University of Alberta

Is Participation in Family Role-play in Second Life Associated with Improved

Social and Emotional Support and Well-Being Among Adults with Autism

Spectrum Disorders?

by

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DEDICATION

I dedicate this thesis to everyone who encouraged me throughout my life from the time I was a young child with Asperger's Syndrome struggling in the Nova Scotia school system to the present day. I thank my parents, Lynn and Barry Gilmour who have always believed I can do anything I want to do and that nothing can stop me.

I also dedicate this thesis to my grandmother; Esther Gilmour who watches over me from heaven has been an important inspiration from childhood to present and always took great pride in my work while she was on earth. Last but not least, I dedicate this thesis to my undergraduate research supervisor and close friend, Dr. Melike Schalomon who helped me establish a direction in my undergraduate studies and helped me to believe in myself during a time in my life I was struggling and ultimately reach my dreams of graduate school.

Abstract

This study examines whether participation in *Second Life* (SL) among adults with Autism Spectrum Disorders (ASD) is associated with perceptions increased perceptions of emotional support and wellbeing. A total of 53 participants were included in the analysis: In the sample, 7 had ASD and used SL, 6 had ASD and did not use SL, 39 did not have ASD and were SL users, and 11 did not have ASD and did not use SL. Individuals with ASD who participated in SL rated themselves significantly higher on measures of social fun, emotional support, and flourishing in SL than they did on real life (RL) measures of these aspects. Individuals with ASD who participated in SL reported lower social fun in RL than those who did not participate in SL. Results of this study suggest that individuals who are attracted to SL, report poor social and emotional support and well-being offline.

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LIST OF ABBREVIATIONS

ASD   Autism Spectrum Disorders

FS   Flourishing Scale

RL   Real Life

SL   Second Life

SOS   Significant Other Scale

SPANE   Scale of Positive and Negative Experiences

SPANE B   Scale of Positive and Negative Experiences Balanced Sub score

SPANE N   Scale of Positive and Negative Experiences Negative Sub score

SPANE P   Scale of Positive and Negative Experiences Positive Sub score

VE   Virtual Environment

Is Participation in Family Role-play in Second Life Associated with Improved

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This research examines the implications of participation in the virtual

world of *Second Life* (SL) on social and emotional well-being for adults with

Autism Spectrum Disorders (ASD). The first section of the literature review

describes typical social challenges of children with ASD that persist into

adulthood. This is followed by a discussion of the limitations of social skills

interventions that focus on didactic teaching or role play in a structured therapy

setting versus a real world environment. Following this is a review of research on

virtual environments, including SL usage by adults with disabilities. The

discussion on SL is continued by describing the potential of this virtual world in

providing opportunities for increased social connectedness and wellbeing for

adults with ASD. Finally, limitations and potential risks of participation in SL are

discussed with a focus on adults with ASD.

The American Psychological Association (APA, 2013) describes

individuals with ASD as having social-communication difficulties such as poor

conversation skills, misinterpretation or inability to read non-verbal cues, and

difficulty establishing and maintaining friendships expected of someone of the

same developmental age. Calder, Hill, and Pellicano (2013) state that children

with ASD in primary school report having friendships; however, they tend to have

fewer friends and poorer quality friendships. As such, many of these friendships

lack characteristics that would be important to individuals without ASD such as intimacy and reciprocity.

It has been proposed that friendships are more difficult for older children, youth and adults with ASD as relationships become increasingly complex with age (Calder, Hill, & Pellicano). According to the APA (2013) description of autism, communication deficits associated with ASD must be present since early childhood, yet these challenges are not limited to childhood and in many regards contribute to poor social adjustment in adulthood. As an example, Tani et al. (2012) studied 99 adults with ASD and 63 participants without ASD. They found that participants with ASD were more likely to report psychological distress, less friendships, and more loneliness than those without ASD. Further evidence of compromised relationships of adults with autism is found in a study of 235 adults where only 19 (8.1%) of the participants had what was defined by the researchers as 'a friend' (Orsmond, Kraus, & Seltzer, 2004). A 'friend' was defined as an individual of similar age, whom the participants engaged in varied activities that were mutually enjoyed by both parties and involved reciprocal interaction. One fifth (20.9%) reported at least one peer whom they engaged in reciprocal activities outside of a structured setting such as two adults meeting for lunch versus a movie night organized by caregivers specifically for individuals with disabilities. One quarter (24.3%) reported peer relationships in structured settings. Half of the sample (46.4%) reported no peer relationships.Orsmond et al. did not consider the potential value of non-peer friendships or online friendships, as these factors did not meet the criteria used in the study to define friendship. The potential for adults

to form relationships and friendships online is a recent phenomenon (Rajendran, 2013). Virtual worlds, such as SL, may provide a venue to overcome social barriers and allow for the formation of meaningful relationships for some adults with ASD that have difficulty achieving these relationships in offline settings.

Limitations of Interventions to Support Social and Communication Development

Social support and friendship quality are considered key indicators of quality of life in adults with ASD (Burgess & Gutstein, 2007). With these indicators in mind, many programs have been devised to support the development of social development for children, teens, and adults with ASD. For example, Laugeson, Frankel, Mogil & Dillon (2009) created a group instructional program for social skills for adolescents with ASD known as the Program for Education and Enrichment of Relational skills (PEERS). PEERS consists of classroom training sessions for adolescents of common social skills ranging from establishing friendships to handling bullying in conjunction with parent training. A randomized controlled study of 33 adolescents ranging from age 13-17 with a diagnosis of ASD demonstrated improved social skills knowledge, an increase in frequency of outings with peers and parent reports of improved implementation of social skills. However, there was no significant difference in reports of social skill improvements between waitlist and controls by teachers. This finding is important because it is suggestive of limited generalization of the program beyond the clinical setting. Schohl et al. (2013) conducted a randomized waitlist controlled trial of PEERS, expanding upon the study by also measuring participant anxiety

prior to and following completion of the program. A total of 58 individuals with High Functioning Autism (HFA) between the ages of 11-13 participated in the study. It was found that participation in PEERS decreased anxiety but there were no significant differences in parental reports of social skills and friendship quality between waitlist and controls, again suggesting limited transfer to other settings.

Hillier, Fish, Cloppert, and Beversdorf, (2007) studied six adolescents who received peer modeling instruction in a social skills group and met in a naturalistic (real world) setting monthly to practice skills. Despite practice in naturalistic settings, no significant differences were found on participant appraisal of peer relationships following the study. It is possible that these environments do not resemble authentic situations enough for participants to apply their new social skills and knowledge to obtaining friendships. These findings are not surprising as it is well established that individuals with ASD show poor transferability of skills between dissimilar environments (Dorston, et al., 2009).

Promise of Virtual Environments to Support Authentic Social Interaction

In recent years, technology has allowed researchers to explore the potential benefits of using virtual environments (VEs) as social learning contexts for individuals with ASD. VEs may be more accessible and cost-effective therapy settings than naturalistic environments and, although somewhat counter intuitive, may provide more of a real-world context than didactic instruction or scripted group role-play. In a review of the use of VEs for individuals with ASD, Rajendran (2013) suggests that VEs bear close enough resemblance to real world environments for generalization. VEs can provide digital 3D replicas of

commonly encountered environments but the way they are used by 'players' can alter how closely they resemble real world experiences. For example, Parsons, Leonard, and Mitchell (2006) studied two adolescent boys with ASD in virtual simulations of a café and bus that were populated with digital representations of customers and commuters. The participants in the study interacted with these representations as 'avatars,' or 3D representations of themselves. The customers in the cafe and people on the bus were scripted to give predetermined responses. Parsons et al found that some of the participants expressed that the VE did not seem like an authentic environment and failed to follow social conventions implied by the simulations. These findings suggest that overly prescribed VEs may be limited in realism, which, like classroom or therapeutic setting may inhibit generalization of learned skills. VEs that rely on the participation of live people who create the environment themselves may offer a more realistic opportunity. *Second Life* (SL) is a VE that involves other humans as active participants who create and manipulate aspects of the virtual world. It is proposed that participation in SL may result in improved comfort engaging in social interactions as it involves authentic daily life problem solving (e.g. working as a teacher in a virtual school and dealing with complaints from avatars acting as parents) leading to an increased likelihood of meaningful interactions with others that might lead to developing authentic friendships offline and a reduction of the negative consequences of loneliness.

There is an emerging literature that supports some benefits of online virtual worlds in cases where participants know each other offline. Snodgrass,

Lacy, Dengah and Fagan (2011) studied participants in SL without ASD and found that among RL friends who played online games together, the shared experiences online resulted in topics for discussion in offline relationships. Playing online games with RL friends may be beneficial for individuals with ASD who struggle more with face-to-face communication as it may allow them to communicate with their friends in an environment with fewer barriers and gain shared experiences. (Danilovic, 2010). Danilovic discusses the potential use of virtual worlds to reduce social isolation among adults with ASD. As virtual worlds rely less on the use of body language, communication is potentially less complex and confusing to individuals with ASD.

Participating as a member of a community also allows opportunities for social network support. For instance, some adults in virtual worlds who are unable to have children will form communities and raise virtual babies. The author, an individual with ASD, has participated in a couple of SL groups for raising virtual infants. Due to having ASD and being unsure if she would be able to have her own children, this opportunity helped her experience some of the challenges of parenting. Individuals in these groups role-played raising infants give each other practical and emotional support for parenting and gradually relationships form lending themselves to explore real life (RL) problems. For instance, the author met several parents in these groups who were raising a child with autism in RL and was able to share insight on her own experiences of being an adult with ASD. A further example of social support was experienced when some people in these groups advised the author on aspects of interaction that she struggled with such as

being able to recognize someone in the group who was trying to convince her to sell virtual merchandise for much less than what it was worth.

Second Life may provide a more authentic environment than scripted role play in group therapy for both the practice of social interactions and establishment of friendships. In cases where participants know each other offline, an environment like SL may provide a medium for shared interactions where individuals with ASD are more comfortable than face to face settings. Interactions in SL may also result in mutual friendships between individuals behind other avatars and adults with ASD.

Understanding the Context of Second Life

Second Life (SL) is a virtual world populated by a wide variety of people, some with ASD and some who do not have ASD. The population of individuals that interact within Second Life is likely more representative of the general population than participants in most therapy programs, making it a virtually 'inclusive' environment. Danilovic (2010) discusses the potential use of virtual worlds to reduce social isolation among adults with ASD. As virtual worlds rely less on the use of body language, communication is potentially less complex and confusing to individuals with ASD.

Gilbert et al. (2013) studied 196 adults with various disabilities who signed up for SL. Three months later, 61 of these participants were available for follow up. The participants reported improvements on measures of emotional and psychological well-being. Scores were related to number of friends and groups and to overall feelings about involvement in SL. However, number of close

friends or amount of involvement did not seem to have a correlation. Authors suggest that individuals with disabilities that benefited from interaction in SL were seeking an involvement that was less demanding and less dependent on interpersonal connectedness than offline relationships. While adults with ASD were not specifically examined in this study, these findings are suggestive of the potential of SL as a context for increased access to authentic social experiences that may lead to perceptions of greater social support and well-being.

Second Life also includes several disability-specific communities. Brigadoon, a community exclusively for people with ASD existed several years ago in SL and closed due to owner illness (personal communication, Golda Stein, April 2013). Hickey-Moody and Wood (2008) also describe non-consumer oriented disability-specific communities in Second Life. One community, Wheelies encouraged interaction between individuals with and without disabilities. Some people with disabilities will create avatars that are without disability and some without disabilities will create avatars with disabilities as part of the process of understanding each other. Group events such as concerts with live singing are an attraction of this group. Some groups and communities are disability-exclusive. For instance, Gimp-Girl is a group exclusively for women with disabilities. Other communities in SL are not related to disabilities and may give adults with and without disabilities opportunities for peer interaction.

Family role-play neighborhoods in SL are digital representations of real world neighbourhoods and involve participation of live avatars, or 3D representations of actual people who have entered the VE. The avatars carry out

tasks similar to individuals in an offline community such as working in a store, booking a medical appointment, or attending a neighbourhood gathering. Participants in SL create their own environment based on their interests and creative ideas. For instance, the author is a participant in SL and a person with ASD and has purchased and decorated her own home, worked as a teacher at a virtual pre-school where she planned activities and schedules for other avatars, and organized dinner outings and shopping trips with other avatars in a family-role play neighbourhood. Creating and participating in these scenarios presents opportunities for social problem-solving within authentic situations that arise such as de-escalating a situation with an upset 'parent' at the preschool or attending a neighbourhood game night and engaging in appropriate conversation with a community group.

Potential Drawbacks of Virtual Environments for Individuals with ASD

When considering the use of VEs in adults with ASD, the benefits and drawbacks between virtual and offline social interactions must be considered. For instance, in the case of romantic relationships, the online environment may present problems. Craft (2010) proposes that many people who seek romantic partners in *Second Life* (SL) are already in an offline relationship. Further, Gilbert, Murphy, and Ávalos (2011) reported that individuals in virtual relationships are more likely to idealize characteristics of their virtual partners over their offline partners. For adults with ASD, these perceptions might create both unrealistic expectations and opportunities to engage in socially inappropriate

behaviour (e.g., having an online relationship with someone who is married offline).

In the author's interactions on SL, she has heard experiences individuals who are married outside of SL, but engage in role play of sexual activity in SL, have virtual weddings, and even in some cases travel to meet offline. In some cases the individuals' spouses tolerated it, believing it was a fantasy game and not recognizing that real feelings were involved and in other cases individuals conducted the activities in secrecy of their spouses such as spending the week with their virtual partners while their spouses were away on business. On SL, sexual activities that would be considered deviant or even illegal are frequently role-played on SL. For instance, there are urban neighbourhoods where participants engage in role play of crime, including detailed accounts of rape and it is seen as socially acceptable in that context. Also, some people choose to have a child avatar but engage in adult sexual activities on that avatar, despite it being against the official Terms of Service of SL and classified as virtual child pornography in many countries.

Some individuals with ASD play characters different than their offline selves for non-sexual reasons. For instance, an adult in a family role-play community may play a child or teenager. Sometimes, this may be done to escape the stresses of being an adult. Other times an individual may have reported poor experiences as a child such as illness, disability, or abuse and want to recreate a happy childhood. Places such as toy stores, playgrounds, preschools, and pediatricians offices exist in family role play neighbourhoods for this purpose and

children are often adopted into family units by other users role playing as adult. Although playing a younger character may allow them to learn some of the basic rules of friendship and socialization that they may have missed learning when they were younger, it may also lead to individuals being inappropriately dependent on other adults. For instance, a child avatar may expect their virtual parents to spend all their online time with them and become jealous if the person role -playing their parent has other interests that do not include the child avatar. Playing as a child can also be used an excuse for inappropriate behaviour, such as frequently interrupting conversations, and the individuals may also miss out on opportunities to develop meaningful age-appropriate skills and relationships.

Financial and social situations can also present challenges for those who use SL. SL allow users to make in-world purchases. If an adult with ASD has difficulty managing finances or is easily led by others, this may lead to spending money intended for essential purposes in SL or giving large amounts of money to strangers in the case of an online scam. For instance, a player may approach someone who appears naive in a virtual store in private messaging and say they have a serious illness in real life and have no money but really want to have a particular item. An adult with ASD may be less likely to recognize a scam due to inability to comprehend lying in some cases. As in offline situations, scammers will approach people who appear vulnerable. The author has had several experiences with people approaching her such as an individual who said they were dying of cancer in RL and wanted someone to purchase and care for virtual pets that belonged to them that she had priced above market value. The author has

also heard accounts of individuals targeting under aged players or adults with learning disabilities.

Additionally, as with offline situations, there is the risk of cyberbullying or potentially unhealthy friendships with users who have severe antisocial behaviours or psychiatric symptoms. For instance there have been a few cases where women in family neighbourhoods took another avatar into her home who was roleplaying as a baby out of the desire for virtual parenthood and the babies ended up being individuals who chose to role play as infants due to pedophilia rather than the desire to role play as realistic children.

Study Aims and Hypotheses

Despite the above risks, the aim of this study is to determine if participation in family role-play in *Second Life* (SL) among adults with ASD is associated with increased, perceived social support, and improved perceptions of well-being.

    a. It is hypothesized that individuals with ASD who participate in SL will report higher social support and well-being in their SL than in their real life (RL)

    b. It is hypothesized that adults with ASD who participate in family role play in SL will report higher social support and well-being than individuals with ASD who did not participate in SL.

    c. In contrast, no differences in scores are expected between SL users and non-users among persons without ASD because they would likely have similar levels of social support in both environments.

These hypotheses are formed assuming that role-play in SL may be more accessible and comfortable medium than direct interaction, providing more opportunities to form friendships and social networks among individuals with ASD.

Method

Participants

Four groups of participants were recruited for this study: adults with a diagnosis of ASD who participated in *Second Life* (SL), adults without a diagnosis of ASD who were SL participants, adults with ASD who did not participate in SL, and adults without ASD who did not participate in SL. No limitations were placed in recruitment on participants' country of origin or diagnosis of conditions other than ASD. Participants were solicited to participate in the study via a secure online survey platform.

Measures

Significant Other Scale

A modified version of the short form of the Significant Others Scale (SOS; Power, 1988) was used to measure quality of relationships within the participants' social network in real life and in Second Life. The short form of the questionnaire (Power, 1988) has five questions: one that measures practical/financial support, three that measure emotional support, and one question that examines social fun. In the present study, the SOS was modified to include two forms of each question, one for real life (RL) and one for SL. This resulted in a total of ten questions. Reliability coefficients reported by Power (1988b) on the original questionnaire (0.73-0.83) and in the present study, the questionnaire with the added SL questions (.92- .98), were comparable.

Scale of Positive and Negative Experiences (SPANE)

The Scale of Positive and Negative Experiences (SPANE) and Flourishing Scale (FS) (Diener, 2010) were implemented to measure overall life satisfaction of participants. The SPANE is a scale with 12 items. Six items measure positive emotional experiences and six measure negative emotions. Of the 12 items, six are general emotions, expected to be equally weighted in all cultures (e.g., positive, bad) whereas the other six are more culturally specific (e.g. joy, fear). Individuals report how often they have experienced each emotion in the past four weeks. The SPANE has three scales. The SPANE-P is a sum score of positively reported emotions. The SPANE N is a sum score of negative emotions, and the SPANE-B (balanced) is the SPANE-N score subtracted from the SPANE-P score. The SPANE has and has a reported Chronbach's alpha of 0.81 for negative feelings and 0.87 for positive feelings (Silva & Caeteno, 2013). Our Chronbach alphas were comparable with 0.87 for negative feelings and 0.91 for positive feelings. Scores were computed by averaging items within the subscales.

Flourishing Scale (FS)

The FS has eight items that describe important aspects of human functioning ranging from positive relationships, to feelings of competence, to having meaning and purpose in life. Participants rank the items on a one to seven scale ranging from strongly disagree (1) to strongly agree (7). The FS has one dimension and according to Diener (2010) scores reflect participants' ratings across five important domains of life functioning. Diener reports a Chronbach's alpha of 0.87 (Diener, 2010) and Silva & Caetena (2013) validated the measure in

Portugal with a Chronbach's alpha of 0.83. The present study modified the FS to have questions for RL and questions for SL. Chronbach's alphas were .90 for RL and .99 for SL.

Procedure

The study was conducted within the Research Electronic Data Capture (REDCap) secure electronic data capture housed at the University of Alberta. Participants were recruited via a short paragraph and hyperlink to the website that was posted to several locations. The *Second Life* (SL) participants were recruited through notices sent through a group known as Family Role Play Network (groups in SL are similar to an email Listserv), and through clickable signs in 3D displays and rentable ad billboards. One such display took place in a Halloween festival in a family neighbourhood in Second Life known as Somersley Estates The display included a decorated sign describing the project surrounded by Halloween decorations at a mock booth where avatars could sit at a virtual table while filling out the survey (see Figure 1, Appendix A). Participants that did not use SL were recruited via a hyperlink to the survey on the author's personal autism advocacy blog (http://touchedbyanalien.blogspot.ca/) and the author promoted additional traffic to her blog by joining in autism discussion groups on Facebook. The link for the author's blog was also sent to graduate and undergraduate Listservs within the Faculty of Education at the University of Alberta.

Data Analytic Plan

      The author conducted a preliminary analysis using graphical inspection to determine if appropriate assumptions were met for one-way ANOVAs and t-tests. Following this, a paired-sample t-test was conducted to determine if individuals with ASD who used *Second Life* (SL) reported higher social and emotional support and well-being in SL than in real life (RL). To test whether individuals with ASD who use SL score higher on RL measures of social and emotional support and well-being than those who do not use SL a one-way ANOVA was used. Determining if a difference existed among those without ASD who used SL versus those who did not was also tested with a one-way ANOVA. Following testing the research questions, results suggested additional analyses would be useful. One way ANOVAs were then used to determine whether differences existed between individuals with ASD and those without ASD on these measures in RL and in SL.

Results

Preliminary Analysis

Questionnaire responses were assessed for data accuracy and missing data prior to conducting descriptive and statistical analysis. A total of 82 respondents accessed the questionnaire. Of these 82 individuals, 58 had complete or partially complete responses. Out of those 58 participants, 5 had not completed at least one of the questionnaires. As this missing data accounted for more than 5% of the total data per participant and values had a discernable pattern to the missing data (i.e., were not missing randomly), these participants were excluded from descriptive and statistical analysis (Tabachinck & Fiddell, 2007). A total of 53 participants were included in the final analysis.

Graphical inspection of the FS, SPANE scales (P, N, and B), and SOS (emotional support, financial support, and social fun subscales) were conducted to ensure no violation of the assumptions of normality, homogeneity of variance, and independence. The distribution for SPANE – P was negatively skewed (-0.203) and negatively kurtotic (-0.723), The SPANE N distribution was skewed positively (0.183), and slightly negatively kurtotic (-0.64). The distribution for the SPANE-B was slightly negatively skewed (-0.012) and slightly negatively kurtotic (-0.031). These p-values assessing normalcy of distribution were (p= 0.91, 0.20, 0.20) for SPANE-P, SPANE-N, and SPANE-B respectively and did not reach significance indicating that distributions were adequate.

The distribution for the FS-RL was negatively skewed (-.414) and negatively kurtotic (-.964) but not significantly (p = .06, n.s.), indicating that the assumption of normality was not violated for this variable. Similarly, the distribution for FS - SL was negatively skewed (-.87) and positively kurtotic (.98) but not significantly (p = .13, n.s.).

The RL distribution for practical and financial support on the SOS was negatively skewed (-0.634) and negatively kurtotic (-0.447). The measure of social fun for RL on the SOS was negatively skewed (-0.456) and negatively kurtotic (-0.759) suggesting that participants reported a high degree of RL social fun. Social and emotional support for RL on the SOS was negatively skewed (-0.801) and positively kurtotic 0.27 suggesting participants overall reported a high degree of emotional support offline. The p-values were (p=0.000, 0.000, and 0.003) for financial and practical support, social fun, and emotional support respectively. All of the SOS subtests violated the assumptions for normality and homogeneity of variance as these values were significant (p<0.001)

The SL distribution for practical and financial support on the SOS was positively skewed (0.219) and negatively kurtotic (-0.136) suggesting that the majority of the participants perceived low financial support in *Second Life*. For social fun, it was negatively skewed (-1.914) and positively kurtotic (5.958) suggesting that participants experienced high social fun in SL. Emotional support was negatively skewed (-2.238) and positively kurtotic (8.025) suggesting that participants experienced high emotional support in Second Life. The p-values were (p=0.015, p=0.000, p=0.001) for financial support, social fun, and emotional

support respectively. These values were all significant indicating that normality was violated in each case (p <0.01).

Overall, the skewness and kurtosis statistics for the measure distributions suggest that some data violates the assumption of normality. Since the sample was comprised of participants completing wellness scales, this was an expected pattern. Most individuals are assumed to be reasonably happy with their lives; therefore, these patterns do not indicate a problem with the scales, but instead, reflects the underlying nature of the measured constructs (Pallant, 2005). As such, transformations were not performed on the data. The violation of the normality assumption is of little concern, however, since nonnormality has little effect on analyses, such as F-tests (Glass, Peckham, & Sanders, 1972), which were conducted following the preliminary analyses. According to the criteria proposed by Pallant (2006) an effect size of .01 is considered small, .04 is considered to be a medium effect, and .06 is considered a large effect. To control for multiple test (Type 1) error, we set the alpha level at .01 for all tests of significance.

Participants

Descriptive and statistical analysis was calculated for a total of 53 participants. Table 1 shows the frequencies for the four groups in the study for age, gender, and country of residence. The majority of the participants were under the age of 35, female, and from the United States (see table 1). Recruitment of Second Life users was more successful than recruitment of non-Second Life users. As expected, more individuals without ASD participated in the study than individuals with ASD.

Perceived Social Support

Table 2 shows perceived level of social support in the categories of emotional support, practical and financial support, and social fun. Power (1988) obtained means of 4.24 for emotional support and 4.54 for practical and financial support among symptom-free individuals. This is comparable to the present study's scores for individuals without a diagnosis of ASD who do not use *Second Life* (SL). As seen in Table 2, SL users had lower than average scores for real life (RL) emotional support, practical support, and social fun. Social support in RL was lower among people with ASD than those without an ASD diagnosis and lowest for SL users with ASD. Among individuals with ASD, emotional support was comparable to Power's means for his RL population and social fun in SL was rated as highly as social fun in RL among individuals without ASD. For individuals without ASD, mean scores on these measures (SL emotional support) for SL users remained lower than Power's RL means for these measures on symptom-free individuals. Practical and financial support was lower in SL than RL for the two groups of SL users.

Table 3 (see appendix A) compares the four groups in this study on Diener's (2010) scales of Positive and Negative Experiences (SPANE) and Flourishing Scale (FS). On the SPANE, Deiner obtained mean scores of 22.05, 15.35, and 6.69 for the Positive, Negative, and Balanced scales respectively. Diener reported percentiles for the SPANE for the general population. The ASD/SL group scores in the 31st percentile on the SPANE-P, the ASD/no SL and the no ASD/SL group score in the 41st percentile, and the no ASD/no SL group

score in the 62nd percentile when comparing the means. On the SPANE-N, the ASD/SL, ASD/no SL, and no ASD/SL groups scored in the 73rd percentile. The no-ASD/no-SL group scored in the 33rd percentile. On the SPANE B the ASD/SL group and ASD/no-SL group scored in the 33rd percentile. The non-ASD/SL group scored in the 40th percentile and the no ASD/No SL group scored in the 65th percentile. However, the ranges for the scores were similar for all groups and the standard deviations were large.

On the Flourishing scale (FS), Diener obtained a mean sum score of 44.97 for symptom free participants. Flourishing scores for real life (RL) for individuals with ASD and *Second Life* (SL) users were below this score, with the lowest score being for individuals with ASD who used SL. Flourishing scores for SL were comparable to the sum scores Diener obtained for his RL population. Examining the percentiles reported by Diener for the general population on this scale reveals more trends. On RL flourishing the ASD/SL group scored between the 3rd and 5th percentile as reported by Diener. The ASD/no-SL group and no AS/SL group both scored in the 21st percentile. The no ASD/no SL group scored in the 77th percentile. On the measures of SL flourishing, SL users with ASD scored in the 70th percentile which as suggest by the above means, is similar to the no ASD/no SL group's score on RL flourishing. The no-ASD/SL group scored in the 44th percentile for flourishing in SL.

Second Life **and Associations with Perceived Social Support and Well-being**

Research Question # 1: Do individuals with ASD who participate in SL report higher social support and well-being in their SL than in their real life (RL)?

A comparison of social and emotional support in RL (M=2.76, SD=.63) versus SL (M=4.48, SD=0.26) for the ASD SL group reached significance ($t(6)$=-6.43, p=<.005, η^2 =.58) with participants reporting higher social and emotional support in SL than RL. Significant differences were found between financial and practical support in RL (M=3.86, SD=.90) versus SL (M=2.14, SD=1.07) for adults with ASD who were SL users with higher support being reported in RL ($t(6)$=3.03, p.<.005, η^2 =.60). Differences between social fun in RL (M=1.86, SD=.90) versus SL (M=4.29, SD=.49) for adults with ASD who used SL were significant ($t(6)$=-6.58, p=<.005, η^2 =.88) with higher social fun being reported in SL. Difference in means between Flourishing in RL (M=33.43, SD=8.08) and SL (M=47.71, SD=5.82) reached significance ($t(6)$=-4.83, p=<.005, η^2 =.80) with higher flourishing scores reported in SL than R for those who use SL.

Research Question # 2: Do Individuals with ASD who participate in SL report higher social support and well-being in their real life (RL) than adults with ASD who do not participate in SL?

No significant differences ($F(1,11)$=4.26, p=0.06, η^2partial =0.28) were found for social and emotional support among individuals with ASD who were SL users (M=2.76, SD=0.63) and those with ASD who did not use SL (M=3.67, SD=0.94). There were no significant differences ($F(1,11)$=2.77, p=0.12,

η^2partial =0.20) found for RL practical and financial support among individuals with ASD who used SL (M=3.86, SD=0.90) and individuals with ASD who did not use SL (M=2.67 SD=1.63). Near-significance was found for social fun, but in the opposite direction than expected ($F(1,11)$=7.96, p=0.02, η^2partial =0.42), indicating the individuals with ASD who do not use SL reported a trend of higher social fun (M=3.17, SD=0.90) that those who used SL (M=1.86, SD=0.90)

On the SPANE-P, no significant differences ($F(1,11)$=.106, p=.75, η^2partial =.01) were found between people with ASD who used SL (M=20.29, SD=3.45) and people with ASD who did not use SL (M=21.00, SD=4.47). Scores on the SPANE-N were also found to have no significant differences ($F(1,11)$=.03, p=.86, η^2partial =.00) between adults with ASD who used SL (M=16.71, SD=3.09) and adults with ASD who did not use SL (M=17.17, SD=5.78). SPANE B scores between adults with ASD who used SL (M=3.57, SD=5.56) and individuals with ASD who did not use SL (M=3.83, SD=9.91) showed ($F(1,11)$=.00 p=.953, η^2partial =.00). There were no significant differences ($F(1,11)$=1.80, p=.25, η^2partial =.14) between measures of Flourishing in RL for adults with ASD (M=33.43, SD=10.03) who used SL versus those who did not use SL(M=40.17, SD=10.03).

Research Question # 3: Do Individuals without ASD who participate in SL report similar scores on social support and well-being in real life (RL) to individuals without ASD who do not participate in SL?

SOS scores for social and emotional support among individuals without ASD who used SL (M=0.33, SD=1.45) were significantly lower

$(F(1,38)=9.41, p<.005, \eta^2$partial $=.198)$ than scores for individuals without ASD who did not use SL (M=4.70, SD=0.35). The SOS scores for financial and practical support showed no significant differences $(F(1,38)=3.03, p=.09,$ η^2partial $=.07)$ between adults without ASD who used SL (M=3.34, SD=1.50) and those who did not use SL (M=4.18, SD=0.87). The SOS measure of social fun did not reach significance$(F(1,38)=3.92, p=.06, \eta^2$partial $=.094)$ for people without ASD who used SL (M=3.28, SD=1.46) versus individuals without ASD who did not use SL (M=4.18, SD=0.60).

On the SPANE-P SL users (M=21.59, SD=4.27) and non-SL users (M=22.64, SD=5.10) showed no significant differences $(F(1,38)=.367, p=.55,$ η^2partial $=.01)$.There were no significant differences between individuals with ASD who used SL (M=16.45, SD=4.66) versus those who did not (M=13.82, SD=4.19) on the SPANE N $(F(1,38)=2.68, p=.11, \eta^2$partial $=.07)$. Comparison of SPANE-B scores among those without ASD who used SL (M=5.14, SD=8.04) versus those who did not (M=8.81, SD=7.76) failed to show significance $(F(1,38)=1.70, p=.20, \eta^2$partial $=.04)$. Near Significant differences in RL flourishing $(F(1,38)=7.18, p=.0.159, \eta^2$partial $=.04)$ were apparent among individuals without ASD who used SL (M=39.79, SD=10.67) versus those who did not (M=48.91, SD=5.65) .

Additional Analysis:

Differences in social well-being and support in SL versus non-SL users in the entire sample

On the SOS measure of emotional support SL (M=3.22, SD=1.34) users reported significantly lower RL support ($F(1,51)=10.01$, $p<0.005$, η²partial =.16) and those who did not use SL (M=4.33, SD=0.78). There were no significant differences ($F(1,51)=.245$, $p=.623$, η²partial =.01) for the SOS measures of financial and practical support for SL (M=3.44, SD=1.40) users versus non-users (M=3.65, SD=1.37). For the SOS measure of social fun SL users (M=3.00, SD=1.47) did not report significantly lower RL social fun ($F(1,51)=4.62$, $p=0.04$, η²partial =.08) than non-SL users (M=3.82, SD=0.81).

Scores on the SPANE-P did not differ significantly ($F(1,51)=.282$, $p=.60$, η²partial =.00) for those who used SL (M=21.22, SD=4.81) versus those who did not use SL (M=22.06, SD=4.28). On the SPANE-N there were no significant differences ($F(1,51)=1.26$, $p=.27$, η²partial =.02) between SL users (M=16.50 SD=4.36) and non-users (M=15.00, SD=4.91). Analysis of the SPANE-B means for SL users (M=4.84, SD=7.58) versus non-SL users (M=7.06, SD=8.62) found no significant difference between means ($F(1,51)=.91$, $p=.34$, η²partial =.02).Individuals who used SL (M=38.56, SD=8.36) scored close to significantly lower on flourishing ($F(1,51)=6.31$, $p=.02$, η²partial =.11) than those who did not use SL (M=45.82, SD=10.43).

Differences in perceived well-being and social support in SL among those with and without ASD.

On the SOS measure of SL only emotional support there were no significant differences ($F(1,34)=2.25$, $p=.14$, η^2partial $=.06$) between people with ASD (M=4.48, SD=0.26) versus people without ASD (M=3.89, SD=1.02) . Scores for financial and practical support on the SOS for SL showed no significant differences ($F(1,34)=.48$, $p=.49$, η^2partial $=.01$)   between individuals with ASD (M=2.14, SD=1.07) versus those without ASD (M=2.52, SD=1.33). For SL social fun individuals with ASD (M=4.29, SD=0.49) demonstrated no significant differences ($F(1,34)=.68$, $p=.41$, η^2partial $=.02$) when compared with individuals without ASD (M=3.93, SD=1.10). No significant differences were found on the SL flourishing scale ($F(1,34)=.69$, $p=.41$, η^2partial $=.02$) between participants with ASD (M=47.71, SD=5.82) and participants without ASD (M=45.17, SD=7.56).

Discussion

The results of the current study supported hypothesis one that individuals with ASD who used *Second Life* (SL) would report higher levels of social and emotional support and well-being in SL than in real life (RL). However, the findings did not support the second hypothesis that individuals with ASD who

used SL would score higher those with ASD who did not use SL on social and emotional support and well-being in RL. Findings suggested the opposite of hypothesis two in that those with ASD who were SL users scored lower on these measures in RL. Hypothesis three was also unsupported. Individuals without ASD who used SL scored lower on measures of social and emotional support, and social well-being compared to those without ASD who did not use SL despite the prediction that individuals without ASD would perform equally well whether involved in SL or RL activities. An analysis of the whole sample showed that SL users scored lower on measures of social and emotional support, social fun, and flourishing. No significant differences were found for these measures in SL for individuals with ASD versus those without ASD.

These findings suggest that individuals who are attracted to SL may experience low social and emotional support in RL and may have few opportunities to flourish offline. From the author's experience as a participant in SL, casual conversations with other users suggest that many SL users have major challenges that prevent full participation in RL. Many individuals disclose a disability or chronic illness. These conditions range from psychological disabilities such as bipolar disorder to medical problems such as cancer. Other individuals disclose situations such as caring for a sick family member or being a stay at home parent in an unhappy marriage. Sometimes the nature of a condition or situation can leave individuals mostly housebound (e.g. agoraphobia, low immunity, no respite care for sick family member). Some of these individuals state that they lived in areas with few resources to cope with their challenges such

as an adult who is able to receive a disability pension but who is not allowed to work part time or gain career skills. It is possible that the individuals with ASD who are attracted to SL were more severely affected and have fewer resources than the individuals with ASD who did not use SL.

In the author's experience as a participant in SL she has met users who appear to have problematic gaming behavior. In some cases, SL appears to take precedence over important RL tasks. For instance some role play businesses in Second Life expect commitments of hours that would be impossible to maintain with a RL job and have salaries of virtual currency that have little value outside of SL. Some parents will ignore crying RL children in the background as they hold an SL meeting or spend hours a day with their virtual partner while ignoring and complaining about their RL partner. Also, some users adapt a schedule that is incompatible with participation in RL such as staying up all night on SL and sleeping all day or even staying up for days in a row to use SL.

Comparisons of reported well-being and social support suggest that among adults with ASD who use SL, within SL social and emotional support and social fun are similar to RL means for individuals without ASD. This suggests that despite the fact that there is no RL transfer of benefits from SL for adults with ASD who participate in SL, they may benefit emotionally from a social life online despite being unable to actively participate in RL. Interaction in SL may remove barriers such as being judged by others for awkward body language and sensory overload (Danilovic, 2010). There are also many areas in SL that cater to special interests where niche groups may be hard to find offline. For instance, the author

has a diagnosis of ASD and a special interest in caring for virtual infants. This would be seen as childlike in most circles but there are groups of people in Second Life who share that interest. However, the question remains whether offline social interactions are more superficial than RL interactions. Gilbert et al. (2013) suggests that in some cases adults with disabilities may be looking for less complex interactions where they are involved but more on the periphery than in most RL social situations.

Participation or non-participation in SL and ASD diagnostic status does not appear to be related to overall emotional state. No significant differences were found in any of the comparisons of means of SPANE scores between groups. When examining percentiles of group means, SL users and those with ASD appeared to score in a lower percentile than non-SL users without ASD on the SPANE-P and B and a higher percentile on the SPANE-N. However, the ranges of all four groups were similar and the standard deviations were large (see table 3), resulting in the difference between the groups being non-significant. According to Diener (2010) the SPANE is superior to other measures of emotional experiences because it takes into consideration the full range of emotions and is based on intensity of emotions and frequency over a recent time period rather than how many of the individual emotions were experienced. In the case of this study there were no significant differences and a similar range of emotions on the SPANE-P, SPANE-N, and SPANE-B, suggesting no significant differences in overall emotional experiences between the four groups any more so than differences in the general population.

One important favourable finding is that all of the participants who used SL reported higher practical and financial support in RL than SL and among individuals with ASD there were no differences between RL financial and practical support among those who used SL versus those who did not. This suggests that financial and practical support needs are met mostly in RL for all participants. Relying on online friends for financial and practical support could be problematic.

The findings from this survey suggest that social benefits of SL for adults with ASD show poor transferability to RL situations. The authors of this study did not specifically examine acquisition of social skills. No measures of social abilities or social learning were used in the survey Family role play neighbourhoods are also open-ended and participants have a great deal of choose on how to participate, including choosing not to interact with others and to remain in their virtual homes working on a solitary project such as making scripted objects or playing with virtual pets. Further research could examine if a combination of interaction in a medium such as SL with didactic instruction such as that used by Laugeson, Frankel. Mogil & Dillon, (2009) or therapists who act as mediators who help users with ASD apply skills learned in SL to RL situations might allow for experience gained in SL to transfer to RL. Mediators could also ensure that adults with ASD were not spending excessive time on SL and the expense of involvement in RL.

In conclusion, SL may provide a social medium for individuals with few outside resources. However, the present findings suggest that the potential

benefits of SL related to social connectedness and well-being do not appear to transfer to offline situations. This may be because SL usage does nothing to remove RL barriers and most of the people attracted to SL may have significant challenges offline that are unaddressed. In some cases, excessive SL usage may have a negative impact on RL. Further research is required to determine if the apparent benefits for adults with ASD within Second Life can be made transferrable to RL situations.

Table 1.

Frequency Table for Gender, Age, and Country of Residence

Group	Gender	Age	Country of Residence

1. Diagnosed with ASD and use SL (n=7)	Male (n=1) Female (n=6)	18-25 (n=3) 25-35 (n=4)	Canada (n=3) USA (n=4)
2. Diagnosed with ASD and do not use SL (n=6)	Male (n=3) Female (n=3)	18-25 (n=1) 25-35 (n=2) 35-45 (n=1) 45-55 (n=1) Over 55 (n=1)	Canada (n=1) USA (n=4) Other (n=1)*
3. Without ASD and use SL (n=29)	Male (n=10) Female (n=19)	18-25 (n=7) 25-35 (n=11) 35-45 (n=8) 45-55 (n=2) Over 55 (n=1)	USA (n=22) Other (n=7)*
4. Without ASD and do not use SL (n=11)	Female (n=11)	18-25 (n=2) 25-35 (n=6) 35-45 (n=2) 45-55 (n=1)	Canada (n=9) USA (n=1) Other (n=1)*

*Table 1 displays the frequencies for participants in each of the four main groups for age, gender, and country of residence. Note *Out of those who reported other for country six lived in the United Kingdom, one lived Germany, one lived Sweden, and one lived in Australia*

Table 2.

Means and Standard Deviations for the Significant Others Scale (SOS)

Construct	ASD – SL N = 7	ASD – no SL N = 6	No ASD – SL N = 29	No ASD – no SL N = 11

Emotional Support - RL	2.76 (.63)	3.67 (.94)	2.78 (1.45)	4.70 (.35)
Emotional Support - SL	4.48 (.26)	N/A	3.91 (1.02)	N/A
Financial and Practical Support - RL	3.86 (.90)	2.67 (1.63)	3.34 (1.50)	4.18 (.87)
Financial and Practical Support - SL	2.14 (1.07)	N/A	2.52 (1.33)	N/A
Social Fun - RL	1.86 (.90)	3.17 (.75)	3.28 (1.46)	3.93 (1.10)
Social Fun – SL	4.29 (.49)	N/A	3.91 (1.07)	N/A

Table 2 displays the means and standard deviations on measures of the SOS across all four groups in the study.

Table 3.

Means and Standard Deviations for the Scale of Positive and Negative

Experiences and Flourishing Scale

Construct	ASD-SL N=7	ASD-no SL N=6	No ASD-SL N=29	No ASD-no SL N=11
SPANE P	20.29 (3.45)	21.00 (4.47)	21.41 (4.89)	22.64(4.27)
SPANE N	16.71(3.09)	17.17(5.78)	16.84 (4.67)	12.82(4.19)
SPANE B	3.57(5.56)	3.83 (9.91)	5.14 (8.04)	8.82 (7.76)
Flourish RL	33.43 (8.08)	40.17 (10.03)	39.79 (10.67)	48.91 (5.64)
Flourish SL	47.71 (5.83)	N/A	45.17 (7.56)	N/A

Table 3 displays the means and standard deviations for measures of the SPANE (P, N, AND B) and flourishing scale across all four groups. The SPANE N is calculated by subtracting participants' SPANE-N scores from SPANE-P scores.

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Appendix

Figure 1. A Halloween display advertising the survey in the family role play
neighborhood of Somersley Estates in Second Life. Clicking on the sign for the
survey would give participants a caption briefly describing the survey and the
URL to the secure online survey.