



HHS Public Access

Author manuscript

Autism Res. Author manuscript; available in PMC 2018 May 01.

Published in final edited form as:

Autism Res. 2017 May ; 10(5): 973–982. doi:10.1002/aur.1753.

Participation in Recreational Activities Buffers the Impact of Perceived Stress on Quality of Life in Adults with Autism Spectrum Disorder

Lauren Bishop-Fitzpatrick, Leann E. Smith, Jan S. Greenberg, and Marsha R. Mailick
University of Wisconsin-Madison, Waisman Center, 1500 Highland Ave., Madison, WI 53711

Scientific Abstract

As the number of adults with autism spectrum disorder (ASD) grows, the need to identify modifiable correlates of positive outcomes and quality of life (QoL) gains in importance. Research indicates that perceived stress is significantly correlated with QoL in adults with ASD. Studies in the general population of individuals without disabilities indicate that greater participation in social and recreational activities may lessen the negative impact of perceived stress on well-being, and this association may also hold among adults with ASD. We hypothesized that: (1) perceived stress would be negatively associated with QoL; and (2) higher frequency of participation in social activities and recreational activities would moderate the relationship between perceived stress and QoL. We used data collected from 60 adults with ASD aged 24–55 and their mothers to address our hypotheses. Findings indicate that adults with ASD with higher perceived stress are likely to have poorer QoL. Furthermore, greater participation in recreational activities buffers the impact of perceived stress on QoL, but no buffering effect was observed for participation in social activities. These findings suggest that interventions and services that provide supports and opportunities for participation in recreational activities may help adults with ASD manage their stress and lead to better QoL.

Keywords

recreational and social activities; perceived stress; quality of life; adults with ASD

Introduction

There is a growing awareness of the need to identify factors that may lead to good outcomes and functioning for adults with autism spectrum disorder (ASD) as the first large wave of individuals diagnosed with ASD as children is rapidly aging into adulthood (Gerhardt & Lainer, 2011). Outcomes for this population are relatively poor in that a large majority of adults with ASD do not achieve the conventional markers of adulthood such as becoming self-supporting, living independently, and developing friendships (for reviews, see: Magiati, Tay, & Howlin, 2014; Seltzer, Shattuck, Abbeduto, & Greenberg, 2004). However, despite

Address of Correspondence: Lauren Bishop-Fitzpatrick, Phone: (608) 263-6315, Fax: (608) 265-4862, bishopfitzpa@waisman.wisc.edu.

Drs. Bishop-Fitzpatrick, Smith, Greenberg, and Mailick have no conflict of interest to declare.

the numerous challenges inherent to ASD, recent research finds that many adults with ASD enjoy aspects of a good quality of life (QoL) when measures of subjective QoL (i.e., reporting satisfaction with life) and objective QoL (i.e., good physical and mental health, adequate living conditions, and supportive and fulfilling social relationships) are taken into account (Bishop-Fitzpatrick et al., 2016; Helles, Gillberg, Gillberg, & Billstedt, in press; Hong, Bishop-Fitzpatrick, Smith, Greenberg, & Mailick, 2016). Identifying correlates of good outcomes and QoL, with a specific emphasis on factors that might be modifiable through targeted treatments, is of paramount importance as more individuals with ASD enter adulthood.

An emerging literature suggests a strong association between perceived stress and social functioning and QoL in three different samples of adults with ASD. Hirvikoski and Blomqvist (2015) found that perceived stress was positively associated with impairments in social functioning among adults with ASD. Similarly, Bishop-Fitzpatrick, Minshew, Mazefsky, and Eack (in press) found that greater perceived stress was associated with greater social disability. Finally, Hong et al. (2016) found that perceived stress was negatively associated with subjective QoL. However, we know little about factors that moderate this association in adults with ASD.

For adults with and without disabilities, a full life involves integration into social and recreational activities in their communities. This includes personally meaningful and reciprocal relationships with friends, co-workers, family members, and neighbors, as well as opportunities to engage in recreational activities either alone or with others. A well-established literature indicates that participation in social and recreational activities may ameliorate, or buffer, the potential deleterious effects of high levels of perceived stress on lower levels of overall well-being (e.g., Cassel, 1976; Cobb, 1976; Cohen & McKay, 1984). This “stress buffering hypothesis” suggests that engagement in social relationships (Cohen & McKay, 1984) and recreational activities (Iwasaki & Mannell, 2000) uniquely moderate the effect of perceived stress on indicators of health and well-being. For example, frequent participation in recreational activities may serve as an important coping mechanism for adults in the general population (Chun, Lee, Kim, & Heo, 2012; Iwasaki & Mannell, 2000). Similarly, engagement in social activities, especially for individuals who feel supported and cared for by their social network, serves as a key buffer that can reduce the negative effects of stress (Cohen & McKay, 1984). Importantly, social activities and recreational activities may serve as separate coping mechanisms and are conceptually distinguished; recreational activities provide opportunities for leisure and the development of self-determination and autonomy (Iwasaki & Mannell, 2000) while social activities provide opportunities for socialization and the development of social support (Cohen & McKay, 1984). In line with a developmental psychopathology framework that posits that key constructs function differently in individuals with typical and atypical development (Cicchetti, 1984), there may be differential benefits in adults with ASD.

Research suggests that participation in social and recreational activities can be beneficial for individuals with intellectual and developmental disabilities (IDD), as in the general population. A recent systematic review found that in individuals with IDD, higher levels of participation in social and recreational activities (measured as a combined construct) can

promote social inclusion, improve independence, enhance physical and mental health, and can increase QoL (Andrews, Falkmer, & Girdler, 2015). Although we know a great deal about the benefits of participation in social and recreational activities for individuals in the general population and in individuals with IDD, we know comparatively little about these effects for individuals with ASD, many of whom report high levels of perceived stress. This is particularly important because individuals with ASD have infrequent participation in social activities (e.g., Orsmond, Krauss, & Seltzer, 2004; Orsmond, Shattuck, Cooper, Sterzing, & Anderson, 2013; Shattuck, Orsmond, Wagner, & Cooper, 2011) and may thus be at greater risk of experiencing the negative effects of perceived stress on QoL.

Research finds higher levels of participation in recreational activities than social activities among adults with ASD. For instance, Orsmond and colleagues (2004) identified relatively high levels of weekly participation in recreational activities, including walking or getting exercise (74.5%), working on hobbies (41.3%), and participating in group recreational activities (35.3%). Recent research from Weiss and Burnham Riosa (2015) indicates that, on average, Special Olympics athletes ages 11 to 22 with ASD and co-occurring intellectual disabilities participate in recreational activities about three times per week. Other research finds that most adults with ASD participated in recreational activities during the past three months (Gray et al., 2014).

Low levels of participation in social activities (Orsmond et al., 2004; Orsmond et al., 2013; Shattuck et al., 2011) compared to recreational activities among adults with ASD (Orsmond et al., 2004; Weiss & Burnham Riosa, 2015), combined with evidence that participation in social activities may be distressing for adults with ASD (Bishop-Fitzpatrick et al., in press), suggests a need to distinguish between social activities and recreational activities. In addition, adults with ASD may derive differential benefits from social activities and recreational activities given that nearly a third of adults with ASD have no regular social outlets (Barnard, Harvey, Potter, & Prior, 2001). For adults with ASD with friends, social activities may be an important source of leisure and support. For adults with ASD without friendships, participation in recreational activities may serve as an important leisure outlet.

While a relatively large body of research finds that greater integration in recreational activities has a positive impact on well-being for adults with IDD (Andrews et al., 2015; Tint, Thomson, & Weiss, in press), there are few studies that focus on such impacts in ASD. A recent study of organized activity participation in adolescents with ASD found that greater participation in organized activities was associated with less depression and loneliness (Bohnert, Lieb, & Arola, 2016). In adults with ASD, participation in leisure programs that promote engagement in recreational activities may reduce stress and improve QoL (García-Villamizar & Dattilo, 2010). Similarly, adults with ASD who participated in a structured recreational activity intervention experienced better QoL post-treatment (Hesselmark, Plenty, & Bejerot, 2014).

The present study aimed to examine the role of participation in social activities and recreational activities on the relationship between perceived stress and QoL in adults with ASD by addressing two key questions. First, is perceived stress associated with QoL? Second, does participation in social activities and recreational activities moderate the

relationship between perceived stress and QoL? We hypothesized that perceived stress would be negatively associated with QoL. We also hypothesized that participation in social activities and recreational activities would each uniquely buffer the negative impact of perceived stress on QoL. We first tested these hypotheses using data directly provided by the adults with ASD, and subsequently with data independently provided by their mothers. We controlled for age, intellectual disability status, and gender because these background characteristics are established correlates of adult outcomes and functioning (Magiati et al., 2014). Our conceptual model is displayed in Figure 1.

Methods

Data and Sample

Participants were from a large, longitudinal sample of 406 adolescents and adults with ASD and their families (Seltzer et al., 2011). Three inclusion criteria determined eligibility for the larger study. First, the family had a son or daughter 10 years of age or older. Second, the child had received an ASD diagnosis from a medical, psychological, or educational professional, as reported by parents. Finally, administration of the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & Lecouteur, 1994) confirmed parental report of ASD.

Ten waves of data were collected over 15 years, and data on perceived stress and QoL used for the present study were collected during the final wave of data collection (2013–2014). We interviewed 67 adults with ASD. We asked individuals to participate in an interview if they were cognitively able to comprehend and respond to a set of interview questions about their daily life experiences and QoL, which was determined based on discussion with parents and data collected in 2004–2005 about whether the adult with ASD was cognitively able to participate in an interview and assessment.

As noted in our previous work on QoL (Hong et al., 2016), seven adults with ASD were excluded from analyses because they had response patterns that indicated a potential lack of understanding of interview questions (e.g., response inconsistencies such as giving the same response for all questions), and this information was corroborated by interview observation notes and historical data on their communication abilities.

We collected data from both adults with ASD and their mothers through separate in-person interviews. Adults with ASD were between the ages of 24 and 55 ($M = 31.5$, $SD = 6.7$). The majority were male (75.0%), and about a quarter had been diagnosed with a co-occurring intellectual disability (27.6%). Compared to adults with ASD who did not participate in the interview but whose families continued to participate in the study at the final wave of data collection, adults with ASD who were interviewed had less severe autism symptoms on both the ADI-R ($t = 3.75$, $p < .001$; Lord et al., 1994) and the SRS ($t = 4.70$, $p < .001$; Constantino & Gruber, 2007). In addition, the percentage of adults with ASD who had a co-occurring intellectual disability was lower ($t = 4.89$, $p < .001$) among those adults who participated in the interview. Descriptive statistics for background variables are displayed in Table 1.

Measures

Dependent Variable: QoL—Adults with ASD reported on their own subjective QoL using the brief version of the World Health Organization Quality of Life assessment (WHOQOL-BREF; Skevington, Lotfy, & O’Connell, 2004), which is psychometrically similar to and correlates highly with domain scores on the longer version of the instrument (Skevington et al., 2004; WHOQOL Group, 1998). The 26 items of the WHOQOL-BREF are measured on a 5-point scale, with higher scores indicating better QoL. We used a scale score of 0 to 100 for analyses. Adaptations made to the WHOQOL-BREF to increase the accessibility of the instrument are detailed in our previous work on QoL (Hong et al., 2016). Our previous findings on QoL (Hong et al., 2016) confirm the reliability and validity of adult-reported QoL using the WHOQOL-BREF. Internal consistency (Cronbach’s α) of the WHOQOL-BREF was strong ($\alpha = .90$).

Independent Variable: Perceived Stress—Adults with ASD reported on their own perceived stress using items from the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). Four of the 10 original items, considered most relevant to adults with ASD were administered in this study: (1) “In the last month, how often have you been upset because of something that happened unexpectedly?”; (2) “In the last month, how often have you felt nervous and ‘stressed’?”; (3) “In the last month, how often have you found that you could not cope with all the things that you had to do?”; and (4) “In the last month, how often have you been angered because of things that were outside of your control?”. Each item was rated by the adult on a 5-point scale from 0=never to 4=very often, and the mean score of the four items was used in the study. The PSS has good internal consistency in other samples of high-functioning adults with ASD ($\alpha = .87$; Bishop-Fitzpatrick et al., in press), and internal consistency of the 4-item version in the current sample was .76.

Moderator Variables: Social Activities and Recreational Activities—Following the distinction by Orsmond and colleagues (2004), we conceptualize *social activities* as casual activities that involve socialization (e.g., hanging out with friends) and *recreational activities* as both organized group activities (e.g., softball league) and solo leisure activities (e.g., reading). We conceptualized recreational activities in this way because we wanted to include a full spectrum of activities that may provide enjoyment and leisure outlets for adults with ASD, regardless of whether they offer specific socialization opportunities. Moreover, participation in either social or non-social leisure activities likely offers coping benefits that go beyond those opportunities provided by socialization alone (Iwasaki & Mannell, 2000).

We report on both self- and mother-reports of frequency of participation in social activities and recreational activities once per week or more often. Of note, our scales of self-reported and mother-reported social activities and recreational activities differed in three ways. First, the number of possible social activities and recreational activities differed. The measure used with adults with ASD consisted of two social activities and six recreational activities while the measure used with mothers consisted of four of each. Second, the period for reporting was different for adults with ASD and their mothers in that adults with ASD reported activities during the past week and mothers reported activities during the past year. Third, the specific activities differed between our two scales. Given these differences, we used a

count variable of number of activities adults participated in once per week or more often. Using a similar metric for self- and mother-report social activities and recreational activities allowed for interpretations that are more meaningful.

Self-reported social activities and recreational activities: Adults with ASD self-reported the frequency of their participation in two social activities and six recreational activities during the past week on a 4-point scale from 0 (not at all) to 4 (five or more times per week). Questions were adapted from the National Longitudinal Study of Adolescent to Adult Health (Harris & Udry, 1994). Social activities (possible range: 0–2) included: (1) “Hang out with friends”; and (2) “Hang out with a girlfriend or boyfriend.” Recreational activities (possible range: 0–6) included: (1) “Do hobbies, such as collecting baseball cards, playing a musical instrument, reading, or doing arts and crafts”; (2) “Watch TV or play video games”; (3) “Go roller-blading, roller-skating, skate-boarding, or bicycling”; (4) “Play an active sport, such as baseball, softball, basketball, soccer, swimming, or football”; (5) “Do exercise, such as jogging, walking, karate, jumping rope, gymnastics, dancing”; and (6) “Go to the gym for exercise.” We counted the number of social activities and recreational activities that adults with ASD participated in at least once per week (i.e., “1 or 2 times,” “3 or 4 times,” or “5+ times” per week). Of note, six participants (10.0%) had similar responses to questions 3, 5, and 6, indicating that there may be some overlap between physical activity questions. However, this was not the case for the majority of participants, and we cannot be sure that participants reported the same activity when responding to separate questions. The use of these questions separately in order to measure physical activity is well-validated and consistent with large-scale epidemiological studies (Harris, King, & Gordon-Larsen, 2005). The correlation between our scales of self-reported social activities and recreational activities was weak, $r = .14$, $p = .27$, suggesting the need to consider them separately.

Mother-reported social activities and recreational activities: Mothers reported on their son’s or daughter’s participation in social activities and recreational activities using a modified version of a measure of social and recreational activities developed for the National Survey of Families and Households (Bumpass & Sweet, 1987) and used previously in Orsmond et al. (2004). Mothers reported the frequency of their son’s or daughter’s current participation in four social activities and four recreational activities on a 5-point scale from 0 (never) to 4 (several times per week). Social activities (possible range: 0–4) included: (1) “Spend social time with relatives (not including family members with whom he/she lives)”; (2) “Spend social time with people he/she goes to school or works with, outside of school/working hours”; (3) “Spend social time with friends and neighbors”; or (4) “Attend a social event at a church or synagogue.” Recreational activities (possible range: 0–4) included: (1) “Participate in a formal or informal recreational activity, such as bowling, movies, etc.”; (2) “Work on a hobby such as video games, computer games, or collecting things”; (3) “Play sports”; and (4) “Take a walk or get some type of physical exercise.” The number of social activities and recreational activities that adults with ASD participated in at least once per week (i.e., “once a week” or “several times a week”) was counted, and we used these two count variables in analyses. Unlike self-report, the correlation between our mother-report scales was strong, $r = .47$, $p < .001$.

Demographic Characteristics Included in Model

Age: Age was recorded based on date of birth.

Intellectual disability (ID) status: ID status was determined by consensus procedure using a variety of sources including the Wide Range Intelligence Test (Glutting, Adams, & Sheslow, 2000), the Vineland Screener (Sparrow, Balla, Cicchetti, Harrison, & Doll, 1984), and a review of available educational records. For a full description, see Taylor and Seltzer (2010).

Biological sex: Biological sex was recorded based on parent report.

Analysis

Preliminary analyses ensured that parametric tests were appropriate. Preliminary analyses also included simple Pearson's correlation analyses to test bivariate associations between variables of interest.

We examined the relationship between perceived stress and QoL in adults with ASD using hierarchical multiple regression predicting QoL from perceived stress. Demographic characteristics were entered in the first step, and the independent variable (perceived stress) and moderator variables (self-reported social activities and recreational activities) were entered in the second step. Next, two interaction terms were entered in the final step: (1) perceived stress x social activities; and (2) perceived stress x recreational activities. Follow-up analyses assessed the same model, but with mother-reported social activities and recreational activities. Perceived stress, social activities, and recreational activities were centered for interaction analysis in order to reduce multicollinearity (Marquardt, 1980).

Results

Descriptive Findings

We first examined patterns of participation in each of the self-reported social activities and recreational activities. Overall, adults with ASD reported that they participated in slightly less than one social activity ($M = 0.82$, $S.D. = 0.90$) and about three recreational activities ($M = 2.98$, $S.D. = .89$) per week. Adults with ASD were most likely to watch TV or play video games (95%) or work on hobbies (86.7%) at least once during the last week. About two-thirds of our sample exercised (i.e., jogging, walking, karate, jumping rope, gymnastics, dancing; 68.3%), and more than half hung out with friends (55.9%) at least once per week. Fewer participants went to the gym for exercise (25.0%), hung out with a girlfriend or boyfriend (22.4%), played an active sport (13.3%), or went roller-blading, roller-skating, skate-boarding, or bicycling (10.0%) at least once per week. Full descriptive data on self-reported participation in social and recreational activities is detailed in Table 2.

Mother-reported data independently confirmed these patterns. Based on mother-report, adults with ASD participated in about one social activity ($M = 1.07$, $S.D. = 1.02$) and about two recreational activities ($M = 2.07$, $S.D. = .80$) per week. In terms of social activities, an equal number of adults with ASD (38.4%) spent time with relatives or friends and neighbors

at least once per week, which were the two most common social activities. Relatively few (20.0%) socialized with friends from school or work outside of school or work, and 10.0% of the sample attended social events at a church or synagogue once per week or more often. In terms of recreational activities, the majority (88.3%) worked on a hobby at least once per week, and more than three quarters (80.0%) walked or exercised at least once per week. Additionally, about one third (30.0%) participated in formal or informal recreational activities at least once per week. However, few participated in organized sports weekly (8.3%). Full mother-report data are detailed in Table 3.

A subgroup of adults with ASD reported feeling stressed fairly or very often. More than one-third (36.7%) reported feeling nervous and “stressed” and about one-quarter (26.7%) reported being angered because of things that were outside of their control fairly or very often. In addition, about one-quarter (23.4%) reported being upset because of something that happened unexpectedly, but only 10.0% reported that they could not cope with all the things they had to do fairly or very often. Frequency of responses to questions from the PSS are reported in Table 4.

Preliminary Analyses

Age was skewed (skewness statistic = 1.73) and was log transformed using the Box-Cox method with lambda set at -2.25 (Box & Cox, 1964), which resulted in a skewness statistics of .05. Diagnostic testing indicated that parametric tests were appropriate. Results of correlation analyses are displayed in Table 1.

Prediction of Quality of Life based on Self-Report Data

Results of hierarchical multiple regression analyses (Table 5, Column A) revealed a significant, positive main effect of perceived stress on QoL, $B = -8.07$, $t(53) = -3.77$, $p < .01$, $sr^2 = .18$, when controlling for age, sex, and ID status. In addition, the women in our sample had lower levels of QoL, $B = -10.17$, $t(56) = -2.09$, $p < .05$, with mean QoL scores ($M = 66.43$, $S.D. = 15.42$) that were nearly 10 points lower than those reported by men ($M = 74.89$, $S.D. = 15.78$).

Results revealed that recreational activities buffered the relationship between perceived stress and QoL, $B = 5.88$, $t(51) = 2.49$, $p = .02$, $sr^2 = .07$, such that for individuals with higher levels of participation in recreational activities, the negative effect of perceived stress on QoL was lessened. This moderation effect is displayed graphically in Figure 2. Self-reported social activities did not significantly moderate the association between perceived stress and QoL.

Prediction of QoL based on Mother-Report Data

Our findings related to mother-reported social activities and recreational activities mirrored our adult self-report findings, and results of the mother-report model are displayed in Table 5, Column B. These analyses revealed a significant, positive main effect of perceived stress on QoL, $B = -8.00$, $t(53) = -3.62$, $p < .01$, $sr^2 = .17$, when controlling for age, sex, and ID status. Results also indicated a trend-level moderation effect of recreational activities on the relationship between perceived stress and QoL, $B = 6.80$, $t(51) = 1.91$, $p = .06$, $sr^2 = .05$.

This trend-level moderation effect is displayed graphically in Figure 3. Like our self-report findings, mother-reported social activities did not significantly moderate the association between perceived stress and QoL.

Discussion

This study examined the impact of participation in social activities and recreational activities on the relationship between perceived stress and QoL in adults with ASD. In the present study, most adults with ASD participated, on average, in social activities about once per week and in recreational activities two- to three-times per week. This finding differs from data on the general population from the National Survey of Families and Households (1990) in that adults in the general population participate in social activities more frequently than recreational activities. Our finding that adults with ASD participated in about one social activity per week based on both self- and mother-reports was unexpected, given that previous studies have found that most adults with ASD do not participate in social activities on a weekly basis (Orsmond et al., 2013; Shattuck et al., 2011). This higher rate of social participation may be due to one of the selection criteria for the present analysis, namely that the adult was able to participate in an in-person interview. Frequency of weekly participation in recreational activities aligned with other data on frequency of participation in recreational activities among adults with ASD (Taylor, Adams, & Bishop, in press). Descriptive findings supported a growing body of research that indicates that adults with ASD participate in fewer social activities (e.g., Orsmond et al., 2004; Orsmond et al., 2013; Shattuck et al., 2011) than recreational activities (Gray et al., 2014; Orsmond et al., 2004; Weiss & Burnham Riosa, 2015), although direct statistical comparisons cannot be made because these measures were reported on different scales in our study.

As expected, results supported our hypothesis that perceived stress is negatively associated with QoL. We also hypothesized that participation in social activities and recreational activities would each uniquely moderate the relationship between perceived stress and QoL. Partially consistent with our hypotheses, we found that self-reported recreational activities moderated the relationship between perceived stress and QoL, but social activities did not. Based on this finding, participation in recreational activities may serve as an important resource for adults with ASD that could improve QoL even in cases of high levels of perceived stress. This finding implies that participation in recreational activities may help to improve well-being, even if those activities do not provide explicit opportunities for socialization. Indeed, the most frequent activities engaged in by our sample were in all likelihood individual activities: hobbies, watching TV/video games, and taking a walk.

Research that focuses on the general population finds that individuals with greater social resources are likely to have better well-being even in cases of high stress (Cassel, 1976; Cobb, 1976; Iwasaki & Mannell, 2000). However, our findings indicate that social participation does not have the same benefits for adults with ASD. This may be because social interactions are more difficult and stressful for adults with ASD because of well-established challenges with socialization (Klin et al., 2007) and a keen awareness of the extent of one's own social differences (Sperry & Mesibov, 2005). Thus, greater participation

in social activities does not have the same stress-reducing impact for adults with ASD as in the general population.

Of note, women in our sample reported levels of QoL that were nearly 10 points lower than levels reported by men. While research on outcomes and QoL for women with ASD is limited and small samples may render findings inconclusive (Magiati et al., 2014), current findings do suggest that women with ASD may have poorer adult outcomes than men (Magiati et al., 2014; Seltzer et al., 2004; Taylor, Henninger, & Mailick, 2015). Our findings add to this literature and suggest that women with ASD experience significantly lower levels of QoL than do men. Future research with larger samples of women should examine if recreational activities are equally beneficial for males and females.

This study has three key limitations. First, findings may not be representative of all adults with ASD. The families who participated in this study lacked racial diversity and had been participating in our research for almost 15 years when data was collected. In addition, because all participants included in this analysis were able to complete a one-on-one interview, they are not representative of adults with ASD with more limited verbal abilities. Second, we do not have available clinical measures of depression or anxiety, so were unable to explore the role of anxiety and depression. Future research should examine these components of distress in addition to perceived stress. Finally, our measures of self- and mother-reported social activities and recreational activities were limited. In particular, our measure of self-reported social activities may not have accurately identified the social activities in which adults with ASD participated because it only included two items, one of which asked how frequently adults with ASD “hung out” with a boyfriend or girlfriend. Given how much our estimate of participation in social activities differed from those reported in other studies (i.e., self-reports in our study indicated that 60% of adults with ASD hung out with friends at least once per week while the National Autistic Society (NAS) report found that only 28% of adults with ASD have access to social groups (Barnard et al., 2001)), our measure of self-reported social activities may overestimate actual frequency of social contact. In addition, our measures of social activities and recreational activities did not allow us to assess the relative quality of social activities or recreational activities. Differences in the quality of activities, in addition to the frequency of participation, may drive beneficial effects. This limitation did not allow us to explore the likely overlap between our measures of social activities and recreational activities in that many recreational activities involve social components (i.e., playing an active sport necessarily requires interaction with others, although the degree of that interaction may vary). Future research should examine these constructs in more nuanced ways. Future research could also examine the impact of perceived social support on QoL in adults with ASD, which could provide key information about the level and quality of social engagement. However, our findings are strengthened by the inclusion of both self- and mother-report measures of social activities and recreational activities, which reduces shared method variance and makes findings more robust.

Despite these limitations, we draw a number of conclusions and implications from our findings. First, we found a significant association between perceived stress and QoL. This finding corroborates previous research conducted in other samples (Bishop-Fitzpatrick,

Mazefsky, Minshew, & Eack, 2015; Bishop-Fitzpatrick et al., in press; Hirvikoski & Blomqvist, 2015) and indicates that high perceived stress is a problem for adults with ASD that needs to be addressed through targeted treatment and services. Notably, and perhaps most importantly, the deleterious impact of higher levels of perceived stress on QoL is buffered by greater participation in recreational activities. This suggests that services and interventions that aim to help adults with ASD improve their stress management should encourage and support adults with ASD to engage in recreational activities. This also indicates that targeting availability of and access to recreational activities may improve QoL. Of note, much of the ASD literature suggests that interventions should target core autism symptoms in order to help individuals with ASD to develop social networks (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010). However, participation in social activities was not associated with QoL in our analysis. Thus, interventions that offer opportunities for participation in recreational activities, even if those activities do not provide explicit opportunities for socialization, may help adults with ASD manage stress and feel more satisfied with their QoL.

Acknowledgments

Grant sponsors: NIH, Grant numbers: R01 AG08768, T32 HD07489, P30 HD03352; Autism Speaks, Grant number: 7724.

References

- Andrews J, Falkmer M, Girdler S. Community participation interventions for children and adolescents with a neurodevelopmental intellectual disability: A systematic review. *Disability and rehabilitation*. 2015; 37(10):825–833. [PubMed: 25070651]
- Barnard, J., Harvey, V., Potter, D., Prior, A. Ignored or Ineligible? The Reality for Adults with Autism Spectrum Disorders. London, UK: National Autistic Society; 2001.
- Bishop-Fitzpatrick L, Hong J, Smith LE, Makuch R, Greenberg JS, Mailick MR. Characterizing objective quality of life and normative outcomes in adults with autism spectrum disorder: An exploratory latent class analysis. *Journal of Autism & Developmental Disorders*. 2016; 46(8):2707–2719. [PubMed: 27207091]
- Bishop-Fitzpatrick L, Mazefsky C, Minshew NJ, Eack SM. The relationship between stress and social functioning in adults with autism spectrum disorder and without intellectual disability. *Autism Research*. 2015; 8(2):164–173. [PubMed: 25524571]
- Bishop-Fitzpatrick L, Minshew NJ, Mazefsky C, Eack SM. Perception of Life as Stressful, not Biological Response to Stress, is Associated with Greater Social Disability in Adults with Autism Spectrum Disorder. *Journal of Autism & Developmental Disorders*. (in press).
- Bohnert A, Lieb R, Arola N. More than leisure: Organized activity participation and socio-emotional adjustment among adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*. 2016:1–16. [PubMed: 26210515]
- Box GE, Cox DR. An analysis of transformations. *Journal of the Royal Statistical Society. Series B (Methodological)*. 1964:211–252.
- Bumpass, L., Sweet, J. A national survey of families and households. Madison, WI: Center for Demography and Ecology, University of Wisconsin-Madison; 1987.
- Cassel J. The contribution of the social environment to host resistance. *American Journal of Epidemiology*. 1976; 104(2):107–123. [PubMed: 782233]
- Chun S, Lee Y, Kim B, Heo J. The contribution of leisure participation and leisure satisfaction to stress-related growth. *Leisure Sciences*. 2012; 34:436–449.
- Cicchetti D. The emergence of developmental psychopathology. *Child development*. 1984; 55(1):1–7. DOI: 10.2307/1129830 [PubMed: 6705613]

- Cobb S. Social support as a moderator of life stress. *Psychosomatic medicine*. 1976; 38(5):300–314. [PubMed: 981490]
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of health and social behavior*. 1983; 24(4):385–396. [PubMed: 6668417]
- Cohen, S., McKay, G. Social support, stress and the buffering hypothesis: A theoretical analysis. In: Baum, A. Taylor, SE., Singer, JE., editors. *Handbook of psychology and health*. Hillsdale, NJ: Lawrence Erlbaum; 1984. p. 253-267.
- Constantino, JN., Gruber, CP. *Social Responsiveness Scale (SRS)*. Los Angeles, CA: Western Psychological Services; 2007.
- García-Villamizar D, Dattilo J. Effects of a leisure programme on quality of life and stress of individuals with ASD. *Journal of Intellectual Disability Research*. 2010; 54(7):611–619. [PubMed: 20500784]
- Gerhardt P, Lainer I. Addressing the needs of adolescents and adults with autism: A crisis on the horizon. *Journal of Contemporary Psychotherapy*. 2011; 41(1):37–45.
- Glutting, J., Adams, W., Sheslow, D. *Wide Range Intelligence Test: WRIT*. Wilmington, DE: Wide Range; 2000.
- Gray KM, Keating CM, Taffe JR, Brereton AV, Einfeld SL, Reardon TC, Tonge BJ. Adult outcomes in autism: Community inclusion and living skills. *Journal of Autism and Developmental Disorders*. 2014; 44(12):3006–3015. [PubMed: 24915930]
- Harris, KM., King, RB., Gordon-Larsen, P. Healthy Habits among Adolescents: Sleep, Exercise, Diet, and Body Image. In: Moore, KA., Lippman, LH., editors. *What Do Children Need to Flourish? Conceptualizing and Measuring Indicators of Positive Development*. Boston, MA: Springer US; 2005. p. 111-132.
- Harris, KM., Udry, JR. *National Longitudinal Study of Adolescent to Adult Health (Add Health), 1994–2008: Wave I: In-Home Questionnaire*. Ann Arbor, MI: Inter-university Consortium for Political and Social Research; 1994.
- Helles A, Gillberg IC, Gillberg C, Billstedt E. Asperger syndrome in males over two decades: Quality of life in relation to diagnostic stability and psychiatric comorbidity. *Autism*. (in press).
- Hesselmark E, Plenty S, Bejerot S. Group cognitive behavioural therapy and group recreational activity for adults with autism spectrum disorders: A preliminary randomized controlled trial. *Autism*. 2014; 18(6):672–683. [PubMed: 24089423]
- Hirvikoski T, Blomqvist M. High self-perceived stress and poor coping in intellectually able adults with autism spectrum disorder. *Autism*. 2015; 19(6):752–757. [PubMed: 25073750]
- Hong J, Bishop-Fitzpatrick L, Smith LE, Greenberg JS, Mailick MR. Factors associated with subjective quality of life of adults with autism spectrum disorder: Self-report versus maternal reports. *Journal of Autism and Developmental Disorders*. 2016; 46(4):1368–1378. [PubMed: 26707626]
- Iwasaki Y, Mannell RS. Hierarchical dimensions of leisure stress coping. *Leisure Sciences*. 2000; 22(3):183–206.
- Klin A, Saulnier CA, Sparrow SS, Cicchetti DV, Volkmar FR, Lord C. Social and communication abilities and disabilities in higher functioning individuals with autism spectrum disorders: The Vineland and the ADOS. *Journal of Autism and Developmental Disorders*. 2007; 37(4):748–759. [PubMed: 17146708]
- Lord C, Rutter M, Lecouteur A. Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders*. 1994; 24(5):659–685. [PubMed: 7814313]
- Magiati I, Tay XW, Howlin P. Cognitive, language, social and behavioural outcomes in adults with autism spectrum disorders: A systematic review of longitudinal follow-up studies in adulthood. *Clinical Psychology Review*. 2014; 34(1):73–86. [PubMed: 24424351]
- Marquardt DW. You should standardize the predictor variables in your regression models. *Journal of the American Statistical Association*. 1980; 75(369):87–91.
- National Survey of Families and Households. *Main Questionnaire Codebook*. Madison, WI: University of Wisconsin-Madison; 1990. Retrieved from: <ftp://elaine.ssc.wisc.edu/pub/nsfh/c1all.001>

- Odom SL, Collet-Klingenberg L, Rogers SJ, Hatton DD. Evidence-based practices in interventions for children and youth with autism spectrum disorders. *Preventing School Failure*. 2010; 54(4):275–282.
- Orsmond GI, Krauss MW, Seltzer MM. Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of Autism and Developmental Disorders*. 2004; 34(3): 245–256. [PubMed: 15264493]
- Orsmond GI, Shattuck PT, Cooper B, Sterzing P, Anderson KA. Social participation among young adults with an autism spectrum disorder. *Journal of Autism and Developmental Disorders*. 2013:1–10. [PubMed: 23104615]
- Seltzer, MM., Greenberg, JS., Taylor, JL., Smith, LE., Orsmond, GI., Esbensen, A., Hong, J. Adolescents and adults with autism spectrum disorders. In: Amaral, DG, Dawson, G., Geschwind, DH., editors. *Autism Spectrum Disorders*. New York: Oxford University Press; 2011. p. 241-252.
- Seltzer MM, Shattuck PT, Abbeduto L, Greenberg JS. Trajectory of development in adolescents and adults with autism. *Mental Retardation and Developmental Disabilities Research Reviews*. 2004; 10(4):234–247. [PubMed: 15666341]
- Shattuck PT, Orsmond GI, Wagner M, Cooper BP. Participation in social activities among adolescents with an autism spectrum disorder. *PLoS one*. 2011; 6(11):e27176. [PubMed: 22110612]
- Skevington SM, Lotfy M, O’Connell KA. The World Health Organization’s WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial: A report from the WHOQOL Group. *Quality of Life Research*. 2004; 13(2):299–310. [PubMed: 15085902]
- Sparrow, SS., Balla, DA., Cicchetti, DV., Harrison, PL., Doll, EA. *Vineland adaptive behavior scales*. 1984.
- Sperry LA, Mesibov GB. Perceptions of social challenges of adults with autism spectrum disorder. *Autism*. 2005; 9(4):362–376. [PubMed: 16155054]
- Taylor JL, Adams RE, Bishop SL. Social participation and its relation to internalizing symptoms among youth with autism spectrum disorder as they transition from high school. *Autism Research*. (in press).
- Taylor JL, Henninger NA, Mailick MR. Longitudinal patterns of employment and postsecondary education for adults with autism and average-range IQ. *Autism*. 2015 1362361315585643.
- Taylor JL, Seltzer MM. Changes in the autism behavioral phenotype during the transition to adulthood. *Journal of Autism and Developmental Disorders*. 2010; 40(12):1431–1446. [PubMed: 20361245]
- Tint A, Thomson K, Weiss JA. A systematic literature review of the physical and psychosocial correlates of Special Olympics participation among individuals with intellectual disability. *Journal of Intellectual Disability Research*. (in press).
- Weiss JA, Burnham Riosa P. Thriving in youth with autism spectrum disorder and intellectual disability. *Journal of Autism and Developmental Disorders*. 2015; 45(8):2474–2486. [PubMed: 25772536]
- WHOQOL Group. Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine*. 1998; 28(3):551–558. [PubMed: 9626712]

Scientific Summary for Families

There are now more adults diagnosed with autism than ever before. We know very little about which factors may lead to better outcomes and quality of life for adults with autism. Research shows that feelings of higher stress may lead to worse quality of life for adults with autism. However, participation in social activities and recreational activities may help reduce stress and improve quality of life. We predicted that adults with autism who felt that they were more stressed would have worse quality of life. We also predicted that participating in more social activities and more recreational activities would reduce the impact stress on quality of life. Adults with autism who reported more stress also reported worse quality of life. We also found that participation in recreational activities lessened the impact of stress. The findings of this study suggest that we should encourage adults with autism to participate in recreational activities. This might help them manage their stress and have a better quality of life.

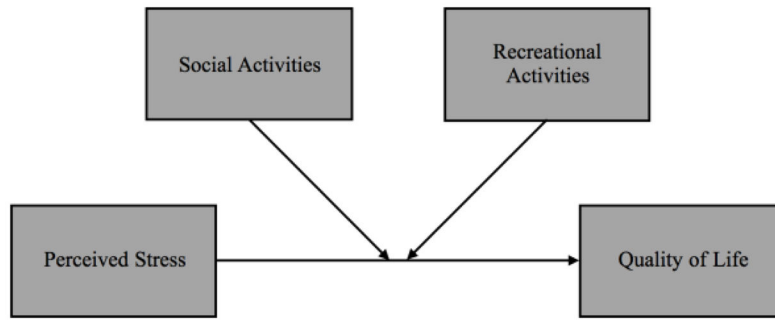


Figure 1.
Conceptual Model

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

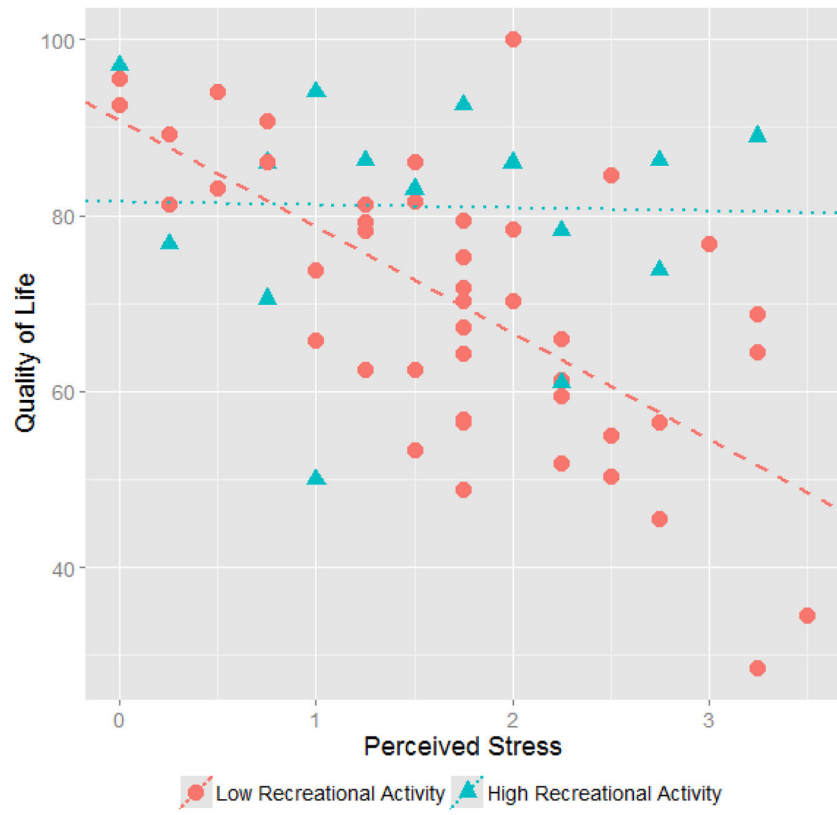


Figure 2. Self-Reported Recreational Activities Moderates the Association between Perceived Stress and Quality of Life in Adults with Autism Spectrum Disorder

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

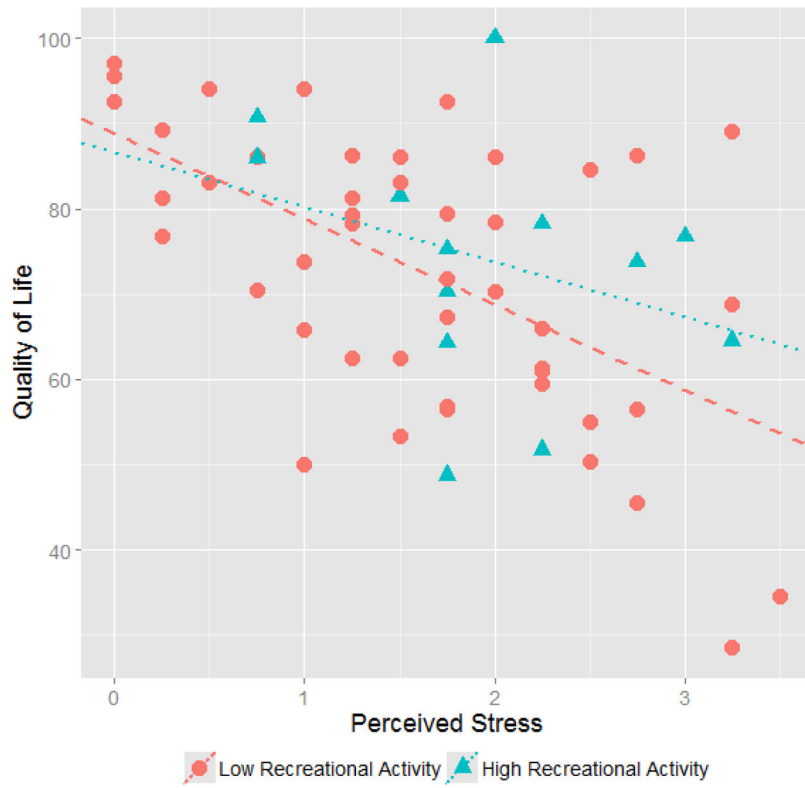


Figure 3. Mother-Reported Recreational Activities Moderates the Association between Perceived Stress and Quality of Life in Adults with Autism Spectrum Disorder

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Descriptive Statistics

Continuous Variables	Mean	S.D.	Range
Age	31.48	6.75	24–55
Lifetime ADL-R	41.22	6.79	23–53
Perceived Stress	1.69	.90	0–3.5
Self-Reported Social Activities	0.82	.77	0–2
Self-Reported Recreational Activities	2.98	.89	1–5
Mother-Reported Social Activities	1.07	1.02	0–4
Mother-Reported Recreational Activities	2.07	.80	1–4
QoL Total	72.91	15.68	28.5–100

Categorical Variables	N	%
Sex (Male)	46	76.7
Has intellectual disability	16	26.7
Competitively employed	28	48.3
Lives with parents	31	53.4
Has spouse or partner	5	8.3
Received psychological services in last year	37	62.7

Correlation Matrix	1	2	3	4	5	6	7
1. Sex	--						
2. Perceived Stress	.29*	--					
3. Self-Reported Social Activities	.08	.03	--				
4. Self-Reported Recreational Activities	.10	-.07	.14	--			
5. Mother-Reported Social Activities	.16	-.07	.30*	-.02	--		
6. Mother-Reported Recreational Activities	.20	.11	.05	-.05	.16	--	
7. QoL Total	-.23†	-.51**	.14	.23†	.14	.01	--

Note.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

$p < .10$;
**
 $p < .05$;
*
 $p < .01$;

S.D. = standard deviation; ADI-R = Autism Diagnostic Interview-Revised; QoL = quality of life.

Table 2

Frequency of Participation in Self-Reported Social Activities and Recreational Activities

During the past week, how many times did you:	Not at all (%)	1 or 2 times (%)	3 or 4 times (%)	5+ times (%)
<u>Social Activities</u>				
Hang out with friends?	44.1	28.8	16.9	10.2
Hang out with a girlfriend or boyfriend?	77.6	8.6	6.9	6.9
<u>Recreational Activities</u>				
Do hobbies, such as collecting baseball cards, playing a musical instrument, reading, or doing arts and crafts?	13.3	11.7	28.3	46.7
Watch TV or play video games?	5.0	6.7	21.7	66.7
Go roller-blading, roller-skating, skate-boarding, or bicycling?	90.0	8.3	1.7	0.0
Play an active sport, such as baseball, softball, basketball, soccer, swimming, or football?	86.7	11.7	1.7	0.0
Do exercise, such as jogging, walking, karate, jumping rope, gymnastics, dancing?	31.7	16.7	20.0	31.7
Go to the gym for exercise?	75.0	13.3	10.0	1.7

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 3
 Frequency of Participation in Mother-Reported Social Activities and Recreational Activities

How often does your son/daughter:	Less than yearly (%)	Several times a year (%)	Once or twice a month (%)	Once a week (%)	Several times a week (%)
<u>Social Activities</u>					
Spend social time with relatives (do not include family members whom he/she lives with)?	5.0	33.3	23.3	16.7	21.7
Spend social time with people he/she goes to school or works with, outside of school/working hours?	51.7	23.3	5.0	13.3	6.7
Spend social time with friends and neighbors?	23.3	21.7	16.7	16.7	21.7
Attend a social event at a church or synagogue?	58.3	23.3	8.3	10.0	0.0
<u>Recreational Activities</u>					
Participate in a formal or informal recreational activity, such as bowling, movies, etc.?	6.7	28.3	35.0	18.3	11.7
Work on a hobby such as video games, computer games, or collecting things?	6.7	10.7	3.3	3.3	85.0
Play sports?	70.0	16.7	5.0	3.3	5.0
Take a walk or get some type of physical exercise?	8.3	6.7	5.0	20.0	60.0

Table 4

Frequency of Responses to Perceived Stress Scale Items

	Never (%)	Almost Never (%)	Sometimes (%)	Fairly Often (%)	Very Often (%)
In the last month, how often have you been upset because of something that happened unexpectedly?	20.0	25.0	31.7	16.7	6.7
In the last month, how often have you felt nervous and "stressed"?	15.0	15.0	33.3	25.0	11.7
In the last month, how often have you found that you could not cope with all the things that you had to do?	25.0	26.7	38.3	8.3	1.7
In the last month, how often have you been angered because of things that were outside of your control?	23.3	18.3	31.7	15.0	11.7

Table 5

Hierarchical Multiple Regression Predicting Subjective Quality of Life from Perceived Stress and Self- and Mother-Report Social Activities and Recreational Activities

Variable	A. Self-Report		B. Mother-Report	
	β	sr ²	β	sr ²
<u>Step 1</u>				
Log(age)	-.02	.00	-.02	.00
Sex	-.27*	.07	-.27*	.07
Intellectual disability status	.23	.04	.23	.04
<u>Step 2</u>				
Perceived stress	-.46**	.18	-.45**	.17
Social activities	.14	.02	.11	.01
Recreational activities	.17	.03	.08	.01
<u>Step 3</u>				
Perceived stress x social activities	.09	.01	-.07	.00
Perceived stress x recreational activities	.28*	.07	.26 [†]	.05
R ²	.44		.35	
N	60		60	

Note.

[†] p < .10;

* p < .05;

** p < .01;

β = standardized beta; coefficients are displayed for each individual step.