmed with Mann Whitney tests ($U_{chat} = 290.5, p < .001, r = 0.61$; $U_{socialmedia} = 465.5, p = .002, r = 0.35$).

Calling (including video-calling), and online gaming, were also used for communication with friends, although less frequently. The percentages of adolescents with SM using these tools were lower than in the CG. For example, a third of the adolescents without SM called with friends on a daily base, and 16 % video-called daily, whilst adolescents with SM didn't use these tools on a daily base (see Table 2). These lower frequencies of usage were significant ($U_{calling} = 192, p < .001, r = 0.65$; $U_{videocalling} = 394.5, p < .001, r = 0.43$; $U_{gaming} = 494.5, p = .004, r = 0.32$). Finally, emailing was rarely used for communication amongst friends. Most adolescents in both groups indicated to never use email with friends (CG: 82 %; SM: 91.2 %; $U_{email} = 694, p = .24, r = -0.13$).

Excluding adolescents with co-occurring ASD did not reveal meaningful differences in results. The distribution and median values for CMC with friends by adolescents with and without SM are displayed in Table A1, in the appendix.

3.1.2. Family context

Overall, CMC tools were used for communicating with family, however, less often than with friends. Most adolescents in the CG (91 %) chatted with family at least once a week, compared to half of the adolescents with SM (51 %). The difference in the distribution was supported by the Mann-Whitney test ($U = 533, p = .02, r = 0.26$).

Calling was used to communicate with family, although less frequently. Most CG adolescents used calling for this purpose up to once a week (Table 3) but most adolescents with SM never used calling with family. This difference was supported by the Mann-Whitney test ($U = 464, p = .002, r = 0.35$). Emailing with family was not very popular among adolescents: the CG 60 % never does versus 91 % of the SM group ($U = 523.5, p = .002, r = 0.35$).

Social media, online gaming, and video-calling were not used often by adolescents from both groups in communication with family. No statistical differences were found between the two groups ($p = .10, 0.95$, and 0.08 respectively). Excluding adolescents with co-occurring ASD revealed some alteration of results. The difference in the frequency of calling and chatting between adolescents with and without SM was mainly based on the low frequency of the adolescents with ASD; differences without this group were not significant, and effect sizes dropped (calling $r = 0.14$; chatting $r = 0.17$). The low frequency of emailing compared to the CG was the case for all adolescents in the SM group and this difference remained stable after deletion of the adolescents with co-occurring ASD. The distribution and median values of CMC with family (not living in the same house) are displayed in Table A2 in the appendix.

3.1.3. School context

Because of Covid-19, all students were offered online classes. Only one participant in the CG had not followed any online classes during the survey period in the first months of the Covid-19 pandemic. Within the SM group, however, more than 20 % ($n = 7$) had not followed any distance education. Daily online classes with video calling were the most common arrangement for both groups. Additional CMC tools for communication with teacher(s) and classmates were also used, however, less frequently than video-calling, especially in the SM group. Out of the adolescents following online classes, 68 % of the CG did communicate via chat during lessons, versus only 35 % in the SM group. The majority in the CG (64 %) used email at least once a week to communicate with the school, while this was only 30 % in the SM group. Half of the adolescents with SM never used email for school. The differences in distributions were significant for all four CMC tools ($U_{calling} = 461, p = .001, r = 0.37$; $U_{videocalling} = 414.5, p < .001, r = 0.41$; $U_{email} = 483, p = .006, r = 0.31$; $U_{chatting} = 469.5, p = .003, r = 0.34$). The distribution and medians of CMC usage in the school context are displayed in Table A3 in the appendix. Excluding adolescents with co-occurring ASD did not reveal meaningful differences in results.

Table 2

Perception of CMC with family and friends, distribution of proportions for CG and SM.

Experience	<i>n</i>	0	.50	1	Within-group comparison	Between-group comparison
Preference: family/ friends						
SM	34	73.5 %	8.8 %	17.6 %	FtF>CMC**	N.S.
CG	45	91.1 %	4.4 %	4.4 %	FtF>CMC**	
Tension: family/ friends						
SM	34	32.4 %	32.4 %	35.3 %	n.s.	N.S.
CG*	45	51.1 %	20.0 %	28.9 %	CMC>FtF*	

* $p < .05$; ** $p < .001$.

Note: Within-group comparisons show which communicative mode, CMC or Face-to-Face (FtF), is more preferred or provokes higher feelings of tension. Between-group comparisons represent proportions differences between groups.

Table 3

Perception of CMC with school, distribution of proportions for CG and SM.

	<i>n</i>	0	.33	.76	1	Between-group comparison
SM	28	21.4 %	14.3 %	17.9 %	46.4 %	
CG***	41	58.5 %	24.4 %	9.8 %	7.3 %	$p < .001$

*** = Between CMC and Face-to-Face comparison. $p < .001$.

3.2. Perception of CMC

3.2.1. Preference in communication with friends and family

Most adolescents in the Comparison group as well as the SM group had a mean proportion of 0 % (See Table 2) which means that they tend to prefer face-to-face interaction over CMC when communicating with friends and family (CG, $\chi^2(2) = 67.60, p < .001$; SM, $\chi^2(2) = 25.12, p < .001$). When comparing the two groups, the CG had a higher percentage of adolescents in the 0-proportion group, which means that in our sample the control group has an even stronger preference for face-to-face interactions than the SM group. However, this difference was not statistically significant. Excluding adolescents with co-occurring ASD did not reveal meaningful differences in results.

Feelings of tension during communication with friends and family. In the Comparison group, most adolescents had a mean proportion of 0 (See Table 2), which means that they felt less tension when communicating face-to-face than computer-mediated (CG, $\chi^2(2) = 6.93, p = .03$). In the SM-group the proportions were evenly divided, which means that for some adolescents' face-to-face communication elicits more feelings of tension while for others CMC seems to more tension provoking (SM, $\chi^2(2) = 0.06, p = .97$). When comparing the two groups, the differences between the proportions were not significant. Excluding adolescents with co-occurring ASD did not reveal differences in results.

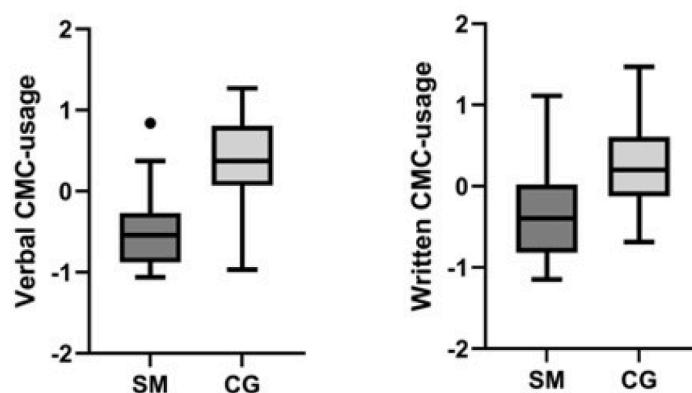
3.2.2. Perception on communication with the school

In the comparison group, the proportions were not evenly distributed (See Table 3.). Most adolescents had a mean proportion of 0, which means that they have a more positive perception of communicating face-to-face with school (CG, $\chi^2(2) = 27.39, p < .001$). The SM group showed a trend towards more adolescents having positive experiences with CMC (most had a proportion of 1), however, the distribution of proportions was not significantly different from an even distribution. (CG, $\chi^2(2) = 7.14, p = .07$). When comparing the two groups, the CG had more preference for face-to-face interactions than the SM group (CG, $\chi^2(3) = 17.92, p < .001$). Excluding adolescents with co-occurring ASD did not reveal meaningful differences in results.

3.3. Verbal and non-verbal CMC

There was a large and significant difference between the SM and CG group on verbal CMC ($t(77) = -8.11, p < .001, d = 1.84$). The mean of the final verbal communication component was -0.51 ($SD = 0.45$) in the SM group and 0.39 ($SD = 0.51$) in the CG group (see Fig. 1). Excluding the co-occurring ASD group revealed no differences and still yielded a large effect size $d = 1.53$.

The written component also showed a large, significant difference between groups ($t(77) = -5.19, p < .001, d = 1.18$); the SM group had a lower mean score ($M = -0.51, SD = 0.45$) than the CG ($M = 0.39, SD = 0.51$), see Fig. 1. Excluding the co-occurring ASD group revealed similar results with a large effect size of $d = 0.92$.

**Fig. 1.** Distribution of Verbal- and Written CMC usage per Group.

Note: On the Y-axis the final verbal and written components are presented.

4. Discussion

In this study, we explored computer-mediated communication (CMC) among adolescents diagnosed with SM. CMC encompasses many different tools such as chat, email, and video-calling, and includes both verbal and written forms of communication. The Covid-19 lockdown provided an opportunity to investigate CMC, as communication via chat, social media, or (video)calls, became the main way to keep in touch with family and friends, and was crucial for distance education.

First, the results of this study demonstrate that the adolescents with SM communicated less often via CMC with their friends, family, classmates, and teachers than adolescents without SM. While selective mutism is defined as “a consistent failure to speak” in specific social situations, our results confirm anecdotal information stating that the communication difficulties extend to other communicative venues and include written communication in many situations (Sutton & Forrester, 2016). Adolescents with SM used not only less verbal but also fewer written CMC across all contexts compared to adolescents without CMC.

Second, while most adolescents without SM reported perceiving face-to-face interaction as more positive than CMC, for adolescents with SM this differed, depending on the context. The majority of the SM group indicated preferring face-to-face interaction with family and friends, even though this provoked more feelings of tension for part of the group than CMC. In the school context, the perception of adolescents with SM was rather divided. Some perceived CMC more positively, others perceived face-to-face more positively.

Taken together, these results predominantly show that adolescents with SM communicate less in general. Their selective mutism is not always only related to talking in specific contexts but generalized to various communicational venues including CMC in contact with friends and family. While CMC, such as chatting with friends, is important to adolescents and used daily by the vast majority of the comparison group, adolescents with SM less often communicate using these tools with friends and family. One may ask whether adolescents with SM have fewer friends than their peers to chat with. There is little known about the friendships of adolescents with SM. Children with SM were found to be as likely as others to be enrolled in sports and engage in after-school playtimes with peers. However, parents and teachers reported that they were less confident socially and had difficulty making friends (Cunningham et al., 2004; Cunningham et al., 2006; Omdal & Galloway, 2007).

The results of our study show that for some adolescents with SM, face-to-face communication is more distressing than CMC, while for others CMC is more stressful than face-to-face communication. Despite the anxiety that CMC elicits in part of the group, the majority preferred face-to-face communication over CMC with family and friends. This corresponds to the change in interpretation of SM that took place. While SM has been defined as a motivational disorder in the past (Anstendig, 1999), it is now classified as an anxiety disorder although the classification is still under debate (Muris & Ollendick, 2015). One study on SM, with a sample including adolescents, found significantly more social motivational problems in youth with SM than in youth with SAD or without psychopathology (Cholemkery et al., 2014). In contrast, the results from the present study seem to indicate that youth with SM prefer direct social communication, even though it is anxious provoking.

In the school context, the perceptions concerning CMC of adolescents with SM are more divided. Face-to-face interaction seems to be preferred by some. Some exploratory preliminary analyses supported this finding. Twenty percent of the adolescents with SM did not participate in distance education in the first weeks of the lockdown and among the SM participants that did follow online classes, more than half reported it extremely stressful to follow video lessons. For others, however, CMC might be a less stressful option. CMC may feel less “social” because the other person is not physically present. This may temper feelings of anxiety.

Several limitations of this study should be considered. First, we had to rely on self-reported symptoms and diagnosis. One-third of the parents of adolescents with SM reported that their child was diagnosed with a co-occurring ASD. A link between SM and ASD in a subset of individuals has frequently been described although the reported prevalence of comorbidity varies widely (Kearney & Rede, 2021; Muris & Ollendick, 2021). In our study we relied on parent-reported diagnoses of ASD in addition to SM. ASD and SM can be difficult to differentiate because of overlapping symptoms in social situations and clinical settings. Based on our data, we cannot confirm that all previously classified co-occurring ASD diagnoses were clinically valid. We therefore did not exclude individuals with co-occurring ASD but investigated the possible effects of ASD by re-analyzing the data without the adolescents with a co-occurring ASD classification. This did not change the results concerning the perceptions and frequency of CMC with friends or for schooling. With respect to extended family members though, the group differences were found to be mainly caused by limited CMC in the SM+ASD group. A possible explanation may be that individuals with SM are less hampered by social anxiety in contact with their extended family members and therefore use CMC more easily, while to individuals with co-occurring ASD communicating with family members is less appealing in general. Previously it has been found that adults with ASD enjoyed CMC to stay close to family and friends less than adults without ASD (Gillespie-Lynch et al., 2014). Future studies are required to investigate differences between individuals with SM and SM+ASD in more detail. An ASD comparison group may help to disentangle behavioral characteristics specific to SM or ASD even more.

Second, one might argue that this exploratory study has a relatively small sample size and a broad age range. It is plausible to assume that older adolescents may engage with CMC differently compared to younger participants. Various factors such as writing or digital skills, social or school-related demands, and personal preferences, may influence their CMC usage. The sample size in our study did not allow for controlling for age. Selective mutism is not frequently diagnosed, especially not in adolescents, so the recruitment of large samples is difficult, especially within the restricted Covid-lockdown timeframe. However, to the best of our knowledge, and compared to the literature (e.g., Kristensen, 2001; Gensthaler et al., 2016b), our present study represents one of the largest adolescent SM samples with self-reported data on communication preferences. Also, the effect sizes we found in this study clearly support our line of argumentation. Nevertheless, the results of this exploratory study should be interpreted cautiously and require replication.

Third, the convenience sample recruited within this restricted timeframe was very well comparable in age, but less so in gender. There were more females in the SM group than in the CG although the difference did not reach significance. Previously, more time

spent using CMC by females than males was reported in adults (Myruski et al., 2020), and in adolescents (Leatherdale, 2010), although others found no gender differences in the frequency of CMC among adolescents (Manago et al., 2020). If female adolescents are more frequent CMC users than males, the overrepresentation of females in our SM sample may have resulted in an underestimation of the difficulties with CMC in adolescents with SM compared to peers.

Fourth, one might argue that adolescents use CMC less often to communicate with friends because they have fewer friends. We did not examine, or control for, the size of their circle of friends. Nowadays, many adolescents make friends online, for instance in game-environments and although they never meet in real life, they may interact regularly (Yau et al., 2020). If the communicative difficulties of adolescents with SM are mainly present in situations where live interaction and speech is required, and to a lesser extent during digital communication in a virtual environment, we would expect them to make more online friends. Future studies are needed to further explore friendships and peer interaction in adolescents with SM.

Fifth, one might wonder whether it is possible to investigate CMC, using an online computer-mediated questionnaire. The relatively large group of adolescents with SM that filled out the questionnaire within a limited timeframe showed that the answer to this question is “yes”, but we can’t rule out a bias. Adolescents with severe CMC anxiety may not have volunteered for this study. However, our questionnaire did not require any personal interaction or direct contact with the examiners. It was filled out at home and respondents were aware that their responses could not be traced back to individuals. These conditions may have facilitated participation.

Sixth, one might argue that selective mutism in this sample can be attributed to the early stages of L2 acquisition. Unfortunately, we did not explicitly inquire information regarding ethnic groups or linguistic backgrounds. However, we consider this unlikely. First, because, this is generally more often seen among younger children entering school, where the school language differs from their home language. The participants in our study were adolescents, who most likely, had been immersed in the Dutch school system for a substantial period. Second, the adolescents volunteered for the study, found the link to the questionnaire online, and were able to read the participant information and comprehend and respond to the questions. Since this was all in Dutch, we think that it is unlikely that adolescents who were not yet proficient or comfortable with the language would have completed the questionnaire. Third, the clinical diagnoses were all given by clinical psychologists and/or psychiatrists. A diagnosis of selective mutism is not taken lightly or provided after a short period of time, particularly in older children. We, therefore, think that it is unlikely that an adolescent would receive a diagnosis of selective mutism while being relatively new to the language environment and going through a prolonged silent period.

With these limitations and strengths in mind, the present study has some important implications for clinical practice and future research. The results show that the perceptions of CMC differ between individuals with SM suggesting that a cautious and individualized approach is required in clinical practice and at school. While CMC could be used as a “steppingstone” in the treatment of SM through gradual exposure (Manivannan, 2015) or serve as a facilitator to reduce social anxiety preceding live interaction (Bunnell et al., 2018; Markovitzky et al., 2012), it may also be an additional stressor and therefore not be useful as a communication facilitator in general.

Consequently, it is important to carefully investigate individual difficulties and preferences when developing a treatment or support plan. Importantly, the diagnostic tools currently used to investigate core symptomatology in individuals with SM (e.g., SMQ, The Frankfurt Scale of Selective Mutism; FFSM and Anxiety Disorder Interview Schedule; ADIS) only inquire about speaking with others or talking on the phone (Bergman, 2008; Gensthaler et al., 2020; Silverman, 1996). Adding items about CMC is recommended to investigate preferences and difficulties concerning contemporary communication venues. This will broaden the clinical picture and benefit the guidance of individuals with SM. In treatment, it is important to set goals regarding CMC with peers or teachers since CMC is an indispensable interaction channel in modern everyday life and education.

Taken together the results of this exploratory study suggest that SM affects more than speaking behavior and extends to other venues of communication. During a period in which Covid-19 compelled everyone to use CMC for social contact with friends, family, and for schooling, adolescents with SM refrained from both verbal and written CMC to a significantly greater extent than adolescents without SM. Future studies in non-Covid times are needed to investigate CMC in more detail. Without a doubt though, Covid-19 contributed to an acceleration of CMC that will last in the post-pandemic world and only gain importance for social interaction and education. We consider it therefore important to give more attention to the burden and benefits of CMC for individuals with social-communicative anxiety.

Statement of ethics

All of the respondents gave digital informed consent. The study was granted approval by the Ethics Committee of the Department of Child and Education Studies at Leiden University, The Netherlands (ECPW-2020/269).

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Data availability statement

Research data are not publicly available due to confidentiality constraints within our ethical approvals. Data inquiries can be directed to the corresponding author.

CRediT authorship contribution statement

Maretha V. de Jonge: Conceptualization, Funding acquisition, Project administration, Writing – original draft, Supervision. **Nikki Nibbering:** Conceptualization, Funding acquisition, Project administration, Investigation, Data curation, Writing – original draft, Writing – review & editing. **Iris Brand:** Investigation, Data curation, Writing – original draft. **Anja van der Voort:** Methodology, Validation, Formal analysis, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors have no conflict of interest to declare.

Appendix

Table A1
Frequency of CMC with Friends per Group.

CMC-tool	Never %	Less than once a week %	Once a week %	2-3 times a week %	4-6 times a week %	Daily %
Calling						
SM	62	18	9	0	12	0
CG	4	13	13	22	13	33
Video calling						
SM	53	24	15	4	3	0
CG	24	18	2	13	27	16
Social media						
SM	47	12	6	6	15	15
CG	27	7	2	0	9	55
Email						
SM	91	6	0	3	0	0
CG	82	7	7	2	0	2
Online gaming						
SM	65	18	6	3	6	3
CG	38	16	9	2	13	22
Chatting						
SM	32	9	9 ¹⁾	18	3	29
CG	2	2	0	2	7	87

Note: Dark gray: median value SM group; light gray: median value comparison group.

¹⁾ Median value is exactly between the two categories.

Table A2
Frequency of CMC with Family (not living in the same house) per Group.

CMC-tool	Never %	Less than once a week %	Once a week %	2-3 times a week %	4-6 times a week %	Daily %
Calling						
SM	53	18	18	6	0	6
CG	13	29	40	11	2	4
Video calling						
SM	65	18	9	6	3	0
CG	44	22	22	9	2	0
Social media						
SM	68	18	3	3	6	3
CM	53	11	9	9	2	16
Email						
SM	91	9	0	0	0	0
CG	60	36	2	2	0	0
Online gaming						
SM	74	15	3	0	3	6
CG	73	18	2	2	0	4
Chatting						
SM	18	32 ¹⁾	3	12	9	27
CG	7	2	16	22	20	33

Note: Dark gray: median value SM group; light gray: median value comparison group.

¹⁾ Median value is exactly between the two categories.

Table A3

Frequency of CMC with School per Group.

CMC-tool	Never %	Less than once a week %	Once a week %	2-3 times a week %	4 times a week %	Daily %*
Calling						
SM	82	9	0	0	3	6
CG	43	25	7	11	2	11
Video calling						
SM	32	15	6	6	18	24
CG	14	2	7	5	5	68
Email						
SM	50 ¹⁾	21	12	6	12	0
CM	25	11	18	30	7	9
Chatting						
SM	65	3	3	9	12	9
CG	32	7	7	11	7	36

Note: Dark gray: median value SM group; light gray: median value comparison group.

¹⁾ Median value is exactly between the two categories.

²⁾ Daily based on schooldays, five days per week.

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