Physical Fitness and Physical Activity in Adolescents With Asperger Syndrome: A Comparative Study

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While physical activity is beneficial for youth with developmental disabilities, little is known about those individuals’ fitness profile and levels of activity. Therefore the purpose of this study was to investigate the physical fitness profile and physical activity level of 30 adolescents with and without Asperger syndrome (AS). Evaluations were done using the Eurofit physical fitness test and the Baecke Habitual Physical Activity questionnaire. A $2 \times 2$ MANOVA indicated that adolescents with AS scored significantly lower than the comparison group on all physical fitness subtests, including balance, coordination, flexibility, muscular strength, running speed, and cardio-respiratory endurance ($p < .001$). Adolescents with AS were also less physically active ($p < .001$). Engagement in physical activities is therefore recommended.

Asperger syndrome (AS) is considered to be at the higher end of the continuum of Autism Spectrum Disorders (ASD). Although individuals with AS often have behavioral and social difficulties associated with autism, people with AS tend to have language and cognitive skills within or above normal range (Attwood, 1998, 2009). The disorder is characterized by qualitative impairments in social interaction and subtle communication skills and restrictive interests (American Psychiatric Association, 1994). AS may also include motor clumsiness, problems with handwriting, and being hypo- or hypersensitive to specific sensory experiences (Gillberg & Gillberg, 1989). Besides these difficulties, individuals with AS also have positive qualities including a wish to seek knowledge and truth, albeit with a different set of priorities than the norm; being direct, honest and determined; enjoying solitude; being a loyal friend; and having a distinct sense of humor (Attwood, 2009).

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Physical activity is vital for a healthy lifestyle for individuals with and without disabilities (Ploughmann, 2008). While low fitness and physical inactivity are strongly associated with each other, research evidence also suggests that individuals with poor motor coordination are less physically active than their more coordinated peers (Bouffard, Watkinson, Thompson, Dunn, & Romanow, 1996; Hands & Larkin, 2006; Sahlander, Mattsson, & Bejerot, 2008). In his classic paper on the syndrome, Hans Asperger (1944, translated in Frith, 1989) presents four case histories and all describe children with AS as motor clumsy or poorly coordinated. About a boy named Fritz he notes, “Motor milestones were rather delayed. He learned to walk at fourteen months, and for a long time was extremely clumsy and unable to do things for himself” (Asperger, p. 39). About another boy named Harro he described, “The motor clumsiness was particularly well demonstrated in physical education lessons. Even when he was following the group’s leader instructions and trying for once to do a particular physical exercise, his movements would be ugly and angular. He was never able to swing with the rhythm of the group. His movements never unfolded naturally and spontaneously” (Asperger, p. 57). Similarly, major differences in motor competence between children on the autistic spectrum and typically developing children have been reported in a number of studies (Green et al., 2002; Sahlander et al., 2008; Smith, 2000). Of particular interest is a study by Green et al. (2002), focusing on children with AS. Their aim was to measure the severity and the extent of motor impairment in children with AS using the Movement ABC (M-ABC; Henderson & Sudgen, 1992). This M-ABC is a valid and reliable norm referenced motor ability test, used to identify children who are significantly behind their peers in motor development. Among 11 children with AS tested on the M-ABC, all obtained total test scores below the 15th percentile with nine being below the 5th percentile, indicating severe motor impairments.

Physical exercise is important for everyone, but especially for individuals with autism spectrum disorder. Where physical activity reduces the risk of chronic diseases including cancer, diabetes, and coronary heart disease in all people, research evidence with ASD suggests that moderate to intensive physical exercise is often associated with decreases in stereotypic behaviors, hyperactivity, aggression and self-injury, and increases in concentration (e.g., Elliott, Dobbin, Rose, & Soper, 1994; Rosenthal-Malek & Mitchell, 1997). Elliott et al. (1994) used different types of aerobic exercise with a group of adults with ASD and suggested that, while mild exercise (hr 90-120 beats per minute) seemed to have little effect on maladaptive and stereotypic behaviors, only more intensive aerobic exercise (hr above 130) resulted in significant reductions of these behaviors. Rosenthal-Malek and Mitchell (1997) reported that following moderate aerobic activity (20 minute jogging sessions), children with ASD experience increases in attention span and on-task behavior.

Recent research with youth with ASD, including AS, indicated that they were less active than their normal developing peers, were at similar risk for health problems associated with inactivity, and showed a similar decline in physical activity with increasing age (Pan & Frey, 2006). Where it is recommended that typically developing children and adolescents should do 60 minutes (1 hour) or more of physical activity each day, only few meet this standard (USDHHS, 2009). As increasing physical fitness and activity levels could be a key element in individuals’ with AS habilitation process, it is important to gain insight into their physical fitness profiles and activity levels. To date, these have not been thoroughly investigated. Therefore, the purpose of this study was to assess components of physical fitness and perceived
physical activity levels in adolescents with and without Asperger syndrome. Because differences in fitness levels may be related to differences in practice and training, self-reported physical activity measurements were also included in this study.

**Method**

**Participants**

Thirty young adults aged 15–21 years (M = 17.2 yrs; SD = 1.2) with Asperger syndrome agreed to participate in the study. Members of the group with AS were selected from an upper secondary vocational education program, especially designed for young adults with ASD, in the province of southern Finland. To be included in this group, all participants were required to meet the diagnostic criteria for AS as presented in the ICD-10R (F84.5; World Health Organization, 1993; i.e., deficiencies in social interaction and communication, but no clinically significant delay in language or cognitive development). A professional with 10 years of experience diagnosing people on the autism spectrum made the diagnosis. Mental retardation and psychosis were used as exclusion criteria. The group of participants with AS consisted of 9 females (M = 18.0 yrs; SD = 1.4 yrs) and 21 males (M = 16.9 yrs; SD = 0.9 yrs). Prior to the investigation, informed consent was presented orally by the principal investigator with minimal technical jargon and the aid of pictures about the test tasks. In a voluntarily additional student/parent meeting dedicated to inform both the students and their parents about this research project, the students received an informed consent form to take home. They were asked to return these documents within the same week if they intended to participate in the study. These written consents (from both the participants and their legal guardians) were collected by the principal investigator. The school’s ethical committee approved the study, and the treatment of participants was in accordance with the ethical standards of the American Psychology Association.

The control group consisted of thirty age- and gender-matched students (M = 16.9; SD = 0.8 yrs). The participants in the control group had no physical or mental disabilities according to their own reports. All participants in this study were Caucasian, followed upper secondary education, and were from the same geographic region. Demographic data on the participants are provided in Table 1.

**Table 1** Demographic Data of Adolescents With and Without Asperger Syndrome (AS)

<table>
<thead>
<tr>
<th></th>
<th>Adolescents with AS (N = 30)</th>
<th>Adolescents without AS (N = 30)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M ± SD</td>
<td>Min-Max</td>
</tr>
<tr>
<td>Age</td>
<td>17.2 ± 1.2</td>
<td>15-21</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>173.1 ± 7.3</td>
<td>158-191</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>63.7 ± 14.8</td>
<td>47-122</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>21.3 ± 4.8</td>
<td>16-39</td>
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</table>

*Note.* No significant differences observed.
Instruments

**Eurofit.** Physical fitness was assessed using selected items of the European test of physical fitness (Eurofit; Adam, Klissouras, Ravazzolo, Renson, & Tuxworth, 1988), which is widely employed within European schools. Most of these test items were used annually in adapted physical education assessments in the participating schools. For this reason, students had a certain familiarity level with the test items. Considering the difficulty these individuals may have with change and new routines, this familiarity was an important reason for choosing the Eurofit. The selected test items are also similar to the items of other widely used tests, such as the in the U.S. popular Brockport Physical Fitness Test (Winnick & Short, 1999).

The information collected included the assessment of the following components: demographic information, flexibility, musculoskeletal fitness (tests for muscle strength and endurance), motor fitness (tests for balance and speed of movement), and aerobic fitness (test for cardio-respiratory endurance). The items of this test battery, used to measure the aforementioned components, are reliable and valid, and this instrument is commonly used to measure physical fitness in children and adults in Europe (Mac Donncha, Watson, McSweeney, & O’Donovan, 1999). A detailed description of the test items is given in Oja and Tuxworth (1995). Guidelines from the Eurofit manual were followed and both the group with AS and control group were given the same test set-up.

Demographic information includes age, height, weight, and body mass index (BMI; see Table 1). BMI was defined as body mass (kg, measured using an electronic weighing scale to the nearest 0.1 kg) divided by height (m, measured to the nearest 0.1cm) squared. The items used from the Eurofit measured the following physical fitness components: **Flexibility** was measured using the sit-and-reach test (SAR). This test involves sitting on the floor with legs out straight ahead. Feet (shoes off) were placed with the soles flat against the sit-and-reach box, shoulder-width apart. The tester held both knees flat against the floor. Subjects reach as far as possible forward in a smooth and slow movement without twisting the shoulders. The knees were held in extended position by the investigator throughout the test. The better of the two trials was recorded to the nearest 1 cm. **Muscle strength** was measured by handgrip strength (HGR) using a handgrip dynamometer (JAMAR Hydraulic Hand Dynamometer) that was squeezed as forcefully as possible with the preferred hand. Subjects sat in a straight-backed chair with feet flat on the floor, shoulders adducted in a neutral position, arms unsupported, elbows flexed at 90 degrees, and forearm in neutral rotation. The better of two trials was recorded to the nearest 1 kg. **Explosive muscle strength** was measured by a standing broad jump (SBJ), using a tape measure on a foam mat. Participants were asked to stand behind the line and jump forward as far as possible using an arm swing and knee bend before jumping. The distance jumped was recorded from the take-off line to the landing point closest to the aforementioned take-off line. The better of two trials was measured to the nearest 1 cm. **Muscular endurance** was measured as the number of correctly completed sit-ups in 30 seconds (SUP). This test was performed with the hands placed at the side of the head, fingertips touching the back of the earlobes, knees bent 90°, and the subject’s feet being held by the tester. A correct sit-up was defined as
touching the knees with the elbows and returning the shoulders to the ground. **Balance** (single leg balance test, SLB) was measured as the number of attempts needed by the individuals to achieve a total duration of 30 s in balance. This test was performed on a flat firm surface on their preferred foot with eyes closed. For reasons of safety and test familiarization, this test was performed with eyes open first. **Speed and coordination of limb movement** (plate tapping, PLT) was assessed using a plate tapping table on which two rubber discs at 80 cm distance have to be touched alternately with the preferred hand as quickly as possible. The score was the amount of time needed to complete 25 cycles. The better result of the two attempts (recorded in tenths of a second) was the score. **Running speed** was assessed using a 10 by 5 m shuttle run (SHR5). Each participant was required to sprint 10 times between two lines placed 5 m apart. The track was 1.3 m wide. The result was recorded to the nearest tenth of a second.

While the previous items were from the Eurofit for children, we opted to estimate **aerobic fitness** (cardio-respiratory endurance) by using the 2 km walking test of the Eurofit for adults (UWT2). Due to possible motivational challenges of individuals with AS with regard to intensive physical activity, the Cooper test and 20 m shuttle run (both recommended endurance tests of the Eurofit for children), which typically require minimal coordination skills, were not administered. From our clinical experience, our students with AS were unlikely to persist at these tasks, typically giving up on such tests. The 2 km walking test was considered to be less demanding and targets a population that would have difficulty completing a running test (e.g., Laukkanen, Oja, Ojala, Pasanen, & Vuori, 1992). The 2-km walking test was administered outdoors on a hard, even surface. Participants warmed up for 10 minutes by walking to the testing track. The track was marked with colorful cones and one loop was 400 meters. Participants walked five laps at a brisk continuous pace, without running. The walking time was recorded to the nearest second. Heart rate at the end of the test was monitored with a heart rate monitor (Polar FS1, Polar, Kempele, Finland). Descriptive data on physical fitness profiles is provided in Table 2.

**Physical Activity Research Questionnaire (PARQ).** A questionnaire was designed to assess the participants’ physical activity background with questions about the participants’ demographic information, knowledge about physical fitness, feelings toward physical activity, and perceived physical activity level. This paper-pencil questionnaire was filled out during regular school hours under the supervision of the primary investigator. The questionnaire was completed in small groups of three to five. During an average administration time of half an hour, participants had the opportunity to ask questions regarding the questionnaire. An expert panel, existing from three licensed therapists (two physiotherapists and an occupational therapist), discussed the PARQ questionnaire and unanimously judged that the content of the questionnaire had adequate coverage on participants’ physical activity background needed to plan future intervention. To earn specific knowledge about perceived physical activity levels, a questionnaire developed by Baecke (Baecke, Burema, & Frijters, 1982) for measurement of a person’s Habitual Physical Activity (HPA) was included as an important part of the PARQ. This HPA questionnaire evaluates physical activity over the previous 12 months. The HPA makes use of easy-to-understand scales
Table 2  Descriptive Data on and Comparison of Physical Fitness Profiles of Adolescents With and Without Asperger Syndrome

<table>
<thead>
<tr>
<th>Adolescents With AS</th>
<th>Adolescents Without AS</th>
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<tbody>
<tr>
<td></td>
<td>Males (N = 21)</td>
</tr>
<tr>
<td>SAR (cm)</td>
<td>22.7 ± 11.3</td>
</tr>
<tr>
<td>HGR (kg)</td>
<td>31.9 ± 13.7</td>
</tr>
<tr>
<td>SUP (#/30 s)</td>
<td>12.8 ± 5.1</td>
</tr>
<tr>
<td>SLB (#/30 s)</td>
<td>6.0 ± 5.5</td>
</tr>
<tr>
<td>PLT (0.1s)</td>
<td>166.5 ± 65.0</td>
</tr>
<tr>
<td>SBJ (cm)</td>
<td>145.7 ± 35.6</td>
</tr>
<tr>
<td>SHR5 (0.1 s)</td>
<td>248.7 ± 38.1</td>
</tr>
<tr>
<td>UWT2 (s)</td>
<td>1079 ± 175</td>
</tr>
<tr>
<td>HF end (bpm)</td>
<td>129.7 ± 26.7</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01 for comparison of total groups with and without AS; SAR-sit and reach, HGR-handgrip strength, SUP-sit-ups, SLB-single leg balance, PLT-plate tapping, SBJ-standing broad jump, SHR5-shuttle run 5X10, UWT2-2km walking test, HF end-heart rate at end of walking test.
to assess the magnitude of physical activity and separates physical activity into three distinct dimensions, including work activity, sports activity, and leisure activity. Although each dimension had a precise set of questions, for this study we only used the “sports activity” part of the questionnaire, as we were interested in their specific sport activities during leisure time. This section included questions on sport and physical exercise in leisure time and consisted of four main questions, scored on a five-point scale: whether or not you play sports in general; whether, compared to your own age group, you think you are more or less active; whether or not you sweat during leisure time; and whether or not you play sports in leisure time. If a participant answered affirmatively to the first question, six more questions followed to gather data regarding their most frequently played sports. These questions included information on intensity and regularity of their sport activities. Baecke et al. divided sport intensity into three levels: (a) low level (e.g., billiards, sailing, bowling, golf) with an average energy expenditure of 0.76 MK/h; (b) middle level (e.g., badminton, cycling, dancing, swimming, tennis) with an average energy expenditure of 1.26 MJ/h; (c) high level (e.g., boxing, basketball, football, rugby, rowing) with an average energy expenditure of 1.76 MJ/h. Based on this, a simple sport score (SSS) for the participants’ most (SSS1) and second most (SSS2) frequently played sport as well as a physical exercise in leisure time score (PEL) were calculated. A simple sport score was calculated by multiplying the values for intensity, weekly time, and number of months spent on their most frequently played sports. The total sport score was calculated by adding both SSSs together. The PEL score was found by dividing the sum of the points on the four parameters by four. A number of studies have shown good reliability indices for Baecke’s HPA questionnaire. The values for physical exercise score were of $r = 0.93$ for Belgian adult males (Philippaerts & Lefevre, 1998). A second study showed that the questionnaire can correctly classify elderly people as low or highly active but does a poorer job for moderately active individuals (Hertogh, Monninkhof, Schouten, Peeters, & Schuit, 2008). Other data by Pols et al. (1995) showed that repeatability of the questionnaire is good and evidence based on relations to other variables (in Pols’ case an activity diary) is moderate. Descriptive data on physical activity levels is provided in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>Adolescents With AS (N = 30)</th>
<th>Adolescents Without AS (N = 30)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M ± SD</td>
<td>Min-Max</td>
</tr>
<tr>
<td>SSS1</td>
<td>112.9 ± 119.8**</td>
<td>0-406</td>
</tr>
<tr>
<td>SSS2</td>
<td>22.0 ± 45.6</td>
<td>0-185</td>
</tr>
<tr>
<td>SSST</td>
<td>120.5 ± 123.4</td>
<td>0-426</td>
</tr>
<tr>
<td>PEL</td>
<td>255.0 ± 78.1</td>
<td>100-400</td>
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Note. Level of significance *$p < .05$, **$p < .01$; SSS1-simple sport score 1, SSS2-simple sport score 2, SSST-simple sport score total, PEL-physical exercise in leisure time score.
Procedures

A team of three licensed therapists (two physiotherapists and one occupational therapist) with 5-10 years of experience in working with individuals with AS assessed the individuals with and without AS during the school year 2007-2008. Each assessment was initiated with a short (approximately 10 minutes) informative session, briefing the participants about the test situation. The verbal presentation was supported by pictures of test environments and of the test items. Thereafter, the participants responded to the PA questionnaire mentioned above. Breaks were built in and this first session took approximately one hour. Over the next few days, the students took part in the different fitness tests, conducted in small groups from 4 to 8 persons. The same selection of fitness tests and same testing procedures were used for both index (group with AS) and control group. Students wore suitable physical education clothing, so that movement was not restricted in any way. After a 10-minute warm up, the fitness tests were administered. A demonstration of every single task was given prior to test administration. Additionally, every station had a laminated information sheet, describing the specific test. These included pictures of the test position and guidelines for administration. The student-teacher ratio was 3:1. This second test session took around 1.5 hours, including build-in breaks. A week after completion of all sub-tests, the participants met the principal investigator. They received verbal and written feedback with regards to their performance and spoke about their own physical activity goals.

Data Analysis

Data were analyzed using SPSS 17 (PASW Statistics) for Windows. Descriptive statistics were obtained and the different items of the Eurofit were combined in a 2 × 2 (group by gender) MANOVA-model to assess differences between index and control group. Univariate F-tests as well as effect size statistic (partial eta-squared) were used as follow-up procedures in order to evaluate differences on the different physical fitness tests with regard to groups and gender. A 5% level of statistical significance was implied (0.05). A similar 2 × 2 MANOVA-model was used to assess differences between index and control group with regard to levels of reported physical activity.

Results

Gender is combined in description of results, because no significant interactions between group and gender were found, with, respectively, Wilk’s lambda for the mean score of physical fitness items, PF = 0.746, $F(8, 49) = 2.09$ ($p > 0.05$), and Wilk’s lambda for reported physical activity level RPAL = 0.975, $F(4, 53) = 0.35$ ($p > 0.05$).

Group Differences in Physical Fitness

The multivariate statistics of variance revealed significant main effect differences between groups on physical fitness items, with Wilk’s lambda, respectively ($\lambda_{PF}$) = 0.358, $F(8, 51) = 10.18$ ($p < .001$) and partial eta-squared = 0.56, representing
large effect. As follow up procedures, univariate F statistics indicated group differences on all subtest of the Eurofit (see Table 2). Adolescents with Asperger syndrome did not score as high as the comparison group on all physical fitness tests. Significant differences between the two groups were found in tests of balance, coordination, speed of limb movement, flexibility, strength, running speed, and cardio-respiratory endurance.

**Group Differences in Reported Physical Activity**

Significant differences were shown for reported physical activity levels with Wilk’s lambda ($\lambda_{RPAL}$) = 0.651, $F(4, 54) = 7.35$ ($p < .001$) and partial eta-squared = 0.30, representing large effect. The univariate F statistics indicated group differences on all reported physical activity variables (see Table 3).

When asked in the PARQ physical activity questionnaire if they were involved in sports activity, the majority (80 %) of the group with AS reported not being involved at all or being involved in less intense physical activities once a week. On the other hand, most individuals in the control group exercised intensely at least a few times a week.

There was an obvious discrepancy in the kinds of activities in which the index and control group were engaged. Adolescents with AS preferred solitary activities such as walking, swimming, and biking. Their typically developing peers were more engaged in team sports and group activities such as ice hockey, soccer, aerobic, and fitness classes. The participants with AS who were engaged in more intense activity had often trained and participated in one particular sport (e.g., martial arts, badminton, bowling, mountain biking, indoor climbing) and had been doing so regularly for many years. We hypothesize that they had achieved greater skill level because of intensive participation in their favorite physical leisure time activity throughout their childhood with many repetitions as a key to success. The choice of the above mentioned leisure time activities in the AS group was logical, as all activities were structured in nature and had repeated actions as well as rhythm built in. As well, these activities were less competitive and, to a certain degree, predictable. For example, in an indoor climbing unit, one climbs up as high as she/he can following a predictable route and, when finished, repels down. This is followed by belaying the climbing partner. This clear “your turn/my turn” structure as well as the choice of a preset (and clearly marked) route makes indoor climbing attractive for people with AS, because it is already adapted to their specific needs.

**Gender Differences**

Where females and males differed significantly on the physical fitness test items, Wilk’s lambda PF = 0.424, $F(8, 49) = 8.31$ ($p < .001$) and partial eta-squared = 0.58, no gender difference was found for the levels of physical activity, Wilk’s lambda = 0.99, $F(4, 53) = 0.14$ ($p > 0.05$). From the eight physical fitness test items, only four significantly differed between gender beyond the 0.05 level. As expected, males were stronger and scored higher than the females on strength items (handgrip, sit-ups, and standing broad jump). Females also scored lower on the walking test.
Discussion

To our knowledge, this was one of the first studies to examine physical fitness and physical activity levels in adolescents with AS. The obtained results relative to previous research, its implications for individuals with AS, as well as its limitations and recommendations for future research are presented in the discussion.

Results and Implications in Perspective

Adolescents with AS had lower levels of physical fitness in balance, coordination, flexibility, muscular strength, running speed, and cardio-respiratory endurance and had higher levels of physical inactivity when compared to age matched peers. Engagement in an active lifestyle, featuring individualized training adapted for adolescents with AS, may improve their overall fitness. Motivating adolescents with AS to adhere to such an active lifestyle, however, is a major challenge, as it is well documented that, in the general population, PA significantly decreases from childhood to adulthood (Telama et al., 2005). To improve program adherence in persons with AS, one must develop an exercise program that is manageable, supportive, and tailored to their interests and fitness levels. Too difficult or chaotic activities may discourage future involvement in physical activity. Inspiring students with AS to be active can be achieved by including students in the planning of the PA curriculum as well as listening to their specific reflections on activities. It is important to gather feedback about which parts of the activity they enjoyed most (e.g., warming-up, main part, or cooling down) and why certain activities at certain places are more favored. For example, our students did not like ice skating “too much” at the large and empty nearby primary school ice field, but they were thrilled skating on the “for tourists mainly” ice ring in the middle of our capital’s city centre. It was during daytime and not too busy, but it was still cozy and attractive as it had music, video clips, and skaters of various skill levels. Spontaneous reflections of adolescents with AS on assessment and physical activities may provide teachers with very interesting information that could be useful with regard to their pedagogical and curricular approach. Teachers can increase enjoyment and active participation of all students, including students with AS, in their group by keeping in mind some basic adapted physical education teaching strategies, such as organizing and structuring events into routines, using language that is clear and to the point, using pictures or visual cues to illustrate the task, being aware of sensory preferences and reducing sensory overload, using prompts and positive reinforcement, and maximizing the active time spent in the physical education class.

In this study, one week after being assessed, all students with AS voluntarily met the principal investigator for 30 minutes to discuss their test results and discuss their future physical activity goals. During this relaxed one-on-one conversation, valuable information was shared. For example, most participants reported that they only joined in physical education at school because it was required and would avoid participating if possible. Many have had very negative movement experiences in the past and have viewed themselves as clumsy and uncoordinated; often, they were the last ones picked for a team. A commonly stated negative aspect of physical education (PE) was the reliance on motor skill improvement to evaluate students’ ability. This type of assessment frequently does not take into account individual
differences and uniqueness, and is too performance related (e.g., the time it takes to swim 100 yards or the number of baskets they can make). This competitive environment can be traumatizing for individuals with AS and may result in decreased motivation and lower self-esteem. In our view, in a noncompetitive yet stimulating environment, individuals with AS often are focused and engaged in the proposed activities. It is crucial that instructors who work with people with AS focus on their strengths rather than their weaknesses. This “ability first” approach is an important step in establishing a respectful and long-lasting working relationship as it may lead to lifelong participation in physical activity.

The results of this study confirm previous research results in youth with ASD (e.g., Pan & Frey, 2006) and demonstrates that adolescents with AS are less physically active in leisure time than their peers. Adolescents with AS may be at risk for developing sedentary behavior as they mature, due to potential overuse of technology-based activities during leisure time such as “surfing” the net and TV watching (e.g., one participant reported in the research questionnaire spending in average ten hours per day surfing the web or watching recorded shows on TV), small amount of physical education time in school, lack of active recess time during secondary school, and lower physical fitness associated with the disorder. Stimulating healthy exercise habits and reinforcing positive physical activity as early in life as possible could contribute to regular participation in PA. This can be achieved by working with not only the students, but with the whole family to encourage doing fun physical activities together. Going for a swim or biking together or even a 15 minute stretch session or morning walk are strongly recommended. Such bouts of physical activities could easily be built into the daily schedule of the whole family. Another way to stimulate exercise habits is to give the adolescents a choice of age appropriate fun activities, according to what their peers would be interested in as this drives motivation. This could include a wide range of activities ranging from basic walking or swimming to more less known activities such as fencing, canoeing, orienteering, and rock climbing. Even technology-based physical activities, such as Wii boxing or tennis, may be beneficial to increase fun physical activity. Also tailor made instructional strategies, such as using pictures, giving extra slow-motioned demonstration of the activity, or adapting an activity to increase success could facilitate exercise adherence. All these together could lead to a greater appreciation of exercise, health benefits, and, as well, contribute to maximal community participation such as employment and independent living as an adult.

Limitations of the Study and Recommendations for Future Research

The small sample of convenience limits generalizability. The recruitment of participants from a preparatory training for vocational upper secondary education is a limitation that must be considered when interpreting these results. Examining the effects of physical education and the influence of educational placement on motor skill and physical fitness are areas that require further research. Although we did not assess the relationship between other important characteristics of AS—such as social interaction and communication—ongoing research is crucial to better understand the impact of these abilities in a PA environment. Future research could also examine different methods by which fitness and activity levels of students
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with AS could be increased. These could include, but are not limited to, familial considerations, peer tutoring, exercise opportunities, curricular issues, pedagogical issues, and last but not least, “social issues” related to welcoming (in many senses of the word) students with AS.

Design limitations notwithstanding, the findings of this study provide meaningful, new information regarding the physical fitness profiles and physical activity habits of adolescents with AS. Adolescents with AS were less physically fit and active than adolescents in the control group. As students with AS are at risk for physical inactivity, engagement in physical activity—with individualized training adapted for individuals with AS—is strongly recommended.

References


