

Exploring the relationships between motor proficiency, independence and quality of life in adolescents with autism spectrum disorder

Caner Ozboke¹ , Mehmet Yanardag² and Ilker Yilmaz¹ 

¹Faculty of Sport Sciences, Eskisehir Technical University, Eskisehir, Turkey; ²Research Institute for Individuals with Disability, Anadolu University, Eskisehir, Turkey

The aim of this study was to explore the relationships between autism severity, motor performance, independence in daily living skills and quality of life in adolescents with autism spectrum disorder (ASD). The study included 31 participants, aged 13–18 years. Evaluations were made with the Gilliam Autistic Disorders Rating Scale-2 (GARS-2), Bruininks-Oseretsky Test of Motor Proficiency-2 Short Form (BOT-2-SF), Functional Independence Measure (WeeFIM II), and Pediatric Quality of Life Inventory (PedsQL). Motor performance of the participants was determined as below average according to the norms of BOT-2 SF, and were negatively correlated with GARS-2 at a moderate level ($r = -0.61, p < 0.001$), and a moderate negative correlation was determined between GARS-2 and WeeFIM II ($r = -0.65, p < 0.001$) and PedsQL ($r = -0.61, p < 0.001$). Independence in daily living skills (DLS) and autism severity were found to be significant predictors of PedsQL ($R^2 = 0.463, p < 0.05$). Motor impairment still appears to be a missing piece of the puzzle for this age group. Promoting motor skill acquisition and independence could be a key factor in preventing the deterioration of physical health and improving quality of life in adolescents with ASD.

Keywords: autism spectrum disorder; motor proficiency; quality of life; independence; daily living skills; adolescents

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental and lifelong disorder that occurs in early childhood and is characterized by restricted-repetitive behavioural patterns and limitations in social communication and interaction (APA 2013). In children with ASD, stereotype behaviours such as echolalia, tolerance to pain and toe walking, or social skills and poor eye contact are prevalent (Mayes *et al.* 2012). Moreover, social interaction and communication problems can limit the physical activity opportunities to learn new complex motor and movement skills in the same way as their peers (Todd and Reid 2006). Although motor performances are not diagnostic criteria for ASD, there is a growing body of evidence in literature showing that individuals with ASD have lower levels of motor competence than those without ASD (Hudry *et al.* 2020, Fournier *et al.* 2010, Liu and Breslin 2013, Liu *et al.* 2014, Staples and Reid 2010, Pan 2014). Owing to

difficulties in motor skill areas such as fine and gross motor performance, and static and dynamic balance, participation in physical activities could be negatively affected for individuals with ASD (Liu and Breslin 2013, Pan 2014, Whyatt and Craig 2012). A study showed that individuals with ASD are less physically active than their peers (Pan 2009). Moreover, they do not have a regular participation for a physical activity program and their engagement in physical activity decreases as they get older (Memari *et al.* 2013, MacDonald *et al.* 2011). Moreover, it has been reported that participation in a motor skills program could also improve the performance of daily living skills (DLS) of individuals with ASD (Jasmin *et al.* 2009, Murphy *et al.* 2008).

DLS, defined as activities that are oriented toward taking care of one's body, are impacted by gross and fine motor, cognitive and sensory skills (American Occupational Therapy Association 1994). Especially; balance, hand-eye coordination, fine-hand use, grasping and strength are basic building blocks for the DLS during the self-care, mobility and cognition parts of the

Correspondence to: Mehmet Yanardag, Research Institute for Individuals with Disability, Anadolu University, Yunus Emre Campus, 26470, Eskisehir, Turkey. Email: myanardag@anadolu.edu.tr, yanardagm@gmail.com

daily routine. DLS also is essential for the adaptive skills, which are defined as any skill necessary to independently conduct one's own life (Matson *et al.* 2009). Children with ASD have trouble to be independent in DLS and motor aspect of the self care remain to be poor characterized for this heterogeneous group (Jasmin *et al.* 2009). Duncan and Bishop (2015) found a low level of independence in DLS in more than half of adolescents with ASD. In another study, it was determined that adults with intellectual disabilities had a higher level of independence in DLS compared to individuals with ASD (Matson *et al.* 2009). Furthermore, independence in DLS is an essential element for quality of life (QoL) (Kamp-Becker *et al.* 2010). Therefore, QoL should be taken into account in individuals with ASD (Jennes-Coussens *et al.* 2006).

QoL refers to an individual's well-being and functionality in multiple areas (Ikeda *et al.* 2014). Physiological, psychological and social factors in everyday life are seen as essential factors for life satisfaction and QoL of the individual (Kose *et al.* 2013). QoL gives the individual the chance to make inferences and decisions in important areas such as interpersonal relationships, thoughts on physical well-being, social factors, and perspectives of the self and environment (Schalock 2004). QoL and the related construct of self-determination are topics at the foreground of consideration in developmental disabilities. Self-determination is the ability of an individual to independently set goals, solve problems, make choices and decisions, regulate one's own advocate (Wehmeyer, 2010). A high QoL expects the person possesses developmentally appropriate levels of self-awareness and self-knowledge, and these may be improved as the individual is experienced to the further opportunities afforded by increased independence (Turygin and Matson 2014). Kuhlthau *et al.* (2010) found that individuals with ASD had lower levels of emotional functioning, physical and psychosocial functions than their peers. Likewise, individuals with ASD had a lower quality of life than their peers (Kose *et al.* 2013). An improvement in QoL facilitates the well-being and happiness of individuals with ASD (Kuhlthau *et al.* 2010). Independence and self-determination are necessary components for high quality of life, which increases as an individual gains adaptive skills. Therefore, independence in daily life activities could be associated with positive physiological and psychological parts of QoL in adolescents and adults with ASD (Kamp-Becker *et al.* 2010). However, further studies are needed to focus on this issue in adolescence, young adulthood and adulthood as it covers significant developmental periods and individuals may have unmatched needs during this period (Kuhlthau *et al.* 2010, Volkmar *et al.* 2014). Moreover, it is important to support the independence of individuals with ASD in their daily life skills during childhood and adolescence

(Hume *et al.* 2014). In addition, motor deficits and the life habits during childhood and adolescence are transferred to adulthood and believed to persist into adulthood (Green *et al.* 2009, Halfon and Hochstein 2002). When it is considered the essential to the biopsychosocial model of the International Classification of Function, Disability and Health (ICF), which was developed by the World Health Organization (WHO, 2001, 2007) is that individual's level of functioning is the outcome of a complex interaction among the body function, activities and participation (WHO, 2001, 2007). Therefore, the dynamic and bidirectional interaction of the motor skills (body function), DLS (activities) and QoL (participation) of the adolescents with ASD should be determined for research and clinical practice (Bölte *et al.* 2014). 'However, there is no enough data about the interaction among these components during the adolescent period, which is critical age band, because possible impairments could be determined and should be prevented to transit from the adolescent to young adulthood'. Moreover, this kind of cross-sectional study is essential to be able to determine goals for an individualized physical education program of the adolescents with ASD.

The purpose of this study was to explore the relationships between autism severity, motor skills, independence in DLS and QoL in adolescents with ASD. It was also aimed to determine the effects of autism severity on the motor skill and DLS and to investigate factors that could influence QoL. On the basis of previous knowledge, it was hypothesized that (1) relationships would exist between autism severity and motor profile, independence and QoL (2) adolescents with moderate autism symptoms would demonstrate higher performance than adolescents with severe autism symptoms; and (3) motor performance, independence and autism severity would influence QoL of the adolescents with ASD.

Materials and methods

Participants

The study included 31 adolescents with ASD. The inclusion criteria of the study were defined as ASD diagnosis, age 13–18 years, and willingness to participate in this study. The sample size was identified with a priori power analysis, the number of participants to be included in the study with 80% power with alpha error margin 0.005 was determined as at least 29 adolescents with ASD. Exclusion criteria were the presence of any comorbidity such as epileptic seizures or any additional disorder such as deafness. Thus, the sample selection in the research was purposive sampling (Fraenkel *et al.* 2011). Participants were recruited from an association established by the families of children with ASD. The association was contacted for research, and families wishing to participate were included. Participants in the

Table 1. Physical characteristics of the participants.

	Gender		Age (years)			Body height (cm) (mean ± SD)	Body weight (kg) (mean ± SD)	BMI (kg/m ²) (mean ± SD)
	Male	Female	13–14	15–16	17–18			
Participants (n / %)	28 / 90.3	3 / 9.7	15 / 48.4	10 / 32.3	6 / 19.4	163.45 (±11,8)	65.94 (±19,7)	24.77 (±6,9)

Table 2. The distribution of the study subjects according to the BOT-2 SF.

	Well Below Average Participants (n / %)	Below Average Participants (n / %)	Average Participants (n / %)
Motor profile	29 / 93.5	2 / 6.5	0 / 0

Table 3. The relationships between autism severity, motor profile, independence, quality of life, psychosocial and physical functioning.

Scale	GARS-2	BOT-2 SF	WeeFIM II	PedsQL	Psychosocial functions	Physical functioning
GARS-2	-----	-0.61***	-0.65***	-0.61***	-0.53**	-0.54**
WeeFIM II	-0.65***	-----	-----	0.58***	0.34	0.74***

* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.

study were diagnosed with ASD by a licensed physician (i.e. a child psychiatrist) based on the DSM-V criteria. The physical characteristics of the participants are given in Table 1. The Turkish Version of the Gilliam Autism Rating Scale-2 (GARS-2), Bruininks-Oseretsky Test of Motor Proficiency-Short Form, Second Edition (BOT-2 SF), Functional Independence Measure (WeeFIM II) and Pediatric Quality of Life Inventory for Children 13–18 Years Old (PedsQL) were used to evaluate individuals with ASD. All the participants were evaluated by the first author, who uses these measurement tools regularly and is qualified in the use of WeeFIM II. The autism levels of the participants were evaluated using GARS-2, then two groups were formed according to the GARS-2 classification, as those with mild to moderate symptoms (MS) ($n=7$, male = 7) and those with severe symptoms (SS) ($n=24$, female = 3, male = 21). No significant difference was determined between the groups in respect of age ($p > 0.05$). Before the study, written informed parental consent and verbal approval were obtained from all the parents of the participants in compliance with the Declaration of Helsinki. Approval for the study was granted by the Ethics Committee of the university with research proposal number 29030–2016.

Procedure

All the parents were informed about the aims and procedures of this study to explore the relationship between motor performance, independence in DLS, QoL and autism severity in adolescents with ASD. All the measurements for each participant were completed in a single day at a center. After the participants were evaluated in the gym, the parents were interviewed. The study used a descriptive, correlational and cross-sectional design (Fraenkel *et al.* 2011). The following

measurement tools were used to determine the profiles of the participants in respect of autism severity, motor skills, independence in DLS and QoL.

The Turkish version of the Gilliam autism rating scale-2 (GARS-2)

GARS-2 (Gilliam 2005) is used for the evaluation of individuals in the age range of 3–23 years who exhibit behaviours related to ASD. The scale was completed by the first author observing the participant and interviewing the parents. The scale comprises a total of 42 items as 14 items in each of 3 sub-dimensions of stereotype behaviours, communication, and social interaction. The score from the scale is classified as ‘mild to moderate symptoms’ (MS) or ‘severe symptoms’ (SS). The GARS-2 was adapted to Turkish and has been found to be valid and reliable for native speakers of Turkish. The Cronbach alpha reliability was 0.94 for the original scale, and 0.88 for the Turkish version (Diken *et al.* 2012, Gilliam 2005). The GARS-2 was used to form two subgroups of the participants with ASD to compare the characteristics (see Table 4).

Bruininks-Oseretsky test of motor proficiency-short form, second edition (BOT-2 short form)

The BOT-2 Short Form (BOT-2 SF) (Bruininks and Bruininks 2005) is a test tool that provides effective and reliable information about fine and gross motor performance. It can be completed in approximately 15–20 min for individuals aged 4–21 years. The BOT-2 SF consists of 4 parts: fine manual control, manual co-ordination, body co-ordination, and strength and agility. Each part of the BOT-2 SF has two sub-tests, so the total 8 sub-tests examine fine motor precision, fine motor integration, manual dexterity, upper-limb co-ordination, bilateral co-ordination, balance, running speed,

Table 4. The impact of the severity of ASD on motor performance, independence, and quality of life.

Variable	SS group (mean ± SD)	MS group (mean ± SD)	t
BOT-2 SF	.77±.57	1.39±.47	-2.57*
WeeFIM II	78.50 ± 14.97	97.85 ± 13.24	-3.08**
PedsQL	60.32 ± 14.40	76.55 ± 9.89	-2.77**
Psychosocial functioning	57.29 ± 14.49	71.66 ± 11.62	-2.39*
Physical functioning	66.01 ± 21.02	85.71 ± 9.85	2.38*

* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$, 'mild to moderate symptoms' (MS), 'severe symptoms' (SS).

and agility and strength. The BOT-2 SF has been found to be valid and reliable for individuals with developmental disorders. The BOT-2 SF was used to assess the motor proficiency of the participants in this study (see Table 2). The BOT-2 SF was adapted to Turkish and has been found to be valid and reliable for native speakers of Turkish (Köse 2018). The Cronbach alpha reliability was 0.78 for the Turkish version. The BOT-2 SF fine motor precision subtest (ICC = 0.57) and manual dexterity subtest (ICC = 0.74) were found to be moderately reliable, and the other subtests were found to be extremely reliable (ICC > 0.8).

Functional independence measure (WeeFIM II)

The WeeFIM II (UDSMR 2014) is used to determine the independence in DLS levels of individuals with ASD. The scale evaluates how effectively individuals can perform activities of daily life. It contains 18 items, each of which is rated on a 7-point scale ranging from 1 (total assistance) to 7 (complete independence). The scale can be scored by observation or by interviewing the subject, the parent or caregiver, and takes about 15 min to administer (UDSMR 2014). The WeeFIM II was completed by the first author during an interview with the parents of the participants. The necessary permission was obtained from UDSMR to use the WeeFIM II in this study. The Turkish version of the scale has been found to be valid and reliable (Aybay et al. 2007), the Cronbach alpha value was found to be 0.99, and ICC was 0.81 for motor WeeFIM rating and 0.92 for cognitive WeeFIM rating.

Pediatric quality of life inventory for children 13–18 years old (PedsQL)

PedsQL is a scale used to measure the quality of life of children and adolescents aged 2–18 years. It contains 23 items, with 15 items related to psychosocial functions and 8 items to physical functions. The responses to PedsQL are given on a 5-point Likert scale (0: Never, 1: Rarely, 2: Sometimes, 3: Often, 4: Always). The PedsQL forms can be completed by the parents of the participants (Varni et al. 1999, 2001). Parents of the adolescents with ASD completed the PedsQL during an interview with the first author. The Turkish version of the scale has been tested and found to be valid and reliable for a Turkish population (Çakır n Memik et al.

2007). The internal consistency coefficients of the scale were 0.73 for the physical health subscale, 0.73 for the psychosocial health subscale, and 0.82 for the total scale.

Statistical analysis

The data obtained in the study were analysed using Statistical Package for Social Sciences version 23 software (SPSS 23.0, Chicago, IL, USA). Normal distribution of the data was tested descriptively. BOT-2 SF data were not normally distributed, and so LOG10 transformation was applied (Pallant 2005, Tabachnick and Fidell 2001), after which the data were normally distributed in tests for the comparisons of the MS and SS groups. Therefore, a series of t-tests were used to compare the groups. Partial correlation analysis was used to determine the relationship between autism severity and motor performance. Pearson correlation analysis was used to determine the relationship between independence in DLS, QoL, and autism severity. Multiple regression analysis was used to explain the total variance in the QoL. A value of $p < 0.05$ was accepted as statistically significant in the study.

Results

Motor Profile: The study subjects with ASD were classified as 'well below average' (93.5%) according to the score categorization of the BOT-2 SF. A score of 'below average' was achieved by 6.5% and none reached the 'average' values of the BOT-2 SF (Table 2). A moderate negative correlation was determined between motor performance and autism severity ($r = -0.61$, $p < 0.001$) (Table 3). Higher motor performance scores were obtained by the MS group than the SS group ($t = -2.57$, $p < 0.05$) (Table 4).

Daily Living Skills: According to the WeeFIM II categories, the subjects needed assistance in grooming (64.5%), bathing (77.4%), upper (35.5%) and lower (51.6%) body dressing, toileting (61.3%), comprehension (83.9%), expression (87.1%), social interaction (90.3%), problem solving (100%), and memory (41.9%). Supervision was required in grooming (32.3%), bathing (19.4%), and upper (29%) and lower (22.6%) body dressing. When the relationship between independence level and autism symptoms was examined, a moderate, negative correlation was determined

Table 5. Multiple regression analysis results for quality of life as a dependent variable.

Variable	B	Standard error _B	β	T	p	Zero-order r	Partial r
Constant	64.381	29.575		2.177	0.038	–	–
Autism severity	–0.360	0.160	–0.421	–2.246	0.03*	–0.611	–0.397
Motor profile	–8.369	6.768	–0.340	–1.237	0.22	0.424	–0.232
Independence in DLS	0.544	0.265	0.600	2.052	0.04*	0.583	0.367

$R=0.680$, $R^2=0.463$, $F(3,27)=7.747$, $p=0.001$.

* $p < 0.05$.

between independence in DLS and autism severity ($r = -0.65$, $p < 0.001$) (Table 3). The participants in the MS group had higher scores of independence in DLS than the SS group ($t = -3.08$, $p < 0.01$) (Table 4).

Quality of Life: Pearson Correlation Analyses yielded a moderate and negative relationship between the GARS-2 scores and QoL ($r = -0.61$, $p < 0.001$), psychosocial functions ($r = -0.53$, $p < 0.01$) and physical functioning ($r = -0.54$, $p < 0.01$) (Table 3). The MS group obtained higher scores for quality of life ($t = -2.77$, $p < 0.05$), psychosocial functioning ($t = -2.39$, $p < 0.05$) and physical functioning ($t = -2.38$, $p < 0.05$) (Table 4). A positive relationship was determined between independence in DLS, and QoL ($r = 0.58$, $p < 0.001$) and the physical functioning subscale of the QoL ($r = 0.74$, $p < 0.001$) (Table 3).

The regression analysis results for predicting quality of life according to autism severity, motor performance and independence variables are given in Table 5. The variables of autism severity, motor performance and independence together had a strong, significant relationship with the quality of life scores ($R=0.680$, $R^2=0.463$, $p=0.001$). Together, these three variables explained approximately 46% of the total variance in the quality of life. According to the standardized regression coefficient, the order of relative importance of the predictive variables on quality of life was independence, autism severity, and motor performance, respectively. When the t-test results related to the significance of the regression coefficient were analysed, it was seen that independence and autism severity were significant predictors of quality of life ($R=0.680$, $R^2=0.463$, $p < 0.05$).

Discussion

The purpose of this study was to determine the relationships between motor performance, independence in DLS, and QoL of adolescents with ASD. It was also aimed to compare adolescents with moderate and severe autism symptoms in terms of the dependent variables. Previous studies have compared individuals with ASD with their healthy peers and found that individuals with ASD have lower motor performance levels (Freitag et al. 2007, Hilton et al. 2012, Liu and Breslin 2013, Pan 2014). Hilton et al. (2012) found a negative relationship between social interaction problems and motor performances of individuals with ASD. Similarly, motor

impairments in adolescents with ASD between the ages of 12–18 years were reported in another study (Chu et al. 2020). In the current study, as hypothesized, a negative moderate correlation was found between autism severity and motor performance. In addition, differences in motor performance of individuals with ASD were observed. The findings of the study are consistent with the results in the literature. Therefore, the results of the current study demonstrated that the basic characteristics of ASD could have a negative effect on motor development. It can be recommended that autism severity and different practices for individuals at different severities are examined when preparing a motor skill intervention for motor failures in adolescents with ASD. Moreover, it could be stated that the individual education programs should focus on not only autism core symptoms but also other symptoms such as motor and living skills for adolescents with ASD.

An increase in autism severity is thought to affect DLS (Matson et al. 2009). Bal et al. (2015) found that DLS in young adults with ASD were below the level expected for age. Individuals with ASD have also been found to have lower independence in DLS than individuals with intellectual disability (Matson et al. 2009). Kao et al. (2015) reported that autism severity was associated with independence in managing crucial life tasks in children and adolescents with ASD. In contrast to those studies, Duncan and Bishop (2015) indicated that autism severity is not a factor for independence in DLS in individuals with ASD. However, they also found that the majority of adolescents with ASD had lower DLS than expected (Duncan and Bishop 2015). In the current study, it was hypothesized that there would be a relationship between DLS and autism severity and that there would be differing levels of DLS in adolescents with different degrees of autism severity. The study findings supported these hypotheses. A significant negative relationship was determined between independence in DLS and autism severity, and the levels of independence in DLS were higher in the MS group than in the SS group. These results are consistent with findings in literature that individuals with ASD need assistance with daily living skills. Adolescents with ASD should definitely be included in a transition programs to increase their independence and autonomy before young adulthood period.

Independence is seen as an important factor for quality of life (Kamp-Becker *et al.* 2010). Autism symptoms may have a negative effect on QoL, and several studies in literature have reported that individuals with ASD may have a lower QoL than their peers (Delahaye *et al.* 2014, Kuhlthau *et al.* 2010). Kose *et al.* (2013) reported that autism severity was related to QoL, whereas Kamp-Becker *et al.* (2010) stated that there was no relationship between autism severity and QoL. It has also been shown that an increase in autism severity is related to a decrease in quality of life (Knüppel *et al.* 2018). The results of the present study demonstrated a negative, significant relationship between autism severity and QoL, psychosocial and physical functioning of the individuals with ASD, which confirmed the study hypothesis. In addition, it was determined that the scores of the QoL and physical functioning subscale were higher in the MS group. The underlying reason for the different results in literature could be related to the selected instruments, and the knowledge and attitude of both parents and child.

Independence and QoL in individuals with ASD are important factors throughout life (Chiang and Wineman 2014). Tilford *et al.* (2012) found a correlation between the quality of life and independence in DLS of individuals with ASD. In another study, a relationship was determined between independence and quality of life in young adults with Asperger's syndrome, high-functioning autism or atypical autism (Kamp-Becker *et al.* 2010). According to the results of the current study analysis, a positive relationship was found between independence and quality of life, thereby showing the importance of independence for a higher QoL for individuals with ASD. Practitioners should consider to increase independence in DLS in order to improve the QoL in adolescents with ASD.

The last hypothesis of the research was partially supported. Autism severity and independence in DLS were found to be predictive factors of QoL whereas motor performance was not. From the results of another similar study, it was determined that independence in DLS and autism severity are predictors of QoL in male adolescents and young adults with ASD (Kamp-Becker *et al.* 2010). De Vries and Geurts (2015) found that autism traits and daily executive functions had an impact on the quality of life. In another study of adults with ASD, parental reporting of independence in DLS was found to be one of the predictors of QoL. However, the self-reports of adults with ASD did not predict any domain of QoL (Hong *et al.* 2016). Autism severity was reported to be one of the main predictive factors for QoL in adults (17–80 years) with ASD (Mason *et al.* 2018). The results of that study showed that self-care skills such as eating, dressing and showering may be an important factor for adolescents with ASD. To be able to improve the QoL for adolescents with ASD, it

is necessary to support independence in DLS. Studies conducted on ASD have generally focussed on pre-school and older age groups. Therefore, there is a clear need for further studies of adolescents with ASD.

The present study can be considered to make some contributions to literature in terms of research and clinical findings: (1) It supports existing studies which state that adolescents with ASD may have lower motor proficiency and quality of life than their peers. (2) This study includes a narrow age range (13–18 years old) of individuals with ASD. (3) It is one of the first studies to have evaluated and compared all the variables of quality of life, daily living skills and motor performance of adolescents with ASD who have moderate and severe autism symptoms.

Limitations

There were some limitations of this study, which should be considered when the findings are interpreted based on the literature. The first limitation was sample size and the uneven number of participants in the MS and SS group, so larger number of adolescents with ASD are needed to compare clearly the effects of the higher autism symptoms on motor, independence and quality of life, and also it helps to facilitate generalization of this findings. The second was that the results were interpreted based on the selected instruments. Motor proficiency scores of the BOT-2 SF are more quantitative than qualitative, so it is difficult to draw conclusion to prepare a content of intervention. Another limitation was that because of the nature of the scales, some of the research data (autism severity, DLS and QoL) could not be collected directly from the subject but were obtained through parental interviews and confirm needs that will assist in the planning of intervention. Finally, other predictive factors that could affect the quality of life were not identified in this study. Further studies are needed to understand other predictive factors that can help to improve QoL. Moreover, it would be useful to include intellectual function (IQ scores) as it relates both motor and overall function of adolescents with ASD. There is also a need for a motor intervention to support independence in DLS, gross and fine motor skills. Future studies should include a larger sample, use direct measurement methods and focus on interventions to determine the effects of physical education programs on the target dependent variables for the population.

Conclusions

The results of this study reflected that adolescents with ASD had lower levels of motor performance which need sensory-perceptual-cognitive integration and these failures were seen more in those with severe autism symptoms. Autism symptoms seem to be a predisposing factor to deteriorate their autonomy. Motor impairment

still appears to be a missing piece of the puzzle for this age group. Practitioners should consider the connections among the ‘body function’, ‘activity’ and ‘participation’ the basis of the ICF. Therefore, a specialist should set not only motor skills goals into the individual education program (IEP) of adolescents with ASD from the ‘body function component of the ICF’, but also mobility, self-care, and domestic life goals from ‘activity component of the ICF’. In addition, practitioner should set goals, which are related with QoL, for ‘participation component of ICF’. Adolescents with ASD need individualized physical education programs to be embedded into their daily routine to improve motor dysfunction and dependence. This routine should be maintained throughout the life span to improve quality of life, and to prevent possible systemic and metabolic diseases in adulthood.

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ORCID

Caner Ozboke  <http://orcid.org/0000-0001-6051-1556>

Ilker Yilmaz  <http://orcid.org/0000-0003-4101-7223>

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