

Participation of Young Adults with High-Functioning Autism in Taiwan: A Pilot Study

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ABSTRACT

This pilot study aimed to investigate the activity participation of young adults with high-functioning autism (HFA) living in Taiwan. Eleven young adults with HFA, their caring adults, and 11 matched typically developing youth were recruited across Taiwan. The Adolescent and Young Adult Participation Sort-Taiwanese version (AYAPS-T) was administered to all three groups to compare the activity participation. In addition, youth with HFA identified activities in which they desired to participate and barriers hindering their participation. The results of this study suggest that youth with HFA had lower participation rates in activities across different domains than their typically developing peers. Youth with HFA were able to identify the activities they desired to do and the barriers hindering their participation. No significant differences in participation were found between the results reported by the caring adults and youth with HFA. Occupational therapy practitioners may work on eliminating the personal and environmental barriers that impede participation as youth with HFA transition out of secondary school. [OTJR: Occupation, Participation and Health. 2014; 34(1):41-51.]

Participating in age-appropriate and meaningful activities is positively correlated with health and well-being (Christiansen, Baum, & Bass-Haugen, 2005). Adolescents who are transitioning to adulthood are facing a plethora of choices in roles and activities in which to participate. The transition from adolescence to adulthood has been recognized as an important time for health promotion, including promoting fitness, developing physical activity routines, establishing a healthy lifestyle, and acquiring skills for independent living and work (Arnett, 2001; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

Researchers have noted differences in participation between youth (also referred to as young adults) with autism spectrum disorders (ASD) and typically developing youth (Hilton, Crouch, & Israel, 2008; Or-

mond, Krauss, & Seltzer, 2004; Shattuck, Orsmond, Wagner, & Cooper, 2011). Individuals with ASD who have intelligence quotients (IQs) in the normal or above normal range are referred to as having high-functioning autism (HFA). The prevalence of autism has increased in the United States to 1 in 88 children (Centers for Disease Control and Prevention, 2012). In Taiwan, approximately 10,610 people are diagnosed with autism, and the prevalence is growing every year. During 2009-2010, the rate of having a diagnosis of autism had grown by 11%, which is the highest among all diagnosed groups (Administration Department in Taiwan, 2011).

Shattuck, Wagner, Narendorf, Sterzing, and Hensley (2011) and Shattuck et al. (2012) compared the postsecondary education and employment rate of youth with ASD to youth with other disabilities,

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such as speech impairment, learning disability, and intellectual disability, after high school. Youth with ASD had an employment rate of 55.1%, which is the lowest among all diagnostic groups. In addition, adolescents with autism between ages 13 and 17 participated in social activities at a significantly lower rate than adolescents in other diagnostic groups. Hilton et al. (2008) studied the out-of-school participation patterns of children between ages 6 and 12 with and without HFA and found significant differences in the diversity of activities in which children participated, the number of individuals with whom they participated, and the variety of environments in which they participated. Hilton et al. suggested that the reduced participation of children with HFA may lead to insufficient opportunity for developing age-appropriate skills, as well as hinder their mental and physical health. Orsmond et al. (2004) investigated the social and recreational activity participation of 235 adolescents and adults with autism. Their findings suggested that the rates of people with autism participating in social and recreational activities were both low. Furthermore, individual factors (e.g., functional independence level, social interaction skills) and environmental factors (e.g., number of services received) may both affect the participation of people with autism.

In Taiwan, youth with autism are also experiencing difficulties in a variety of life situations. Chang (1996) surveyed 91 young adults with autism, and the results showed that most of them stayed at home with very limited participation; 30.8% attended school during the day, and their employment rate was 9.9%. Among those who stayed home, more than 80% could not independently care for themselves. Community life was very restricted among these young adults with ASD. The study also suggested that participation is highly related to the intelligence of youth with ASD. Due to the limited participation of youth with ASD, Lin (2009) interviewed 20 caregivers of adolescents and adults with ASD in Taiwan. The results revealed that 80% of the caregivers reported moderate to extremely heavy caregiver burden. Although the activity participation of youth with ASD is limited, detailed information regarding the barriers to participation remains unclear.

According to Tantam (1991), the well-being of youth with HFA, across all age spans, is the lowest in adolescence and young adulthood. It is during this transition period that symptoms of depression, anxiety, and low quality of life can be exacerbated for individuals with HFA (Ghaziuddin, Ghaziuddin, & Greden, 2002; Kanne, Christ, & Reiersen, 2009; Kim, Szatmari, Bryson, Streiner, & Wilson,

2000; Stoddart, 1999). These difficulties can impact living arrangements, education, employment, social interaction, and intimate relationships (Farley et al., 2009; Howlin, 2003, 2004). Studies have shown that approximately 46% of adults with HFA require a high level of assistance for living; less than 40% of adults with HFA are in competitive or sheltered employment (Farley et al., 2009; Howlin, 2004); 44% complete their education at grade 12 and do not receive advanced education (Moxon & Gates, 2001); and 7% are married (Howlin, 2004). To assist youth with HFA transition from childhood into adulthood, Moxon and Gates (2001) suggested that support across multiple dimensions, such as continuing their education, training for employment, developing independence, fostering social relationships, and addressing health issues, needs to be provided.

Although evidence has shown that youth with HFA may face difficulties in multiple life areas during their transition to adulthood, little is known about their detailed participation patterns and the factors that facilitate or impede participation. The limited knowledge may reflect the need for assessment instruments that measure the participation and challenges of transitioning youth and are feasible for youth with comprehension difficulties, such as youth with HFA.

Measuring the Participation of Young Adults

The Adolescent and Young Adult Participation Sort-Taiwanese version (AYAPS-T, Wang & Berg, 2013) is a measurement instrument designed to capture the participation of young adults transitioning from adolescence into adulthood (Wang & Berg, 2013). The AYAPS-T was developed based on the Taiwanese culture and contains 61 activities belonging to six domains, including chores, leisure, social activity, health, education, and work. Each activity has a corresponding photograph showing Taiwanese youth participating in the activity.

To measure the participation of young adults, the AYAPS-T uses a card sort in which clients can be actively involved by sorting cards into categories pre-determined by researchers. For example, in the AYAPS-T, when asked "Do you currently participate in this activity?," the respondent would sort the cards into *yes* and *no* piles. If the respondent chooses *no*, there is a second sort to indicate whether or not they are interested in participating in this activity. For the activities in which the respondent is not participating but is interested, the respondent further identifies from a pre-set list those barriers that keep

him or her from doing the activity. The barrier list in AYAPS-T contains personal factors and environmental factors that were developed based on the personal and environmental factors of the International Classification of Functioning, Disability, and Health (ICF, World Health Organization [WHO], 2001). Using the barrier list in the AYAPS-T, clinicians will gain an understanding of what hinders participation of youth with HFA (Stucki, Cieza, et al., 2002; Stucki, Ewert, & Cieza, 2002).

This pilot study aimed to examine the participation of young adults with HFA and explore the factors that hinder their participation using the AYAPS-T. Additionally, the feasibility of using the AYAPS-T on youth with HFA as a self-report instrument was also evaluated.

Method

Design

This pilot study is a cross-sectional descriptive study using non-parametric statistics. This study had three phases. First, the activity participation of young adults with HFA and their age-matched, typically developing peers were described and compared using the AYAPS-T. Second, the activities reported by young adults with HFA as having difficulties but interest in were examined using the AYAPS-T's barrier list to clarify possible personal and environmental barriers. Third, the results reported by the young adults with HFA and their caring adults were compared to see if AYAPS-T scores were similar. All data were collected by the first author, who is an occupational therapist from Taiwan, fluent in Mandarin.

Recruitment and Selection

Three groups of participants were recruited for this research project: young adults with HFA and their identified caring adults, and typically developing young adults. The group of participants with HFA was recruited throughout Taiwan from several autism associations and hospitals that serve youth with ASD. The inclusion criteria were age 18 to 25, had a diagnosis of HFA or Asperger's syndrome by a physician, self-reported ability to read at the 6th-grade level, and ability to sit for at least 1 hour to complete the assessments. Exclusion criteria were having a medical condition other than ASD that might have significantly affected their participation (e.g., traumatic brain injury), inability to understand or follow directions, and living in an institution at the time of study. Participants self-identified whether they met the criteria; the diagnosis of HFA

was confirmed using the Autism Spectrum Quotient (ASQ, Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) completed by both the caring adult and youth.

The group of caring adults was recruited after the young adults with HFA had completed their session. Each young adult was asked to identify a caring adult who met the following inclusion criteria: age 30 or older and reported familiarity with the youth's daily activity participation.

The typically developing youth participants were recruited from several high schools, colleges, and community centers in different locations in Taiwan using posted flyers. People who had chronic diseases, neurological issues, or other medical conditions that might have significantly affected their activity participation were excluded from this sample.

Instrumentation

Demographic Data. The demographic questionnaire used in this study included questions about age, gender, educational level, and income. Income was categorized and ranged from lower than \$20,000 New Taiwan Dollars (NTD) per year to more than \$100,000 NTD per year.

Adolescent and Young Adult Participation Sort-Taiwanese Version. The AYAPS-T is a culturally developed assessment instrument measuring the participation of young adults in Taiwan. It has a total of 61 items in which youth in Taiwan engage, belonging to six domains: obligatory chores; leisure activities; social activities; health, fitness, and wellness; education; and work. Each item consists of a photograph showing the activity listed. The respondents are shown one photograph and answer whether they are participating in the activity or not. If not, they are further asked whether or not they want to do the activity (Wang & Berg, 2013). The test-retest reliability of AYAPS-T is excellent (intraclass correlation coefficient = 0.91) (Shrout & Fleiss, 1979; Wang & Berg, 2013).

For the activities in which the respondents do not participate but want to, the respondents identify barriers from a pre-set list of factors that keep them from doing the activity. The barrier list was designed based on the ICF (WHO, 2001) and the Occupational Therapy Practice Framework (American Occupational Therapy Association [AOTA], 2002). The barrier list consists of personal and environmental barriers. Personal barriers are those attributed to motor, cognitive, sensory, or psychological issues of the person. Environmental barriers are attributed to the physical, economic, or social factors that may hinder participation.

Table 1

Demographic Data for Youth With HFA and TD Youth

Variable	Youth with HFA (n = 11) n (%)	TD Youth (n = 11) n (%)
Gender		
Male	8 (73)	8 (73)
Female	3 (27)	3 (27)
Educational level		
High school	1 (9)	0 (0)
College	5 (46)	4 (36)
Graduate school	2 (18)	3 (27)
Not at school	3 (27)	4 (36)
Income level (per month)		
Less than \$20,000 NTD	1 (9)	1 (9)
\$20,000 to \$50,000 NTD	7 (64)	8 (73)
\$50,001 to \$100,000 NTD	2 (18)	1 (9)
More than \$100,000 NTD	1 (9)	1 (9)
Work status		
Full time	1 (9)	3 (27)
Part time	2 (18)	3 (27)
Looking for employment	1 (9)	1 (9)
Not working	7 (64)	4 (36)
Housing		
Living with family	9 (82)	3 (27)
Rent place	1 (9)	6 (55)
Dorm	1 (9)	2 (18)

Note. HFA = high-functioning autism; TD = typically developing; NTD = New Taiwan Dollar.

To evaluate the feasibility of measuring the self-report participation of young adults with HFA using the AYAPS-T, the researcher rated the amount of cueing required to complete the task. A 5-point cueing system was applied for each respondent: *no cues required* = 0, *verbal guidance* = 1, *gesture guidance* = 2, *direct verbal assistance* = 3, *physical assistance* = 4, and *not able to answer the questions* = 5. An example of verbal guidance may be “Keep going; you are doing a good job!”; gesture guidance may be the researcher points to the barrier choices; direct verbal assistance may be “Have you ever cooked yourself some food on the stove top?”; physical assistance may be the researcher manages all aspects of the task and keeps the task going.

Autism Spectrum Quotient. The ASQ was used in this study to evaluate the degree of autistic traits

reported by youth with HFA and their caring adults. The ASQ, developed by Baron-Cohen et al. (2001), is a self-administered instrument for individuals with high function to measure the degree to which one has the traits associated with the autistic spectrum. The ASQ’s discriminant power and test-retest reliability ($p = 0.75$) are good (Baron-Cohen et al., 2001; Woodbury-Smith, Robinson, Wheelwright, & Baron-Cohen, 2005). Liu (2008) translated the ASQ into Mandarin and applied the ASQ to Taiwanese participants of several groups, including adults with high-functioning ASD and typically developing adults. All participants completed the ASQ independently. Liu’s results suggest good discriminate validity between these two groups. The ASQ has been found to have discriminant validity for people who receive a diagnosis of HFA and can be used as a screening instrument (Woodbury-Smith et al., 2005).

The ASQ includes 50 items belonging to five domains: social skill, attention switching, attention to detail, communication, and imagination, as well as a total score. Because some questions could only be completed by those with the disorder, such as “If I try to imagine something, I find it very easy to create a picture in my mind,” the parent version of the ASQ omits 10 of the 50 items (Baron-Cohen et al., 2001). ASQ scores range from 0 to 50, with a cut-off score of 32 and higher distinguishing people who have clinically significant levels of autistic traits (Baron-Cohen, Hoekstra, Knickmeyer, & Wheelwright, 2006).

Procedure

The institution’s Internal Review Board approved all study procedures. After a detailed description of the research project to the youth with HFA, participants were screened by the researcher to determine whether they met the inclusion criteria and then consented. The youth with HFA completed the AYAPS-T and ASQ sequentially. As part of the consent process, the youth identified a caring adult who knew his or her activity participation well. The caring adult was then contacted and separately consented and completed the AYAPS-T and the parent version of the ASQ. Both the youth and caring adult were seen separately, in a place of convenience that was free from distraction.

Data Analysis

Data analysis was completed in all three phases and used SPSS version 19.0. In the first phase, percentages were used to determine the frequency with which the youth with HFA reported engaging in each activity. In addition, Spearman’s rho corre-

Table 2

Comparison Using Mann-Whitney *U* of Frequencies in Activity Participation Between TD Youth and Youth with HFA

Activity	Participation Rate		<i>p</i> Value
	TD Youth (<i>n</i> = 11)	Youth with HFA (<i>n</i> = 11)	
Hanging out	91%	36%	0.000
Dating	82%	27%	0.002
Driving/riding scooter	82%	27%	0.002
Entertaining friends	82%	18%	0.000
In a committed relationship	82%	18%	0.000
Leading a group	82%	45%	0.030
Paying bills	82%	45%	0.010
Managing time	64%	55%	0.010
Going to karaoke	55%	18%	0.001
Watching television	55%	91%	0.020
Using public transportation	27%	82%	0.001

Note. TD = typically developing; HFA = high-functioning autism.

lation was used to test the relationship between income and activity participation of youth with HFA. To compare the activity participation between typically developing youth and youth with HFA, a Mann-Whitney *U* test was used. In the second phase, the barriers reported most frequently by the youth with HFA were compiled. In the third phase, a chi-square test was performed to compare the results of the AYAPS-T and ASQ completed by youth with HFA and their caring adults by item, and a McNemar test was used to compare the results by each AYAPS-T domain.

Results

Participants

The youth with HFA consisted of 11 participants (73% male) between ages 18 and 25 (mean age = 21.5, *SD* = 2.4 years). Seven participants (64%) were full-time students, two (18%) attended school and held a part-time job, one (9%) was a full-time employee, and one (9%) was looking for employment. The majority (*n* = 9, 82%) of participants lived with their families (Table 1). Among the 11 participants, nine were referred to the study by psychiatrists, and two were referred by autism associations. The paired sample of caring adults consisted of 11 caring adults of the youth with HFA. All caring adults who participated in this study were parents of the youth with HFA (Table 1).

The group of typically developing youth contained 11 participants (73% male) ages 18 to 25 (mean age = 21.6, *SD* = 2.2 years). Four participants (36%) were full-time students, three (27%) had a part-time job, three (27%) had a full-time job, and one (9%) was looking for employment. Eight participants (73%) were renting a place or lived in the dorm, and three (27%) lived with family.

Comparison of Reports from Typically Developing Youth and Youth With HFA

The Mann-Whitney *U* test showed that youth with HFA participated significantly less on nine of the 61 activities. Regarding using public transportation and watching television, youth with HFA participated more than their same-aged peers (Table 2).

Activity Participation of Youth with HFA

The frequency of each activity performed by youth with HFA was analyzed (Table 3). The activities that youth with HFA performed most often were listening to music or broadcast, reading, surfing on the internet, using public transportation, and watching television. The activities youth with HFA performed least were dating, going to karaoke, keeping personal health records, having a committed relationship, and driving/riding a scooter.

Activity Barriers of Youth with HFA

Nine activities were most commonly identified as "want to do," with four of these from the social do-

Table 3

Activity Participation Frequency of Youth With HFA (n = 11)

Activity	n (%)
Most frequently engaged	
Listening to music or broadcast	11 (100)
Reading	11 (100)
Surfing on the internet	11 (100)
Using public transportation	11 (100)
Watching television	11 (100)
Least frequently engaged	
Dating	3 (27)
Going to karaoke	3 (27)
Keeping personal health records	3 (27)
Having a committed relationship	2 (18)
Driving/riding a scooter	1 (9)

Note. HFA = high-functioning autism.

main (Table 4). Barriers identified most often were having sensation issues, having attention difficulties, and lacking appropriate resources. Two barriers will be added to the AYAPS-T based on the participants' responses: "not having enough time" and "did not think of doing it."

Comparison of Reports from Youth with HFA and Their Parents

After analysis with the McNemar test, none of the activity participation scores on the AYAPS-T reported by parents and youth with HFA showed significant differences. Based on the scoring of the cueing system, two youth with HFA scored 1 because they asked for reassurance and were given verbal guidance to complete the AYAPS-T. Nine youth with HFA did not need any assistance.

The youth with HFA reported lower ASQ scores than their caring adults in total score and the subscores of all domains, except the domain of attention to detail. The youth scored themselves as having fewer autistic traits and having better imagination, communication and social skills, and attention switching than scored by their parents (Table 5). The average ASQ scores of youth with HFA and their caring adults were 18.0 (*SD* = 9.6) and 22.9 (*SD* = 11.7), respectively, and were below the cut-off score of 32, and thus not in the range of autistic traits. However, among the 11 caring adults, 3 of them scored their youth with HFA higher than 32.

Discussion

This study explored the activity participation of youth with HFA by investigating the self-reported frequencies of and barriers to participation. In addition, the feasibility of using the AYAPS-T as a self-report instrument with youth with HFA was explored. Youth with HFA identified the activities in which they want to participate and the barriers keeping them from participating. Overall, support for the validity of the AYAPS-T is beginning to be documented. Information from the AYAPS-T results by domain will be discussed, as well as implications for therapists who assess and treat this underserved population.

Obligatory Chores

Howlin (2003) and Howlin, Goode, Hutton, and Rutter (2004) investigated the living, education, and work status of 68 adults with autism and above average IQs. The results suggested that more than one third of the group lived with their parents and were not independent in taking care of themselves. In our study, youth with HFA participated less in driving/riding a scooter and more frequently used public transportation. In Taiwan, scooters are a typical means of transportation for youth. Five youth with HFA reported a desire to drive/ride a scooter and identified their personal barriers, including sensory and attention issues, as well as environmental barriers including financial concerns. Fewer transportation options may hinder the participation of youth with HFA in critical areas of transition, including employment and higher education. For example, Lugas, Timmons, and Smith (2010) reported a positive relationship for youth with autism who received transportation services from vocational rehabilitation resulting in an increased rate of employment. To provide adequate transportation for youth with HFA, interventions focused on the capacity to drive and coping strategies to handle traffic or alternative public transportation services need to be addressed. Additionally, further exploration of self-awareness in attention to detail and attention switching—skills critical for driving—is required because of the significant discrepancy between the scores of caring adults and youth with HFA (Crosson et al., 1989).

Social and Leisure Activities

Shattuck, Orsmond, et al. (2011) compared the social participation of adolescents with autism and other diagnostic groups using a nationally representative sample and found the social participation rates of adolescents with autism were significantly lower than adolescents in other diagnostic groups.

Table 4

Desired Activity Participation by Domain and Barriers Identified by Youth with HFA (n = 11) on the AYAPS-T

Domain	Desired Activity	n (%)	Examples of Barriers	
			Personal	Environmental
Obligatory chores	Driving/riding a scooter	5 (45)	<ul style="list-style-type: none"> • I am sensitive to sensations • Fear of falling 	<ul style="list-style-type: none"> • Too expensive
Leisure activities	Playing instrument	5 (45)	<ul style="list-style-type: none"> • Didn't think of doing it 	<ul style="list-style-type: none"> • Too expensive; not available in my community
Social activities	Dating	9 (82)	<ul style="list-style-type: none"> • Talking and being understood by others 	<ul style="list-style-type: none"> • No one to do it with • Too expensive
	Going to karaoke	7 (64)	<ul style="list-style-type: none"> • Fear of failing 	<ul style="list-style-type: none"> • No one to do it with
	Going to place of worship	6 (55)	<ul style="list-style-type: none"> • Talking and being understood by others 	<ul style="list-style-type: none"> • No one to do it with • Not available in my community
	Participating in clubs or organized activities	5 (45)	<ul style="list-style-type: none"> • Talking and being understood by others 	<ul style="list-style-type: none"> • No one to do it with • Do not have time
Health, fitness, and wellness	Keeping personal health records	6 (55)	<ul style="list-style-type: none"> • Trouble staying organized • Didn't think of doing it 	<ul style="list-style-type: none"> • Need help from others to do this
Education	Concentrating on a lecture	7 (64)	<ul style="list-style-type: none"> • Difficulty concentrating • I am sensitive to sensations 	
	Managing time	7 (64)	<ul style="list-style-type: none"> • Difficulty controlling my behavior 	<ul style="list-style-type: none"> • Need help from others to do this

Note. HFA = high-functioning autism; AYAPS-T = Adolescent and Young Adult Participation Sort-Taiwanese version. Due to the limited number of youth with HFA who were working at the time of the study, information regarding barriers to work was not able to be collected.

Shattuck, Orsmond, et al. suggested that the limited social participation was correlated with both individual and environmental factors, such as low family income, impaired language and communication skills, and functional cognitive skills. The positive association between income and activity participation was not found in this study. However, due to the limited sample size in the current study, future study with a larger sample size is needed to investigate how socioeconomic factors affect the activity participation of youth with autism.

Orsmond et al. (2004) investigated participation in social and recreational activities among 235 adolescents and adults with autism. The findings suggested that individuals with autism preferred leisure activities that do not require social interaction. Similar results were found in this study, although this comparison is tentative due to our small sample size. Compared with typically developing youth, youth with HFA participated in fewer social activities, and more of them participated in sedentary leisure activities such as watching television. However, our study also addressed willingness of the youth

with HFA, and they expressed interest in participating in a variety of social activities. The barriers identified by the youth focused on environmental factors and included needing peers with whom to do the activities and insufficient resources. To address the needs of youth with HFA to engage in the leisure and social activities they desire, community-based programs could provide the environmental support to facilitate social interaction and friendship opportunities. Orsmond et al. (2004) examined the correlation between peer relationships and social and leisure activities of young adults. Their findings suggested that environmental characteristics of informal social support, such as greater number of services received, were found to be highly correlated to participation in social and leisure activities.

Health, Fitness, and Well-Being

Cohort data from the National Longitudinal Study of Adolescent Health (Gordon-Larsen, Adair, Nelson, & Popkin, 2004) indicate that very few young adults (12.7%) meet the minimum requirement of physical activity. In addition, a 5-year longitudi-

Table 5

ASQ Results^a Reported by Caring Adults and Youth with HFA

Domain	Adults (n = 11)	Youth with HFA (n = 11)	Z	p Value
	Mean (SD)	Mean (SD)		
Social skills	6.1 (1.9)	3.9 (2.4)	-1.85	0.04
Attention switching	8.1 (1.5)	4.6 (2.8)	-2.61	0.01
Attention to detail	3.1 (1.4)	6.6 (2.9)	-2.68	0.01
Communication skills	6.8 (1.6)	4.1 (3.2)	-2.14	0.03
Imagination	4.0 (1.5)	2.6 (1.6)	-2.40	0.02
Total	22.9 (11.7)	18.0 (9.6)	-2.81	0.01

Note. ASQ = Autism Spectrum Quotient; HFA = high-functioning autism.

^a Analyzed by the McNemar test; ASQ total score 32 and higher = autism traits.

nal cohort study confirmed such adverse changes in activity patterns during the transition from high school age to young adulthood. Physical activity has also been shown to decline even further with specific life events typically accompanying emerging adulthood, such as beginning a romantic relationship, moving out of the parent's house, or becoming a parent, and physical activity stays stable with age after mid-adulthood (Caspersen, Pereira, & Curran, 2000).

Eaves and Ho (1997, 2008) examined the health status of young adults with autism and found there was a significant decline in physical activity participation as people with autism transition from adolescence into young adulthood. Among the youth surveyed, only 46% of them participated in moderate or vigorous physical activity at least once per week. The lack of physical activity may lead to a high obesity rate (42%) among youth with autism, which is twice the rate of typically developing youth (Eaves & Ho, 2008).

Wu and Pender (2002) investigated the factors affecting physical activity participation of all youth in Taiwan. Their findings suggested that perceived self-efficacy and peer influence were important predictors of physical activity. In their study, the importance of managing an exercise routine and peer support was also highlighted. Youth with HFA expressed interest in managing their own health by engaging in activities such as keeping their own health records. The barriers reported included deficits in executive function, such as planning an exercise schedule or organizing health record information. Health care professionals may address the importance of and strategies for maintaining one's health when working with youth with HFA and address social support

for physical activity. Establishing healthy routines, having treatment outcomes of health and wellness, and using health promotion as an intervention approach are all roles for occupational therapists supported by the AOTA (2002) practice framework.

Education

In this study, youth with HFA showed difficulties such as concentrating on a lecture or managing time. They also reported a lower rate of engaging in school tasks involving interpersonal interaction such as leading a group discussion. Shattuck, Wagner, et al. (2011) surveyed post-high school services used among youth with ASD. The results suggested that almost 40% of them never received any services after leaving high school. In particular, youth with ASD who had higher functioning skills were associated with higher rates of not receiving any special education services during high school. The results reflect that youth with HFA are underserved in both secondary and post-secondary education, doing this population a disservice in preparing them to participate in community life. VanBergeijk, Klin, and Volkmar (2008) proposed that with specially tailored interventions such as modified classroom instruction, counseling services, and specific training, youth with autism may fulfill their aspirations of post-secondary school and reach their potential of being self-sufficient and contributing to society.

Farmer (2011) demonstrated a way to provide an inclusive library environment, which trained library staff as well as provided specific resources and services for youth with autism integrated into primary and secondary public schools. Recommended changes included alternative seating and sensitivity to the youth's body space so others' touch will not

affect their sensory system or focus; closed library doors to eliminate outside noises; natural lighting; consistent routines for library use and instruction; and giving youth transitional signals. By fostering an accessible environment in school settings, occupational therapists can facilitate the participation of youth with ASD in school.

Work

Only one of the 11 participants with HFA was working full time. The limited number may reflect the low employment rate of youth with HFA or may reflect those who volunteered to participate in this study. Howlin et al. (2004) found that even among individuals with HFA, the proportion having a paid job rarely exceeds 30%, and the majority of jobs were unskilled and poorly paid. Shattuck et al. (2012) compared the post-secondary education and employment rate of youth with ASD to youth with other disabilities, such as speech impairment, learning disability, and intellectual disability, after high school. Youth with ASD had an employment rate of 55.1%, which was the lowest among all diagnostic groups.

In our sample, only two youth lived independent of their family, and only one reported driving. Researchers have identified barriers hindering youth with ASD from driving (Cox, Reeve, Cox, & Cox, 2012; Reimer et al., 2013; Sheppard, Ropar, Underwood, & van Loon, 2010), which could also influence access to the workplace. Hillier, Fish, Cloppert, and Beversdorf (2007) examined the effects of an 8-week social and vocational skills support group for young adults with autism. The outcome measures included self-rated peer relations, empathy, and feedback from staff and parents. All outcome measures support the efficacy of using peer-support groups for learning social and vocational skills. Taylor and Seltzer (2011) investigated the vocational activities of 66 young adults with ASD. They found that after exiting high school, youth with ASD who did not have an intellectual disability were three times more likely to not engage in any daytime activities compared with youth with ASD who had an intellectual disability. Based on this finding, Taylor and Seltzer suggested that engaging high-functioning youth requires different approaches and programs tailored to the needs youth with ASD who do not have an intellectual disability.

Participation Reported by Youth with HFA and Their Parents

Activity participation reported by the youth with HFA and their caring adults did not show significant

differences. However, on the ASQ, the youth with HFA reported themselves as having a lesser degree of autistic traits than reported by their caring adults.

Baron-Cohen et al. (2001) examined the ability of people with HFA to judge their own social and communicative behavior. Although individuals with HFA may rate their behaviors as more appropriate than others rate them, they are able to report their own preferences and what they find easy or challenging. The AYAPS-T is a client-centered instrument allowing respondents to identify the activities in which they desire to participate. This study is a first step in establishing the feasibility of a self-administered instrument to measure desired activities and barriers to participating in those self-identified activities.

Limitations

The small convenience sample in this study limits generalizability. For example, in this study, only three youth with HFA had a paid job. A larger sample will provide more abundant variable information about the activity participation of youth with HFA. Additional barriers hindering the participation of youth with HFA may be identified in a larger sample. The ASQ did not appear to validate having autistic traits that the youth and referral sources indicated the youth possessed. This requires tentative application of our findings to others with HFA. This study was conducted in Taiwan; therefore, the activities and barriers identified by youth with HFA in this study may not apply to other countries. The AYAPS-T has been developed for use in Taiwan.

Conclusion

This study provides knowledge about activity participation and self-identified barriers to participation of youth with HFA. A self-report instrument may be feasible to measure the participation and willingness to participate for youth with HFA. By using an assessment instrument focusing on participation, such as AYAPS-T, therapists may better help youth with HFA to engage in their desired activities as they emerge into adulthood. Based on the findings of this study, occupation-based services must minimize the personal and environmental barriers and build necessary social support for engagement.

References

Administration Department in Taiwan. (2011). *Report of physical and mentally disabled citizens living and demand assessment survey*. Taipei, Taiwan: Author.

- American Occupational Therapy Association. (2002). Occupational therapy practice framework: Domain & process. *American Journal of Occupational Therapy, 56*, 609-639.
- Arnett, J.J. (2001). Conceptions of the transition to adulthood: Perspectives from adolescence through midlife. *Journal of Adult Development, 8*, 133-143. doi:10.1023/A:1026450103225
- Baron-Cohen, S., Hoekstra, R., Knickmeyer, R., & Wheelwright, S. (2006). The autism-spectrum quotient (AQ)—Adolescent version. *Journal of Autism and Developmental Disorders, 36*, 343-350.
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism-spectrum quotient (AQ): Evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders, 31*, 5-17.
- Caspersen, C.J., Pereira, M.A., & Curran, K.M. (2000). Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Medicine and Science in Sports and Exercise, 32*, 1601-1609.
- Centers for Disease Control and Prevention. (2012). *New data on autism spectrum disorders*. Retrieved from <http://www.cdc.gov/Features/CountingAutism>
- Chang, C. (1996). The survey study on adolescents and adults with autism in Taiwan. *Bulletin of Special Education, 14*, 133-155.
- Christiansen, C.H., Baum, C.M., & Bass-Haugen, J. (2005). *Occupational therapy: Performance, participation, and well-being*. Thorofare, NJ: Slack.
- Cox, N.B., Reeve, R.E., Cox, S.M., & Cox, D.J. (2012). Brief report: Driving and young adults with ASD: Parents' experiences. *Journal of Autism and Developmental Disorders, 42*, 2257-2262.
- Crosson, B., Barco, P.P., Vellozo, C.A., Bolesta, M.M., Cooper, P.V., Werts, D., & Brobeck, T.C. (1989). Awareness and compensation in postacute head injury rehabilitation. *Journal of Head Trauma Rehabilitation, 4*(3), 46-54.
- Eaves, L.C., & Ho, H.H. (1997). School placement and academic achievement in children with autistic spectrum disorders. *Journal of Developmental and Physical Disabilities, 9*, 277-291. doi:10.1023/A:1024944226971
- Eaves, L.C., & Ho, H.H. (2008). Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders, 38*, 739-747. doi:10.1007/s10803-007-0441-x
- Farley, M.A., McMahon, W.M., Fombonne, E., Jenson, W.R., Miller, J., Gardner, M.,...Coon, H. (2009). Twenty-year outcome for individuals with autism and average or near-average cognitive abilities. *Autism Research, 2*, 109-118. doi:10.1002/aur.69
- Farmer, L. (2011, November). *Library services for youth with autism*. Paper presented at the conference of the International Association of School Librarianship, San Juan, Puerto Rico.
- Ghaziuddin, M., Ghaziuddin, N., & Greden, J. (2002). Depression in persons with autism: Implications for research and clinical care. *Journal of Autism and Developmental Disorders, 32*, 299-306. doi:10.1023/A:1016330802348
- Gordon-Larsen, P., Adair, L.S., Nelson, M.C., & Popkin, B.M. (2004). Five-year obesity incidence in the transition period between adolescence and adulthood: The National Longitudinal Study of Adolescent Health. *American Journal of Clinical Nutrition, 80*, 569-575.
- Hillier, A., Fish, T., Cloppert, P., & Beversdorf, D.Q. (2007). Outcomes of a social and vocational skills support group for adolescents and young adults on the autism spectrum. *Focus on Autism and Other Developmental Disabilities, 22*, 107-115. doi:10.1177/10883576070220020201
- Hilton, C.L., Crouch, M.C., & Israel, H. (2008). Out-of-school participation patterns in children with high-functioning autism spectrum disorders. *American Journal of Occupational Therapy, 62*, 554-563.
- Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger syndrome. *Journal of Autism and Developmental Disorders, 33*, 3-13. doi:10.1023/A:1022270118899
- Howlin, P. (2004). *Autism and Asperger syndrome: Preparing for adulthood* (2nd ed.). London, UK: Routledge.
- Howlin, P., Goode, S., Hutton, J., & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry, 45*, 212-229.
- Kanne, S.M., Christ, S.E., & Reiersen, A.M. (2009). Psychiatric symptoms and psychosocial difficulties in young adults with autistic traits. *Journal of Autism and Developmental Disorders, 39*, 827-833. doi:10.1007/s10803-008-0688-x
- Kim, J.A., Szatmari, P., Bryson, S.E., Streiner, D.L., & Wilson, F.J. (2000). The prevalence of anxiety and mood problems among children with autism and Asperger syndrome. *Autism, 4*, 117-132. doi:10.1177/1362361300004002002
- Lin, L. (2009). Pilot study: Caregiver burden and life-span issues of autism in families of adolescents and adults with autism spectrum disorders in Taiwan. *Journal of Disability Research (Taiwan), 7*, 291-311.
- Liu, M. (2008). Screening adults for Asperger syndrome and high-functioning autism by using the autism-spectrum quotient (AQ) (Mandarin version). *Bulletin of Special Education, 33*, 73-92.
- Lugas, J., Timmons, J., & Smith, F. (2010). Vocational rehabilitation services received by youth with autism: Are they associated with an employment outcome? *Research to Practice Brief, 48*. Retrieved from http://www.communityinclusion.org/article.php?article_id=309
- Moxon, L., & Gates, D. (2001). Children with autism: Supporting the transition to adulthood. *Educational and Child Psychology, 18*, 28-40.
- Nelson, M.C., Story, M., Larson, N.I., Neumark-Sztainer, D., & Lytle, L.A. (2008). Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity, 16*, 2205-2211. doi:10.1038/oby.2008.365
- Orsmond, G.I., Krauss, M.W., & Seltzer, M.M. (2004). Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of Autism and Developmental Disorders, 34*, 245-256.
- Reimer, B., Fried, R., Mehler, B., Joshi, G., Bolfek, A., Godfrey, K.M.,...Biederman, J. (2013). Brief report: Examining driving behavior in young adults with high functioning autism spectrum disorders: A pilot study using a driving simulation paradigm. *Journal of Autism and Developmental Disorders, 43*, 2211-2217. doi:10.1007/s10803-013-1764-4
- Shattuck, P.T., Narendorf, S.C., Cooper, B., Sterzing, P.R., Wagner, M., & Taylor, J.L. (2012). Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics, 129*, 1042-1049. doi:10.1542/peds.2011-2864
- Shattuck, P.T., Orsmond, G.I., Wagner, M., & Cooper, B.P. (2011). Participation in social activities among adolescents with an autism spectrum disorder. *PLoS ONE, 6*(11), e27176. Retrieved

- from <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0027176>. doi:10.1371/journal.pone.0027176
- Shattuck, P.T., Wagner, M., Narendorf, S., Sterzing, P., & Hensley, M. (2011). Post-high school service use among young adults with an autism spectrum disorder. *Archives of Pediatrics and Adolescent Medicine*, *165*, 141-146. doi:10.1001/archpediatrics.2010.279
- Sheppard, E., Ropar, D., Underwood, G., & van Loon, E. (2010). Brief report: Driving hazard perception in autism. *Journal of Autism and Developmental Disorders*, *40*, 504-508. doi:10.1007/s10803-009-0890-5
- Shrout, P.E., & Fleiss, J.L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, *86*, 420-428.
- Stoddart, K.P. (1999). Adolescents with Asperger syndrome: Three case studies of individual and family therapy. *Autism*, *3*, 255-271. doi:10.1177/1362361399003003004
- Stucki, G., Cieza, A., Ewert, T., Kostanjsek, N., Chatterji, S., & Ustün, T.B. (2002). Application of the International Classification of Functioning, Disability and Health (ICF) in clinical practice. *Disability and Rehabilitation*, *24*, 281-282.
- Stucki, G., Ewert, T., & Cieza, A. (2002). Value and application of the ICF in rehabilitation medicine. *Disability and Rehabilitation*, *24*, 932-938.
- Tantam, D. (1991). Asperger syndrome in adulthood. In U. Frith (Ed.), *Autism and Asperger syndrome* (pp. 147-183). Cambridge, UK: Cambridge University Press.
- Taylor, J.L., & Seltzer, M.M. (2011). Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism and Developmental Disorders*, *41*, 566-574. doi:10.1007/s10803-010-1070-3
- VanBergeijk, E., Klin, A., & Volkmar, F. (2008). Supporting more able students on the autism spectrum: College and beyond. *Journal of Autism and Developmental Disorders*, *38*, 1359-1370. doi:10.1007/s10803-007-0524-8
- Wang, H.Y., & Berg, C. (2013). The development of Adolescent and Young Adults Participation Sort—Taiwanese version. *Occupational Therapy International*, *20*, 124-133. doi:10.1002/oti.1344
- Woodbury-Smith, M.R., Robinson, J., Wheelwright, S., & Baron-Cohen, S. (2005). Screening adults for Asperger syndrome using the AQ: A preliminary study of its diagnostic validity in clinical practice. *Journal of Autism and Developmental Disorders*, *35*, 331-335.
- World Health Organization. (2001). *International classification of functioning, disability and health (ICF)*. Retrieved from <http://www.who.int/classifications/icf/en>
- Wu, T.Y., & Pender, N. (2002). Determinants of physical activity among Taiwanese adolescents: An application of the health promotion model. *Research in Nursing & Health*, *25*, 25-36.