Research Article

Use of Social Networking Online and Social Emotions in ASD and Neurotypical Populations

Di Laurenzio A and Prelock P*

Department of Communication Sciences and Disorders, University of Vermont, USA

*Corresponding author: Prelock P, Department of Communication Sciences and Disorders, University of Vermont, USA

Abstract

In the past few decades, innovations in the use of technology to support learning have gained momentum for supporting individuals with Autism Spectrum Disorders (ASD), particularly for those with significant communication impairments. One technological media, Internet-usage, however, has seldom been studied in this population. With some of the most prominent features of ASD being social anxiety and pragmatic deficits, the Internet can and does act as a portal for less intimidating social interactions for individuals with ASD.

Methods: This exploratory study examined how usage of Social Networking Online (SNO) correlates with social difficulties, loneliness, and relationships for 56 adults with ASD (originally diagnosed with high-functioning autism and Asperger Syndrome) and neuro typical young adults. Through a 15-20 minute Skype interview (online video chat application) and a 15-minute online survey to measure use of social networking and internet habits this study also maps the trends in the uses of SNO between ASD and NT populations. Select questions from sections of the Diagnostic Observation Schedule assessed participants' social emotions (soEmo). Both quantitative and qualitative analyses examined trends in how each community used the Internet and if use correlated with positive or negative emotions.

Results: Results from bivariate correlations indicated that NT and ASD populations differ in the types of SNOs they use, the actions they perform online and the reasons they participate in SNOs. Social Emotions (soEmo) also correlate with how individuals use SNO. Researchers and clinicians may wish to explore further the role of online communication in therapeutic settings in an effort to reduce negative social emotions among the ASD community.

Keywords: Social networking; Autism spectrum disorder; ASD; Internet; Asperger syndrome

Abbreviations

ASD: Autism Spectrum Disorder; NT: Neuro Typical; SNO: Social Network Online; soEmo: Social Emotions

Background

Autism Spectrum Disorders (ASD) are characterized by difficulty understanding nonverbal cues particularly in social contexts, displaying social-emotional reciprocity, and developing peer relationships [1,2]. Individuals with ASD often struggle to make sense of their social world, have difficulty interpreting relevant social cues in face-to-face encounters [3], and frequently demonstrate anxiety in novel situations. Individuals with ASD also display unusual approaches to social situations that may compromise the individual's ability to make friends and sustain relationships [4]. As part of these deficits, individuals with ASD often have poorly integrated verbal and nonverbal communication most often characterized by gaze aversion and a mismatch of facial expressions to the social context. As a result of these foundational deficits in social skills during face-to-face interactions, individuals with ASD encounter difficulty interpreting jokes, recognizing prosody that dictates message intent, and answering questions/formulating responses [4]. Internet-based social venues eliminate the need for processing facial expressions,

prosody and eye gaze typical in face-to-face interactions. Such venues may provide a more comfortable environment in which to initiate social interaction [5-9]. Although research examining ASD and Social Networking Online (SNO) has expanded significantly in the past several years, little is known about how individuals with ASD use the Internet and how Internet use impacts relationships and social emotions.

This study primarily sought to explore the uses of Social Networking Online (SNO) among persons with ASD and Neuro Typical (NT) populations with linguistic and cognitive abilities within the normal range. We also examined the possible link between Internet use and emotional affect related to acceptance, loneliness, and relationships for individuals with and without ASD. For this study, we used Jones, Zahl and Huws' definition of an online community: 1) interactive 2) a common public place where members can meet and interact 3) having more than 2 communicators and, 4) having a sustained membership over time [10]. With 56 total participants in 2 main groups (ASD *vs.* NT), this study investigated if either population preferred online social networking to face-to-face interaction and looked for trends and patterns in what SNO(s) the person used, why they used it and what they chose to do while using their SNO(s).

Table 1: Demographic summary for individuals with and without ASD.

Demographic Variables	ASD Group	NT Group
Age	M=27 yrs, SD=8.9	M=20.66, SD=3.97
Gender	60% F, 35% M, 5% Other	80% F, 17% M, 3% Other
Hrs online/day	M=2.35 hrs, SD=2.04	M=2.57 hrs, SD=1.96
Race/ethnicity	80% Caucasian, 15% 2 or more races	78% Caucasian, 8% 2 or more races

ASD and the Internet. The Internet has proven useful in mediating discussions on illness/disease and disorder. [8] Showed increased mental and even physical wellbeing for breast cancer and some stigmatized illnesses (e.g., AIDS, lung cancer) through online support groups. Similarly [11], Discussed the "YouTube generation" using the Internet as a way to mediate illness. People who made online ties through some forum (a form of SNO) tended to be happier and healthier. Given the value of SNO in other populations with impairments, it may be that individuals with ASD who often lack the social supports characteristic of NT populations, may find some welcomed social connections through networking online.

The studies that have specifically investigated the online activity of individuals with ASD show intriguing results. There is a growing online culture focused on ASD [5], cited the Internet as a mode of creating connections and language, and advocating and reducing sensationalism among those with ASD. [12] Investigated online culture through online ASD self-advocacy. This study showed how individuals with ASD could express themselves without automatic judgment as in many face to face interactions. [7] Analyzed the most common types of messages communicated by children with ASD [13-16]. They found messages were mostly comprised of informational support and emotional support. Though these studies were qualitative in nature, they provide insight into the Autistic mind and how the Internet could be an outlet for discussion and information dissemination. Conversely, however, Romano, Osborne, Truzoli, and Redd [13] found that high internet users showed decreased mood compared to low-internet users. ASD and other mood disorders were also associated with higher likelihood for internet addiction. This suggests that certain characteristics of internet use can potentially lead to lower social emotions [14]. The current gap in the literature fails to address differences in internet use between groups of individuals with and without ASD or other comorbid behavioral or mood disorders (NT). Further, questions remain regarding how Internet use relates to an individual's emotional traits.

Participants

Participants included 56 adults, ages 18-55 years (M= 24 years; SD=7.1). Twenty participants had ASD without significant linguistic or cognitive impairments and 36 participants were neuro typical without a history of behavioral, mood or cognitive impairments. Fifteen of these adults (five with ASD and 10 NT) also participated in a 15-20 minute Skype interview. The selection of young adults with ASD who had original diagnoses of high-functioning autism and Asperger syndrome with high-cognitive and linguistic abilities was characteristics important for successful participation in the interview and completion of the online survey. The 20 participants with ASD were recruited from the Vermont area through several different websites. The 36 neuro typically-functioning participants were recruited through the University of Vermont, other local colleges,

and several websites.

For the ASD group, the mean time spent online was 2.35 hours (ranging from 0 to 10 hours per day) with a standard deviation of 2.04 hours. The mean age was 27 (ranging from 18 to 55) with a standard deviation of 8.9 years. Sixty percent of the participants identified as female, thirty-five percent identified as male and the remaining five percent identified as unlisted gender identity. Forty percent had earned an associate's or bachelor's degree, 35% had finished secondary school or had a GED equivalent, 25% had completed primary/grade school. Eighty percent identified as Caucasian while 15% identified as two or more races. For the NT group, the mean number of hours spent online per day was 2.57 (SD=1.96). Mean age was 20.66 (SD=3.97). Eighty percent identified as female, 17% male, and 3% identified as other. Seventy-eight percent were Caucasian, 8% were two or more races. Sixty-three percent of the participants finished secondary school or held a GED equivalent. Twenty-eight percent completed a masters' degree and the remaining 8% completed primary/grade school (Table 1).

Both the ASD and NT groups were similar in terms of mean age, hours spent on social networks, percentages for race/ethnicity, and gender. The major difference in demographics between the groups was in the level of completed education. On average, the ASD group had completed more years of college as a group. This is likely related to the older average age of the participants with ASD.

Methods

Skype interviews provided the researcher with qualitative information about the participants' perceptions of loneliness, acceptance and relationships. There were two main measures used in the study: 1) Skype interview questions (see Appendix) [17] and, 2) an online survey. The Skype interview questions were grouped into three categories: 1) one social anxiety-related question (likert scale 1-10; low anxiety to high); 2) 16 open-ended questions including six on emotions and social difficulties, five on friends and marriage, two on loneliness, and three on online communication; and, 3) nine yes/no questions including one on emotions and social difficulties, four on friends and marriage, two on loneliness, and two on online communication.

The second measure, the online survey, consisted of 48 questions. Three overarching constructs were tapped with varying question construction; demographic information (eight questions), mapping the uses of SNO (18 questions), and social emotions (21 questions). Mapping SNO uses and social emotions were further divided. Mapping SNO uses included what social networks the participant used, what the participant typically did on SNOs, and what reasons compelled the participant to use SNOs. The social emotions (soEmo) section included seven questions on social anxiety, ten questions on relationships, and four questions on loneliness. In addition to the

multidimensional format of the survey, there were several different question structures. Seventeen of the questions were placed on a 6-point Likert scale from 0-5 to measure frequency of an emotion (0=never, 5=All the time). Fourteen of the questions were categorical involving identification as a part of a particular community. Six of the questions were open-ended and the final 11 questions were yes or no.

Results

Demographic comparisons

Correlations among the demographic variables of the two groups were completed to ensure comparability excluding diagnosis. Results indicated that although the ASD group completed more post high school education, education did not correlate with the targeted variables being measured in the study. Age, gender and race/ethnicity also did not correlate with any of the targeted variables. Importantly, therefore, demographic information for both groups was comparable and was not seen as a factor influencing the results of the study.

Qualitative results

Answers from participants were examined for common themes by reviewing the individual answers and categorizing how responses related to feelings involving social versus non-social activities. For example, if the participant answered the question "what makes you happy" with "playing music, piano-playing and teaching, and nature walks with my dog," this was described as one social activity (teaching piano) to three nonsocial activities. There were some noticeable differences when comparing the responses of the two populations. Overall, neuro typical individuals engaged in more social activities than people with ASD.

Positive versus negative statements about SNO were also counted. Fifty-three percent (or 8 participants) found social networking to be a helpful tool. An example of a positive statement regarding SNO was "I think that, without social networking, I would be much less connected to people I know" while a negative statement was "For me, social networking seems to be as difficult as face-to-face interactions". SNOs were perceived as both useful/enjoyable and problematic. One example of a perspective mirrored by most of participants was: "It's a complicated question because if you use it too much, it starts becoming a hindrance because you start to forget about the real world." There was a general consensus that SNO is not a replacement for social interaction. Spending more time interacting online than face-to-face was considered a hindrance. Without being prompted, all but two participants offered this central idea. One example of a typical response was, "I think it is definitely a good thing, too much of it can be a bad thing. It's really easy to get wrapped up in and too much of it can be bad."

The impact of SNO on the participants' lives was also examined. This question included 46 additional participants because their input was also gathered in the anonymous online survey that included the question, "How has online social networking affected your life?" Participants offered a range of positive and negative comments from "it wastes a lot of my time" to "I'm nowhere near as lonely as before." Three of the 46 participants met romantic partners online (1 NT, 2 ASD). Six of the 46 participants said SNO had not affected their lives. The majority of people, who reported an impact of SNO on their lives, used it to stay in contact with people they already knew.
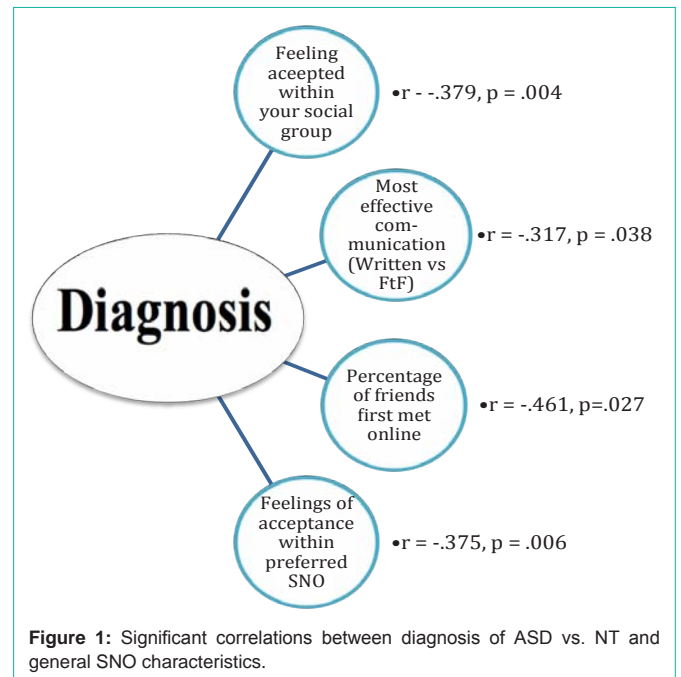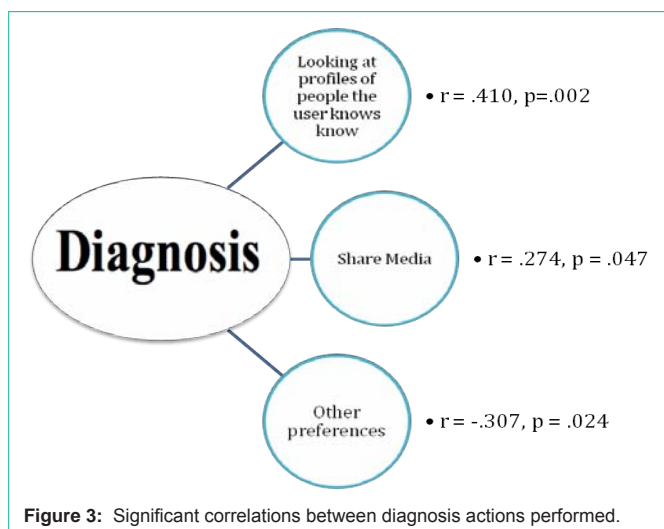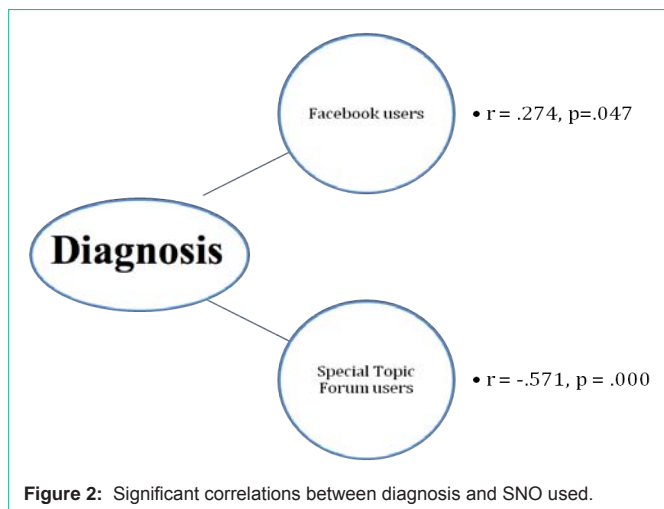

Figure 1: Significant correlations between diagnosis of ASD vs. NT and general SNO characteristics.

NT participants were slightly more likely to use SNOs for keeping in contact with people online. People on the spectrum also mentioned a more significant impact of SNO upon their lives. All five ASD participants mentioned development of skills from online interaction while no NT participant mentioned skill development. For example one participant with ASD said, "I learned English online. I used to be really bad. I was a really big Harry Potter fan, so I was on forums and podcasts. Part of that was also learning logic. When you were defending some theory about what was going to happen in the next book, you had to come up with reasons and references to the source material and just…not make stuff up. You had to have a hypothesis and then defend it from the source material." Another participant stated the Internet "improved my social skills". Those with ASD reported that advocacy and making connections increased their understanding of autism. Three participants with ASD mentioned their use of social media to find other people on the spectrum and understand their own diagnosis better.

Quantitative results

General information: To map the uses of SNO three main areas were examined: which social networks participants used, what actions they performed on SNO, and what reasons they had for using SNO. The fundamental questions were: 1) Are their differences in how NT populations and ASD populations use SNO? and, 2) Do different behaviors correlate with different SNO-use? To answer these questions a number of bivariate correlations were completed to see how SNO use related to type of user (i.e., ASD *vs.* NT) and to social emotions. The survey measured social emotions (soEmo) using 16 open-ended questions, six on emotions and social difficulties, five on friends and marriage, two on loneliness, three on online communication. In measuring social emotions (soEmo), Cronbach's alpha was r = .883, indicating strong internal consistency suggesting the items measured the same general construct.

Initial correlations were completed to assess any differences

Figure 2: Significant correlations between diagnosis and SNO used.

Figure 3: Significant correlations between diagnosis actions performed.

between participants with and without ASD (unrelated to SNO-usage). In this study social emotions are not a measure of happiness or sadness but rather "positive" and "negative" feelings regarding social interaction. Among the ASD group, social emotion scores ranged from 26 to 66 (M=49.35; SD=12.49). The mean score for social emotions in the NT group was 31.37 with scores ranging from 14 to 46 (M=31.37; SD=8.01). Higher scores correlate with more negative feelings There was a significant negative correlation (p<.01) between social emotions and diagnosis, meaning people with ASD were likely to have more negative social emotions. For both groups, age and social emotions correlated positively and significantly at the .01 level, indicating the older the participant, the more negative the social emotions.

Those with ASD were less likely to feel accepted within their group of friends. They were also more likely to feel their most effective communication was written communication as opposed to face-to-face conversation. People with ASD were more likely to have first met friends online and to feel accepted via SNO than their NT peers. However, people with ASD were still more likely to feel accepted within their social group face-to-face and in an online community.

(Figure 2) summarizes these general correlations with diagnosis.

How NT *vs.* ASD populations use SNOs

As a first step, trends between both groups (56 total participants) were examined. A positive correlation indicated that more NT users use a specific SNO function than their ASD counterparts. A negative correlation indicated that ASD users use a specific SNO function more than their NT counterparts.

Trends occurred in the following areas: social networks used (Figure 1), actions users performed (Figure 2), and reasons for participating in SNOs (Figure 3). The most used social network among the NT group was Facebook while forums were the most used for the ASD group. The three most common actions performed in SNOs among the NT group were: "looking at profiles of people I know", "messaging people I know" and "sharing media". For the ASD group, the most common actions were, "looking at profiles of people I know", "messaging people I know," and "posting public messages/bulletins". The most common reasons for participating in SNOs for the NT group were "staying connected to friends/family", "entertainment", and "waste time". For the ASD group, the most common reasons to use SNO were "to share interests with those who share my interests", "to stay connected" and "for entertainment".

There were a number of variables that showed no significant correlation with NT users or ASD users. For example, no significant correlation was found between amount of time spent on SNOs or contributing to SNOs and a diagnosis of ASD. People who met some friends online first are not more or less likely to be NT or have ASD. Though people with ASD did show a preference for written communication over face-to-face communication, there was no trend in preference for online versus face-to-face communication. There was also no significant correlation between users' diagnosis and users of linkedIn, 4chan users, dating site, blogging platform, youtube, or other sites.

In terms of actions performed on SNO there was no significant correlation between a diagnosis of ASD and looking at the profiles of people, updating the user's own profile, messaging people the user knows, messaging people the user does not know, posting public messages/notices, or organizing parties or events. In terms of reasons participants cited as compelling them to use SNOs, there was no significant correlation between diagnosis and meeting new people, developing professional contacts, developing or honing skills, and other uses although there was a low rate of participation in these activities.

In terms of social networks used, NT people were more likely to use Facebook while people with ASD were more likely to use special topic forums (Figure 3). There were also some significant correlations in actions performed online. There was a significant positive correlation at the .01 level between diagnosis and looking at profiles of people the user knew. There was also a positive correlation, significant at the .05 level, between diagnosis and sharing media on SNO- meaning NT people were more likely to share media and look at profiles of people the user knew than people with ASD. There was also a significant negative correlation at the .05 level between diagnosis and other preferences, suggesting individuals with ASD were actually using SNO for more diverse purposes than their NT

Table 2: Significant correlations between, with, and without ASD and SNO-use.

General findings	SNOs Used	Actions on SNOs	Reasons to use SNOs
Feeling accepted within your social group r = -.317, p = .038	Facebook users r = .274, p=.047	Looking at profiles of people the user knows know r = .410, p=.002	Stay connected to my friends r = .364, p = .006
Communicate Best through Writing or FtF r = -.379, p = .004	Special Topic Forum users r = -.571, p = .000	Share Media r = .274, p = .047	Share with those who share my interests r = -.360, p = .007
Percentage of friends first met online r = -.461, p=.027		Other preferences •r = -.307, p = .024	Entertainment r = .270, p = .048
Feelings of acceptance within preferred SNO r = -.375, p = .006			To avoid talking directly to others r = -.360, p = .008

Table 3: Significant correlations between social emotions and SNO use.

General findings	SNOs Used	Actions on SNOs	Reasons to use SNOs
Diagnosis (ASD *vs.* NT): r = -.538 p = .000	No significant correlations	Message people the user knows r = -.493, p = .032	Entertainment r = .524, p = .018
Age of diagnosis r = -.576, p = .010			To avoid talking directly to others r = .533 , p = .019

counterparts (see Figure 3 for a summary of the r and p values for the previous correlations).

In terms of the reasons participants cited for being a part of SNO, there was a positive correlation (p<.05) between staying connected to friends and diagnosis. The same was true for using SNO as entertainment. Thus, individuals in the NT group were more likely to use SNO to stay in contact with friends and for entertainment than ASD users.

Social emotions and ASD Participant's SNO Use

Scores for soEmo responses were compared to the demographic questions. We found no correlation in either group between gender, education, race/ethnicity, and social emotions. There was, however, a significant positive correlation at the .05 level between the age the participant was diagnosed with ASD and their social emotions. That is, the older people were when they were diagnosed, the more negatively they felt in terms of social emotions. Correlations between general online habits and soEmo were also explored and no relationship was found between spending time on social networks and emotions. The same was true of the amount of hours spent on SNO per day. There was also no significant correlation between social emotions and whether or not an individual was involved in SNO. (See Table 4 for a summary of their correlatiolns) the age at which the user started using social networks did not correlate with soEmo. Those who had at least one close friend who they met online did not show any significant pattern in social emotions. Social emotions also did not significantly correlate with the proportion of friends met online to friends met offline.

The following websites the participants used showed no relationship between ASD users and soEmo: Facebook, linked in, 4chan, dating websites, bogging platforms, special topic forums, YouTube. Though there are a diverse number of functions and features on each social networking site sampled in the survey the social network used by people on the spectrum is not linked to the social emotions of the ASD participants. In terms of the actions participants performed online, there was no correlation between looking at profiles of people the user doesn't know, updating the user's own profile, sharing media, messaging people the user doesn't know, posting public messages, organizing events and parties, or other preferences. It is likely that none of these correlated because

there weren't enough participants actually engaged in doing these things. However, there was a significant negative link between messaging people the ASD user knows and soEmo. This means the more likely the participant is to message people the user knows, the happier they tend to be.

Finally, examining the reasons participants joined online communities; there was no link between soEmo and meeting people, professional/career contacts, wasting time, developing/honing skills, or other stated uses. There was, however, a significant negative correlation between using SNOs for entertainment and soEmo meaning that the happier the user was in terms of social emotions, the less likely they were to use SNOs primarily for entertainment. There was a significant positive correlation between using SNOs to avoid talking directly to others and soEmo. This means that the more participants used the Internet to avoid talking directly to others, the unhappier they tended to be socially. A summary of the significant SNO uses as correlated with soEmo among people with ASD can be found in (Table 2).

Relationship between social emotions and SNO usage in the NT group

The amount of time people spent contributing to SNO correlated significantly in a positive direction with soEmo. There was no correlation between what social network the NT participant used and their soEmo score. There were also no correlations found between soEmo and what actions NT participants performed online. Similarly, there were no correlations between the reasons NT participants gave for using SNOs and soEmo. A summary of the NT correlations are presented in (Table 3).

Discussion

The results of this study suggest that there are certain ways to use social networking online that correlate with positive or negative social emotions. In terms of qualitative trends, there are mixed impressions of social networking. Though many individuals with ASD use SNOs for entertainment or staying connected to their friends (see correlations between NT *vs.* ASD diagnosis and other variables), others use the Internet as an educational tool to develop reading and writing skills as well as social skills (see Face-to-face Interviews). Previous research supports the notion of Internet use as a way to provide social support as well as a tool that helps support the

Table 4: Significant correlations between soEmo and SNO-use in the NT group.

General findings	SNOs Used	Actions on SNOs	Reasons to use SNOs
How many hours per day the user contributes to SNOs r = .403, p = .046	No significant correlations	No significant correlations	No significant correlations

individual with ASD and the Internet as a medium of communication for those with pragmatic deficits [6,7] One possible explanation for the trends seen in this study could be that people with ASD who are innately more social choose to use SNOs for more social purposes. Further, people with ASD who are innately more social also have more positive emotions toward social interactions. On the other hand, it is also possible that people on the spectrum using SNOs in particular ways lead them to be "happier" or "sadder" in terms of social emotions. It is important to note that correlation does not equate to causation. A third variable could be at play in many of these correlations. The recruitment process could have created a bias for participants who most often used social network online because several participants found the study via an online forum.

Future research may reveal the causal relationship between certain Internet uses and the impact on social-emotional characteristics. Until then, some trends found in this research indicate a need for further exploration. There was stigma in using the SNOs (discussed in the face-to-face interviews). Many participants mentioned the fact that using SNOs "too much" would be negative. Despite this, our study revealed no correlation between time spent on SNOs and social emotions. We also found that the older participants were when they started using SNO, the more negatively they felt in terms of social emotions. People with ASD were more likely to have higher percentages of friends they first met online. They were also more likely to feel accepted within the social network(s) they used than their NT counterparts.

There were some notable differences between the NT and ASD groups in their use of social networking. Looking at three different dimensions of SNO usage (what SNOs participants used, what actions they performed online, and the reasons they participated in SNOs), NT people and people with ASD used SNOs slightly differently. People with ASD tended to use special topic forums more than NT people, while NT people used Facebook more. NT people were more likely to share media and look at profiles of people the user knew than people with ASD. People with ASD were more likely to share their interests on SNOs than NT people. They also tended to use SNOs to avoid talking directly with others more than NT users.

Social emotions also had some interesting trends with SNO-usage among the groups. There was no significant correlation between social emotions and whether or not an individual was involved in SNO. This was true for both the ASD and NT participants leading to the conclusion that although the two groups tended to use different sites, there is no link between social emotions and what site either population used. For those who used SNOs there were characteristics of use that associated with more negative or positive emotions. The more the user messages people the user knows, the happier they tend to be. The happier the user was in terms of social emotions, the less likely they were to use SNOs primarily for entertainment. We also found that the more often the participants used the Internet to avoid talking directly to others, the unhappier they tended to be socially. There was no correlation between what social network the

NT participant used and their soEmo score. In other words, though some SNO uses were linked to social emotions in the ASD group, there were no trends in the NT group between SNO use and soEmo.

This study's limiting factors include lack of multiple measures, potentially incomplete examination of the constructs of social emotions and online social networking, limited sample size, and some participants' failure to complete all the questions. Specifically, we were unable to compare high-end users and low-end users, which may have yielded a more complete picture of social networking online. Unfortunately, a small number of individuals with ASD actually participate in social media (13.2%) affecting recruitment and eligibility for participation.

One of the possible negative aspects of Internet-interaction is the lack of non-verbal and environmental cues [18]. This can created is connecting between the real world and the online world (Jin, 2010). Online bullying is another growing concern. Kowalski [19] detailed the effects and mechanisms of online bullying in individuals with ADHD and Asperger's syndrome. Kowalski expressed a pervasive worry that some may use or be using the Internet as replacement for face-to-face social interaction. These concerns further complicate the relationship individuals, with and without ASD, have with social networking online. Preliminary results from this study indicate that individuals are aware that SNOs cannot be used as a replacement for social interaction. In fact, our data found that participants from both groups who engaged in Internet use for purposes of connecting with others tended to be happier than those who used the Internet to avoid talking directly to others.

There are many aspects of the Internet that make it an excellent tool to support the communication of individuals with ASD. Online speech is direct by and large because there are no diacritic marks for sarcasm, irony, or other prosodic features. Because individuals on the spectrum generally lack a social filter and rarely master deception, the Internet's candid and anonymous nature makes this behavior seem typical. The immediacy of face-to-face communication is often difficult for ASD individuals, but online, there are no facial cuts, no eyes to follow and plenty of time to think of and compose a response. The Internet plays to the visual strengths of individuals with ASD [20]. Results of efforts to examine the role of the Internet in addressing social behavior in special populations like ASD could lead to possible revisions of intervention approaches and/or inclusion of computer-mediated-communication into daily life.

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