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ORIGINAL PAPER

Effects of an Inclusive Physical Activity Program on the Motor Skills, Social Skills and Attitudes of Students with and without Autism Spectrum Disorder

Ahmet Sansi[1] · **Sibel Nalbant**[2] · **Dilara Ozer**[3]

Abstract
This study investigated the effects of an inclusive physical activity (IPA) program on the motor and social skills and attitudes of students with and without autism spectrum disorder (ASD). The study sample consisted of 45 ASD and typical development (TD) students aged between 6 and 11 years. The students were randomly divided into two groups: a training group consisting of 27 students (n = 13 with ASD and n = 14 with TD) and a control group consisting of 18 students (n = 9 with ASD and n = 9 with TD). In conclusion, the IPA program increased the motor and social skills of the ASD students and improved the motor skills of the TD students and positively affected their attitudes towards the ASD students.

Keywords Attitude · Autism spectrum disorder · Inclusive physical activity · Motor skill · Social skill

Introduction

Autism Spectrum Disorder (ASD) is a pervasive neurodevelopmental condition characterized by social communication difficulties and restricted, and repetitive patterns of behaviours (APA 2013). Motor impairment is not part of the diagnosis of ASD, however 79–83% of children who have ASD do not display the appropriate motor skills of their age group (Green et al. 2009; Hilton et al. 2012). Children with ASD, compared to typically developing (TD) controls, have a variety of poor motor skills (Crucitti et al. 2019) such as kicking or catching a ball, balancing and jumping (Green et al. 2009; Staples and Reid 2010). Children with ASD may have difficulty performing age-appropriate motor skills due to having low muscle tone, impairments in postural control and motor planning and coordination disorder (Shillingsburg et al. 2015). Studies have shown that the participation of children with ASD in inclusive physical activities (IPA) with their peers makes the application of the activities easier (Ward and Ayvazo 2006), supports the social, medical (Block et al. 1995) and motor skill development (Schleien et al. 1988; Hutzler and Margalit 2009; Pan 2011) of these children. The difficulties children with ASD experience regarding the application of their age appropriate motor skills can limit their participation in activities such as playing with their peers in parks, at school, in the streets, which support the development of their communication and interaction skills (Bhat et al. 2011). MacDonald et al. (2013) stated that the weak social skills of individuals with ASD were also found lower in motor skill deficits. Participation in IPA, which is an effective tool in the development of communication and social interaction, is significantly important for children with ASD. According to the National Autism Center (2015), IPA is a method that is used not only to improve the physical sufficiency of students with ASD but to decrease behaviours that are not appropriate such as anger and self-harm and increase behaviours that are encouraged such as giving appropriate responses and taking responsibility. However, despite being inclined to or wanting to participate in physical activities, games or recreative activities with their peers children with ASD are not able to do so at the expected levels due to their communication and social interaction insufficiencies (Yanardag and Yılmaz 2017).

✉ Ahmet Sansi
ahmetsansi72@hotmail.com

[1] Vocational School of Health Services, Batman University, Batman, Turkey

[2] Faculty of Sport Sciences, Alanya Alaaddin Keykubat University, Antalya, Turkey

[3] Faculty of Health Sciences, İstanbul Kent University, İstanbul, Turkey

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Skill deficits observed in the development of social relations are also a defining feature of ASD. The deficits in the social skills of individuals with ASD may be due to their inability to be able to learn skills or their lack of motivation causing them to not use their abilities (Sivaraman and Fahmie 2018). Moreover, the difficulties experienced by individuals with ASD are mainly related to the lack of understanding others' behavior such as the inability to interpret and react to social and emotional signals given by others including eye contact and facial expressions (Sowa and Meulenbroek 2012). Studies have shown that problem behaviours are related to social communication deficits in children with ASD and the communication and interaction skills of children with ASD improved when they participated in IPA (Brookman et al. 2003; Chu and Pan 2012; Yarimkaya et al. 2017).

Problem behaviours are not part of the diagnosis of ASD, however, it has been determined that individuals with ASD display such behaviours that prevent them from learning and developing (Buschbacher and Fox 2003; Matson and Nebel-Schwalm 2007). In addition, the behavioral problems are also limit the ability of ASD students to acquire social, communication and academic skills by preventing them from joining in with learning activities and social interactions (Neitzel 2010). This can lead to a negative attitude towards individuals with ASD in physical education teachers' and peers' (Hodge et al. 2018).

An attitude study conducted on adapted physical education is the evaluation of the thoughts, feelings and beliefs of peers regarding participation and inclusive practices (Hutzler 2003). Some studies conducted in this field have showed that the general attitude towards the issues of disability and inclusiveness is positive, while some have shown ineffective and negative results. These contradictory results suggest that further research is required in this field. Thus, it is important to examine positive and negative peer attitudes towards inclusive physical education (McKay et al. 2015).

In the literature review on children with ASD, no research has been found in which social skills, motor skills and peer attitudes were analysed together. However, there are studies that examines variables seperately and results shows IPA's significant contrubiton to children with ASD. In light of the literature mentioned above, the overall aim of this study was to investigate the effects of an IPA program on the motor skills, social skills and attitudes of students with and without ASD.

Methods

Participants

Within the scope of this study, written request was sent to the Batman Provincial Education Directorate to determine all the schools providing special education to ASD students in the city of Batman, Turkey and the number of ASD students within these schools. As a result, three schools were determined, all of which were included in the study sample. In these schools, the ASD students were educated in special education classes, while the TD students were educated in separate classes in the same buildings. In total, all three schools had 25 ASD students and 4325 TD students. After establishing the number of the ASD and TD students, written permission was granted from the Batman Provincial Education Directorate to contact the directors of the three schools. Official appointments were made to discuss the planning of the study by sending e-mails to the schools. Then, meetings were held with the directors of the schools, the ASD special education teachers and the TD classroom teachers in order to determine the participating students.

After determining the primary schools and number of ASD and TD students for the study sample, the inclusion and exclusion criteria were specified.

The inclusion criteria for the students were following: being between the ages of 6–11 years old, being in the 3rd or 4th grade (TD students), not having attended IPA before, having no health problems before the start of the IPA program activities, having been officially diagnosed with a low level of ASD (ASD students), not having a second disorder such as visual and hearing impairments (ASD students). The exclusion criteria for students were following: not having attended 4 or more IPA program sessions, having a health problem during the 12-week-IPA program that preventing them to attend the program.

All 25 students with ASD from the three primary schools were included in the study as they were in compliance with the participation criteria. Among the 1858 TD students, who met the inclusion criteria 24 students 12 of which were 3rd grade students and 12 of which were 4th grade students, were determined by the simple randomization method.

Procedures

The first step of the study was to examine the student health reports by having separate meetings with the parents and teachers of the students with ASD. This assessment stage provided a general overview of the ASD students participating in the study. The next stage was planned as an adaption stage for the ASD students, in particular, and the other participants. Within this context various applications were carried out to familiarize the ASD and TD students with the teachers and their teaching environments. The voluntary physical education teachers visited the ASD students in their schools three-times in order to get to know them better before the IPA program started. During these school visits, the ASD students were also observed in the classroom environment under the supervision of the special education

teachers to monitor their behaviours in the educational environment. Moreover, in order for the ASD students to better adapt to the environment in which the IPA was going to be held, they were given two seasons of IPA in a segregated environment (without TD peers). After these sessions, the students with ASD began the IPA program with their TD peers. In order to enable both the ASD students and their peers to benefit more from the IPA program, the trainings were organized in groups of three or four by taking into account issues such as the size of the motor activity hall, the number of voluntary physical education teachers and weekly timetables of all the participating students (13 ASD students and 14 TD students).

Peer Teaching

Prior to the IPA program, the TD students were given a peer instruction in two separate 30-min sessions on disability and ASD. In these sessions, visual presentations were carried out and information regarding the general characteristics of individuals with special needs, particularly focusing on the issues that must be considered when communicating with ASD students, was given. At the end of these sessions, a question–answer session was held with the students.

Inclusive Physical Activity Principles

The IPA program was developed to improve the FMS of both the ASD and TD students. The program was applied for 1 h a day, 2 days a week for 12 weeks. The IPA program consisted of activities supporting the development of physical and motor skills, perceptual motor development and movement skills, namely locomotor, ball and balance skills. At the end of each session, a general evaluation was carried out to assess the effectiveness of the session and the principles for the next session were determined. The IPA program used the collaborative learning approach as a teaching method to increase the contact and social interaction between students with ASD and their peers. In order for the ASD students to further benefit from the IPA program, learning activities with the peer support method were also used.

The IPA program activities were implemented in four stages, which were similar to the pre-school physical education activity plan preparation. These stages were as follows: (i) immersive motions (5 min), (ii) functional exercises (10 min), (iii) group activities (35 min), and (iv) whole group activities (10 min). The first stage consisted of warm-up movements, including pleasant activities with different levels of walking, running and jumping. The second stage involved moving the body joints, strengthening muscles and flexibility to prepare the body for the group activities. In the third stage, the development of FMS was supported with activities involving mattresses, ropes, balls, hoops etc. In the final stage, games were held in which all of the students participated in. Throughout all four stages, special attention was paid to the physical contact among the students (Ozer and Ozer 2014).

Research Model

This study used the mixed-method sequential exploratory design that consisted of two stages: the quantitative stage and the qualitative stage (Ivankova et al. 2006; Tashakkori and Teddlie 2010).

The effect of the IPA program on the FMS and social skills of the students with ASD and the changes in the FMS and attitudes of the TD peers towards the students with ASD were measured in the quantitative step. In addition, a focus group interview design was used to determine the opinions of the special education teachers, peers and parents of the ASD students in order to obtain more in-depth information about the effects of the IPA program on the ASD and TD peers. Individual interviews were held with the voluntary physical education teachers, who conducted the 12-week IPA program.

Instruments

The Test of Gross Motor Development-3 (TGMD-3; Ulrich 2019) was used to assess fundamental motor skills on locomotor and ball skills. The students were quantitatively scored in accordance with the original scoring process of the TGMD-3. For the qualitative assessment of the students' test criteria for each skill (marked as either absent: "0" or present: "1") an evaluation was made on the raw scores of their locomotor and ball skills. All TGMD-3 processes were recorded on video and scored later. The TGMD-3 test was performed by three raters trained in FMS and adapted physical education and sports. In order to ensure the reliability of the data obtained from the TGMD-3, the interobserver reliability was tested. The percent agreement on the assessment score was (.85).

The Friendship Activity Scale (FAS; Bak and Siperstein 1987) was used to measure perceptions of the TD peers towards the ASD students. The FAS was developed based on the theories of social cognition regarding the development of friendship (Bak and Siperstein 1987) and described as a tool for the measurement of the behavioural components of attitudes. In the present study, an adaptation of the 17-item FAS carried out for Turkish children by Nalbant et al. (2011), was used. The test–retest reliability for this version of the FAS was found to be (.89).

The Adjective Checklist (ACL; Siperstein 1980) was used to attitudes of the TD peers towards the ASD students. The ACL was developed by Siperstein (1980) to assess the

attitudes of children by asking their judgment of the attributes of a new peer (with ID, about whom they are given a short description) (Manetti et al. 2001). The Turkish version of ACL was developed by Ciftci (1997) and was found to have an acceptable internal consistency reliability (Cronbach's alpha) coefficient of .62 and a concurrent validity rate of .53.

FAS and ACL were conducted on all of the students in a suitable environment in their schools provided by the school administration. In this environment, the TD peers were informed about the scale and were instructed to circle all adjectives that describe their autistic peers.

The Social Skills Rating System-Parent Form (SSRS-PF; Gresham and Elliot 1990) was used to measure social skills and problem behaviours of children with ASD. The SSRS-PF is administered to parents to assess the parental perceptions of child behavioral difficulties and social skills deficits. The SSRS-PF has a high test–retest reliability for social skills (.87) and problem behaviours (.65).

In the present study, the parents of children with ASD were invited to school for participate to the SSRS-PF via school administrators and were first informed about the SSRS-PF and then they responded to questions about their children's social skills and problem behaviours.

Semi-Structured Interviews

In the present study, focus groups and individual interviews were conducted by using a semi-structured interview technique. For this purpose, interview forms were prepared to explain and support the quantitative findings. Then, these questions were finalized by consulting the opinions of three academicians, who had prior experience in the field. The focus groups and individual interviews were conducted with the parents, special education teachers, voluntary physical education teachers and TD peers of the ASD students in a quiet and appropriate environment provided by the school administration. The interviews were recorded on audio and video by a researcher, who was a well-informed expert familiar with the whole research process. The full approval of all of the participants was obtained with consent forms.

Data Analysis

The statistical analysis of the quantitative stage of the data was performed by using SPSS version 21.0. The data analysis carried out with Mann Whitney U test and Wilcoxon signed-rank test aimed to determine any statistically significant differences between the TGMD-3, SSRS-PF, FAS and ACL testing scores obtained before and after the 12-week IPA program. The Mann Whitney U test was used to compare the data between the TRG and CG, while the Wilcoxon signed-rank test was used to evaluate the data for the CG and TRG groups separately.

For the qualitative stage of the data, the descriptive and content analysis techniques were used. For this purpose, firstly the interview recordings were transcribed and all of the interviewed participants were given code names. Then, the texts were read line by line, the coding was performed and the themes were created. In the final step the data were interpreted. In the interpretation of the data, the descriptive narrative was applied to the feelings and thoughts of the participants by giving the direct quotations in the present study. Overall, this qualitative data analysis was followed by considering the research aim throughout the whole process.

Results

The sample of this study consisted of a total of 49 ASD (21 boys and 4 girls) and TD (13 boys and 11 girls) students. The students who participated in the study were divided into two groups, namely the TRG and CG, by using the simple randomization method via the Office Excel 2017 program. The TRG consisted of 14 ASD students (12 boys and 2 girls) and 14 TD students (7 boys and 7 girls). The CG was comprised of 11 ASD students (8 boys and 3 girls) and 10 TD students (5 boys and 5 girls). The TRG students were higher in number in order to prevent any potential loss in the number of the students in this group. After the IPA program began, one ASD student (a girl) in the TRG and one ASD student (a girl) in the CG quit the program due to health problems. Moreover, one ASD student (a boy) and one TD student (a boy) in the CG were excluded from the study due to the fact that they did not attend the post-test of the study. As a result of the exclusions, the final study sample consisted of a total of 45 students, with 22 ASD students (13 students in the TRG and 9 students in the CG) and 23 TD students (14 students in the TRG and 9 students in the CG) (Tables 1, 2 and 3).

It should be noted that all of the participants continued their daily educational activities throughout the study. In addition to their daily routine education, both the ASD and TD students in the TRG regularly attended the IPA program for 1 h, 2 days a week for 12 weeks.

The study provided detailed information regarding the parents of the ASD students in the TRG, the special education teachers and the voluntary physical education teachers (Appendices Tables 4, 5 and 6).

The demographic information of the parents who participated in the focus group interviews is given in Appendix

Table 1 Description of the students: mean age, mean height, mean weight, mean BMI and activities carried out by ASD and TD groups

	ASD		p	TD		p
	TRG	CG		TRG	CG	
N	13 (1 girl + 12 boys)	9 (1 girl + 8 boys)		14 (7 girls + 7 boys)	9 (4 girls + 5 boys)	
M_{age} (SD)	8.69 ± .864	8.26 ± .783	.171	9.12 ± 459	9.18 ± .514	.688
M_{Height} (cm) (SD)	132.92 ± 10.003	131.44 ± 5.918	.789	140.21 ± 5.353	141.00 ± 3.570	.702
M_{Weight} (kg) (SD)	38.10 ± 16.909	34.80 ± 3.377	.483	35.22 ± 6.405	35.68 ± 6.804	.950
M_{BMI} (kg/m^2) (SD)	20.73 ± 6.142	20.27 ± 2.773	.350	17.82 ± 2.577	17.94 ± 3.288	.975
Activities	IPA program for 1 h in 2 days a week for 12 weeks	Continued daily routine special educational activities		IPA program for 1 h in 2 days a week for 12 weeks	Continued daily routine educational activities	

Table 2 Students in training groups: gender, age and class for each ASD and TD students

	ASD			TD		
	Gender	Age	Class	Gender	Age	Class
TRG1	B	10 year 1 month	4	B	9 year 1 month	3
TRG2	B	8 year 2 month	2	B	9 year 7 month	4
TRG3	G	8 year 8 month	3	G	9 year 5 month	4
TRG4	B	7 year 3 month	1	B	8 year 4 month	3
TRG5	B	8 year 2 month	2	B	8 year 6 month	3
TRG6	B	7 year 4 month	1	G	9 year 5 month	4
TRG7	B	8 year 5 month	2	G	8 year 1 month	3
TRG8	B	9 year 5 month	3	B	8 year 9 month	3
TRG9	B	9 year 6 month	3	B	9 year 4 month	4
TRG10	B	9 year 7 month	4	G	9 year 5 month	4
TRG11	B	8 year 1 month	1	G	8 year 9 month	3
TRG12	B	8 year 5 month	2	B	9 year 2 month	4
TRG13	B	8 year 2 month	1	G	9 year 2 month	4
TRG14				G	9 year 1 month	4

Table 3 Students in control groups: gender, age and class for each ASD and TD students

	ASD			TD		
	Gender	Age	Class	Gender	Age	Class
CG1	B	7 year 3 month	1	B	9 year 4 month	4
CG2	B	8 year 0 month	2	G	8 year 8 month	3
CG3	B	8 year 5 month	3	B	8 year 8 month	3
CG4	B	7 year 2 month	1	B	8 year 1 month	3
CG5	B	9 year 2 month	4	G	9 year 1 month	3
CG6	B	7 year 3 month	1	B	9 year 2 month	3
CG7	B	8 year 2 month	2	G	9 year 8 month	4
CG8	G	9 year 2 month	4	G	9 year 4 month	4
CG9	B	8 year 0 month	1	B	9 year 6 month	4

Table 4. Three parents of the ASD students in the TRG did not respond to the study invitation. Thus, they were excluded from the study. Nine parents of the ASD students in the CG were not included in the focus group interviews as the ASD students did not attend the IPA program. Therefore, the focus group interviews were conducted with the parents of 10 ASD students in the TRG. The ages of the parent participants ranged from 23 to 44 years old. It was determined that most of the parent participants were housewives and their education level was at primary school.

The special education teachers who participated in the focus group discussions is given Appendix Table 5. A special education teacher was allocated for every two ASD students as this was the code of conduct for the ASD students in the special education classes. Therefore, seven special education teachers for the 13 ASD students in the TRG were included in the present study. The ages of the special education teachers, most of which were female, ranged from 26 to 34 years old.

The information of the voluntary physical education teachers, who participated in individual interviews, was examined and as a result two voluntary physical education teachers were determined for the study. These teachers were at the ages of 23 and 24 years old, female and had an undergraduate degree.

Changes in Fundamental Movement Skills of the ASD and TD Students

In the present study, no statistically significant differences were determined in the run, gallop, hop, skip, horizontal jumping and sliding locomotor skills or in the two-hand strike, one-hand strike, dribble, catch, kick, overhand throw and underhand throw ball skills between the TRG and CG before the IPA program ($p > .05$). This showed that the ASD and TD students in both the TRG and CG had similar FMS (Appendix Table 7). However, a statistically significant difference was found in terms of the run skill of the ASD students in both the TRG and CG after the IPA program was completed ($p = .003$) (Appendix Table 8).

According to the results of the Wilcoxon signed-rank tests implemented before and after the IPA program, there was a statistically significant difference in favor of the post-program locomotor skills of the students with ASD in the TRG ($p = .003$). When the subtests of the locomotor skills were examined in detail, a statistically significant increase was observed in the run ($p = .007$), gallop ($p = .027$) and skip ($p = .046$) subtests. However, there was no statistically significant difference in the hop, horizontal jumping and sliding subtests ($p > .05$). According to the pre-test and post-test data for the ASD students in the CG, there was no statistically significant difference in the locomotor skills' subtests and total test at the end of the 12-week IPA program ($p > .05$) (Appendix Table 9).

A statistically significant difference was found in the ball skills of the students with ASD in the TRG post-program ($p = .004$). When the ball skill subtests were investigated in detail, a statistically significant difference was found in favor of the post-test two-hand strike ($p = .007$) and kick ($p = .020$) skills. On the other hand, there was no statistically significant difference in the subtests of the one-hand strike, dribble, catch, overhand throw and underhand throw skills ($p > .05$). The same analysis was carried out for the ball skill subtests of the ASD CG students with the pre-test and post-test data. This analysis showed that there was no statistically significant difference in the ball skill subtests or the total test scores at the end of the 12-week IPA program ($p > .05$) (Appendix Table 9).

A statistically significant difference was found in favor of the post-test locomotor skills of the TD students in the TRG ($p = .001$). Furthermore, when the subtests of the locomotor skills were examined in detail, a statistically significant difference was found in the run ($p = .012$), gallop ($p = .003$), skip ($p = .001$) and sliding ($p = .016$) skills. No statistically significant difference was determined for the hop and horizontal jump skills ($p > .05$). On the other hand, it was found that there was no statistically significant difference in the locomotor skills and subtests of the TD students in the CG ($p > .05$) (Appendix Table 9).

A statistically significant difference was determined in the ball skills of the TD students who participated in the study ($p = .001$). In addition, when the subtests of the ball skills were examined, statistically significant differences were in favor of the two-hand strike ($p = .001$), one-hand strike ($p = .012$), dribble ($p = .003$), catch ($p = .009$), kick ($p = .002$), overhand throw ($p = .001$) and underhand throw ($p = .001$) skills after the IPA program ($p < .05$). When the ball skills and their subtests of the TD students who did not participate in IPA were examined, it was determined that there were no statistically significant differences in any of the skills ($p > .05$) (Appendix Table 9).

Perceptions of the ASD Parents, Special Education Teachers and Voluntary Physical Education Teachers on the FMS of the ASD Students in the TRG

The following findings were obtained from the interviews conducted with the parents of the ASD students in the TRG, the special education teachers and the voluntary physical education teachers who participated in the IPA program. The participants who were interviewed stated that the IPA program increased the interest of the students with ASD towards physical activities and improved their motor skills.

Burak's father (44) said: "Burak does sports at home. We have a treadmill at home. Before this (IPA) event, he never used to use the treadmill. However, after this event he now uses it on a daily basis to walk."

Ferhat's mother, a university graduate, said: "The other day there was a round object at home, 'erbane' (a kind of percussion instrument), which was torn and shaped like a hoop. Ferhat told me to hold it as a basketball hoop. He never used to like basketball. We played basketball for an hour. I was throwing in the first half and he was throwing in the second half''. She also stated that Ferhat's sympathy for the ball had improved. Similarly, Sahin's mother, who is a housewife, said: "As I mentioned previously, he was only

hitting and pushing the ball before, now he is hitting the ball really well.''.

In addition, Emel's mother stated that there were no changes in the sports movements of her daughter. However, she also mentioned that Emel had more problems when she went for a walk before the IPA program, but that now she adapts better even when they walk longer distances.

Sevgi's teacher Narin said: "Sevgi was quite an inactive student when she came first in September. It is her 3rd year here in this class and for the first 2 years she just stayed seated. If we hadn't forced her today she would have sat here all day. So, she wouldn't have moved in any way. This year l realized that she is really more active thanks to sports activities."

The voluntary physical education teachers added that at first Sevgi had a lack of ball skills and coordination but later developed these skills.

Perceptions of the TD Students and Voluntary Physical Education Teachers on the FMS of the TD students in the TRG

The qualitative findings regarding the FMS of the TD students in the TRG in accordance with the interviews conducted with the TD students and the voluntary physical education teachers are presented below. The data obtained from the interviews determined that the TD students were very tired at the beginning of the IPA program, however, their fatigue decreased over time. Moreover, they frequently stated that their FMS had improved.

Regarding the TD students, voluntary physical education teacher Evin stated: "They couldn't even jump on one foot two or three times. After showing them a couple of times and putting them in the center of the activity they improved. They even had trouble catching a baseball or hitting a ball with a racket. They even hit the funnel instead of the ball. After showing them and training them a few times they got better." In addition, Evin stated that at the beginning of the IPA program, the TD students felt very tired during the session, however, when they continued training, they got less tired and more accustomed to the activities. Another voluntary physical education teacher, Aslı stated similar views: "… they were tired, reluctant and perhaps feeling incomplete because they were not successful. For example, they couldn't do that thing. They saw baseball as a big challenge. They couldn't do that forehand ball hit by a racket. But the others in general could do football or basketball related things. At first, gallop was challenging for them, but later they improved a lot."

The TD students also stated that they were very tired at the beginning of the IPA program and expressed themselves with the following statements.

Ilyas: "When I first came here I got really tired because it was my first time but in few weeks I got used to it".

Berfin: "I am not going to lie I got very tired. When you get used to it, it is much easier'.

Sevinc: "I got a little bit tired when I first came in, but then I got used to it".

Melek, a 4th grade student, said: "I became the fastest runner in our apartment. I'm literally the fastest among all the girls. They asked me to teach them how to run. So, I taught them the run we do here".

Additionally, Defne, who has five siblings, stated that she was now playing dodgeball much better than before and she can even catch the balls that nearly hit the ground thanks to the movements she learned in the IPA program.

Changes in the Peer Attitudes of TD Students

The FAS and ACL scores of the TD peers in the TRG and CG at the beginning of the IPA program were not statistically different ($p > .05$) (Appendix Table 10). It was determined that this situation did not change at the end of the IPA program (Appendix Table 11).

After the 12-week IPA program, it was observed that there was no statistically significant increase in the FAS ($p = .124$ in TRG; $p = .677$ in CG) and ACL ($p = .361$ in TRG; $p = .362$ in CG) scores of the TD students in the TRG and CG (Appendix Table 12).

Perceptions of the TD Peers Towards the ASD Students

As a result of the analysis of the qualitative data, it was determined that at the beginning of the IPA program, the TD peers were afraid of and felt shy towards their ASD peers, however, later they were able to communicate better with them and did not fear them.

Naz, a 4th grade student, talked about a child with special needs stating "I was scared of him. He was living in our apartment. I can't remember his name. He jumped in front of me when I was doing a running race with my friend. I got really scared." She later said that all her friends used to be afraid of their peers with ASD, but that they weren't now.

Similarly, Nazende said: "the biggest effect on me was the change in my attitude towards my ASD peers. First, I was afraid of them, but now I'm not and I do not feel shy towards them either. I am eager to spend my time with them. I was afraid of them before and I didn't want them near me but now I want to be with them."

Changes in the Social Skills of Students with ASD

At the beginning of the IPA program, no statistically significant differences were determined between the social skills

of the students with ASD in the TRG and CG with the Mann Whitney U test (Appendix Table 13). This showed that the students with ASD in the TRG and CG had similar social skill levels at the beginning of the study. The Mann Whitney U test did not reveal any statistically significant differences between the social skills of the students with ASD in the TRG and CG at the end of the IPA program (Appendix Table 14).

According to the Wilcoxon signed-rank test conducted before and after the IPA program, there was no statistically significant difference in the findings obtained from the SSRS-PF scale of the students with ASD in the TRG and CG ($p > .05$). However, according to the data of the Problem Behaviour scale, used to determine the problem behaviours of the students with ASD, it was determined that the students with ASD in the CG had a high score that created a statistically significant difference in the internalized subtest of the scale ($p = .038$) (Appendix Table 15).

Perceptions of the ASD Parents and Special Education Teachers on the Social Skills of the ASD students in the TRG

The qualitative data obtained from the study showed that there was a positive change in the social skills of the ASD students in the TRG. The changes in the social skills of the ASD students determined from the interviews with the parents and special education teachers are given below.

Murat's mother said that "there is a ball pool in Worldmar (a mall in the city of Batman) and he likes playing there. He wants to go there. In the past he didn't join in with the other kids at all. Now he wants to but we do not have such an environment. We recently moved here and we do nothave any relatives here. Before we weren't able to leave him alone with anybody. But now he asks to be left alone with others, he's not like he was before. Two weeks ago, when we visited his uncle, he played with the kids there. He liked joining in with them. Although he couldn't play as the kids did, he liked spending time with them." She also stated that Murat's speech was more understandable compared to before and that his ability to communicate with others had increased. And he had begun to ask people he came across outside when walking various things and share things with them.

Mehmet's special education teacher, Erkan, stated that Mehmet did not communicate with the other students at first, but that nowadays he makes jokes with one of his classmates, Ahmet, who is another ASD student, and that now Ahmet is teaching him new things.

Zehra, a special education teacher, expressed the changes observed in the communication among the students in the classroom environment after the IPA program. Sha said that "last year Serif, Ilhan and Serpil were in the same class. Ilhan didn't come to school for a month. Serif never even mentioned this. During this time Sadik teacher wasn't at the school for a week and so Ilhan did not come either. Serif constantly asked where Ilhan was and why he wasn't coming to school? When Ilhan did come back to school, Serif asked him and even forced him to play. He tried to communicate with him. He constantly wanted to spend time with him. He would nudge him and tell him to run so he could catch him. It made me happy to see them trying to communicate with each other as it is great progress for them.

Similarly, special education teachers Narin and Sadik also stated that the students used to act alone in their free time activities and no one made contact, but recently they are running together, playing games together and communicating with each other.

Discussion

This study determined that the 12-week IPA program had a positive effect on the FMS of both ASD and TD students according to TGMD-3 scoring (Table 4 and Appendices Tables 7 and 8). This finding was also supported by the qualitative data of the study.

There are a number of the studies in the literature that have reported the positive effects of physical activity on the motor skills of individuals with ASD (DeBolt et al. 2010; Duronjić and Válková 2010; Rogers et al. 2010; Pan 2011; Yanardag et al. 2013; Bo et al. 2019). It has been determined that physical activities varied out together with TD peers and special needs individuals do not adversely affect the motor skills of the TD peers (Block and Zeman 1996; Obrusníková et al. 2003). In fact, when carried out together, physical activities have been found to improve the motor skills of both special needs individuals and TD peers (Houston-Wilson et al. 1997; Hutzler and Margalit 2009; Pan 2011; Chu and Pan 2012; Baran et al. 2013). In compliance with the literature, the present study found that the participation of TDs in the IPA program with ASD students did not create any disadvantage for either party and that there was a significant improvement in the FMS of the students who participated in the IPA program.

Similar studies conducted by Chu and Pan (2012), Pan (2011), Hutzler and Margalit (2009) and Schleien et al. (1988), in which the changes in the FMS of ASD and TD individuals participating in an IPA program were examined, also determined that various physical activities carried out in inclusive environments supported the motor development of both ASD individuals and their peers.

In addition to the effect of the IPA program, the significant improvement in the FMS of the ASD students in the present study can be explained by the contribution of the TD students throughout the IPA program. In short, peer role

models can be considered as a supporting factor in the development of the FMS of ASD individuals.

Currently, evidence regarding exercise interventions for individuals with ASD is limited (Srinivasan et al. 2014). Thus, the National Autism Center (2015) categorized exercise and movement for ASD as emerging interventions (i.e. recognizes that there is some evidence but that it is not sufficient to be classified as an evidence-based practice (EBP). In the present study, the significant improvement in the FMS of the students with ASD throughout the IPA program is evidence that exercise should be included in the category of the EBPs.

In addition to the quantitative methods used to reach the above mentioned conclusion, a mixed method including both the quantitative and qualitative approaches were also used in support. Therefore, this study obtained strong results supported by both quantitative and qualitative research methods.

All the quantitative findings related to the attitudes of the TD students were examined and it was found that there were no statistically significant differences in the attitudes of the TD students towards their peers with ASD according to the FAS and ACL. The attitudes of the students in the TRG and CG started out positive and generally increased to an even more positive level. However, this positive change was not statistically significant. This result is similar to various previous studies published in the field (Xafopoulos et al. 2009; Liu et al. 2010; McKay et al. 2015).

The quantitative result of this study is parallel to the study of Bergman and Hanson (2000), who conducted their study with 54 university students older than 18 years. Accordingly, they divided the students into two groups as TRG and CG. A 2-day sports camp was held with the students from the TRG and the individuals with special needs. When the results were examined, there was no statistically significant difference in the attitudes of the individuals in the TRG and CG towards the individuals with special needs**.**

Klavina and Block (2008) studied an inclusive physical education program involving three elementary school children with severe and multiple disabilities and nine TD peers. They applied different teaching methods for the students with ASD, including (a) teacher-oriented, (b) peer-mediated and (c) voluntary peer support in an inclusive physical education environment. The inclusive physical education program was comprised of 46 45-munite-sessions. The results of the implementation of peer-mediated and voluntary peer support methods showed that the physical interactions increased but the social interactions remained low and the interaction among the students and teachers decreased towards the end of the program.

The lack of statistically significant changes in peer attitude in the quantitative data of the present study can be explained with Perceived Behavioral Control (PBC) (Ajzen, 2002; Beatson, et al. 2020), which has been widely used in the literature to support the development of behavioral change strategies. This theory suggests that three factors, namely attitudes, subjective norms and perceived behavioral control, intend to perform a behavior and, thus, affect the actual performance of the behavior in question (Ajzen 2002). In addition, this finding may have been caused by the social desirability bias in the survey research (Roxas and Lindsay2012). Therefore, the result could be explained by the fact that when marking their answers on the FAS and ACL the students could have been more inclined to give answers that would be accepted instead of their own right answers. Thus, PBC and social desirability may have been the reason for why there was no statistically significant difference in the results regarding the peer attitudes at the end of the study. Although there was difference in the quantitative results, the qualitative results of the study showed that the peer attitudes changed positively and the close relationships established through the IPA program affected the peer attitudes positively. In support of this, the interview data showed that the TD students were afraid of their peers with ASD at the beginning of the study and that they did not know how to communicate with them. However, as the IPA program progressed, the TD peers stopped being afraid of them and later considered them as their friends. This result could be better explained by the contact theory (Allport 1954; Tripp et al. 1995) as the TD peers changed their attitudes throughout the program. According to the contact theory both the frequency and quality of the social contact are essential for improving mutual understanding and acceptance. In addition, some studies reported that contact with children that had mental disabilities positively improved peer attitudes (Castagno 2001; Ozer et al. 2012).

The results of the study were evaluated in terms of the opportunity individuals with ASD had in participating in physical education. Various studies in the literature have reported that individuals with special needs, such as ASD, enjoyed in participating in physical activities (Coates and Vickerman 2010; Rekaa et al. 2019): However, negative peer attitudes towards such individuals prevent them from participating in physical education (Place and Hodge 2001; Obrusníková et al. 2003).

In compliance with the literature mentioned above, the results of the present study determined that participating in an IPA program can be considered as an effective method in decreasing the negative peer attitudes towards individuals with ASD and, thus, motivating them in participating in physical education. In order for an IPA program to be effective, it is essential to select physical activities that ASD and TD students will enjoy and improve their contact with each other. It may also be important to apply "peer teaching" as it positively affects peer attitudes towards ASD students. The positive changes in the attitudes of TD students are expected to be critically important in overcoming various difficulties

experienced by students with ASD in the areas of daily life and school environment. Thus, further studies are required to investigate the quality and permanence of the changing attitudes through an IPA program.

At the end of the 12-week IPA program, the SSRS-PF scale was applied to the ASD students to examine the development of their social skills. In addition, interviews were conducted with the parents, special education teachers and voluntary physical education teachers of the ASD students. When the data of the SSRS-PF was examined it was determined that there were no statistically significant differences in the development of the social skills of the students with ASD. The students with ASD may need a longer process than a 12-week IPA program to fulfill the items specified in the scale e.g. keeping their room clean without being reminded or asking salespersons for information or assistance when purchasing something. The data obtained from the interviews, however, showed positive changes in the social skills and communication skills of the ASD students. For example, a parent stated that her child had more interactions with her peers after the IPA program and that her speech was more understandable. Another parent added that the IPA program was useful for her child, who had started playing with her neighbors' children even though she had never done so before. Moreover, the special education teachers observed that their students began to have interactions with each other after the IPA program. They also added that the students were more aware of each other and played and spent more time with each other in their free time. In parallel to results of this study, a number of relevant studies showing an IPA program positively affecting the social skills of individuals with ASD have been published (Chu and Pan 2012; Yarimkaya et al. 2017).

Any increases in ASD symptoms have been found to decrease the social skills and FMS of the ASD individuals (Memari et al. 2015, 2017). A number of the studies in the literature reported that individuals with ASD had similar social skills and FMS levels and also a significant relationship between them (Staples and Reid 2010Hirata et al. 2014; Hannant et al. 2016; Craig et al. 2018; Reinders et al. 2019). It can be stated that based on the information that there is a significant relationship between the social skills and FMS of individuals with ASD, the improvements observed in the FMS of the ASD individuals as a result of participating in the IPA program positively affected the social skills characterized by ASD. Moreover, it can be suggested that participation in games based on collaboration and partnership, which were used as a base when preparing the IPA program, was an approach that provided opportunities for the participants to establish social relations. It is suggested that future studies should investigate the long-lasting effects of an IPA program on the social skills of individuals with ASD.

Limitations

This study has various limitations, one of which is the fact that the participants of this study were limited to students of primary schools providing special education classes in the city of Batman, Turkey. As a result, the sample size of the study was small, which may have impacted on the statistical analyses for the quantitative data. In addition, a part of the study was based on self-reported data. As students and parents reported their own feelings it is possible that they could have been influenced by recent events or how they felt at the time. In turn, this could have impacted the way they answered the questionnaires. This may have affected the way they answered the study questions. In the literature, very few studies examining the motor skills of ASD and TD students, the social skills of the individuals with ASD and the changes in TD peers' attitudes have been conducted. Thus, there were limited results from the literature to compare the results of the present study with.

Conclusion

This study concluded that the 12-week IPA program was an effective method for improving the social skills and FMS of the students with ASD. In addition, the results demonstrated that this was an effective method for developing the FMS in TD peers and creating positive changes in their attitudes.

For future studies, the interventions can be adapted to increase the participation of individuals with ASD in physical activities and encourage families to participate in these practices. Therefore, future studies should investigate how the daily physical activity levels of individuals with ASD who participate in IPA programs with their parents are affected. This study also recommends that the effects of an IPA program on the academic skills and physical fitness levels of the ASD and TD students of different age groups be examined. Furthermore, the results of this study should be compared with those for students with the medium and heavy levels of ASD. In conclusion, this study recommends the effectiveness of an IPA program on other disability groups e.g. students with physical, intellectual and behavioral disabilities be investigated. This will validate the effectiveness of an IPA program across different disabilities.

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Author Contributions DÖ contributed to the design of the research. AS implemented and completed all data collection and analysis of this research. AS drafted the manuscript and SN augmented, revised, and strengthened the final copy. All authors read and approved the final manuscript.

Compliance and Ethical Standards

Conflict of interest The authors declare they have no conflict of interest.

Ethical Approval All the procedures performed in this research were accordance with the ethical standards of Istanbul Gedik University in the Republic of Turkey.

Informed Consent Informed consent was obtained from all individual participants included in the research.

Appendix

See Tables 4, 5, 6, 7, 8, 9, 10, 11, 12 ,13, 14 and 15

Table 4 Description of parents of students with ASD in TRG

	Code name	Age	Gender	Education	Occupation
1	Ahmet	34	M	Secondary school	Self-employed
2	Asmin	30	F	Secondary school	House wife
3	Ceylan	32	F	High school	House wife
4	Arzu	43	F	Primary school	House wife
5	Leyla	35	F	Primary school	House wife
6	Zilan	29	F	Primary school	House wife
7	Gülsen	34	F	Primary school	House wife
8	Sema	23	F	Undergraduate	House wife
9	Deniz	28	F	High school	House Wife
10	Osman	44	M	Primary school	Farmer

Table 5 Description of special education teachers

	Code name	Age	Gender	Education
1	Narin	28	F	Undergraduate
2	Erkan	26	M	Undergraduate
3	Zehra	29	F	Undergraduate
4	Sadik	28	M	Undergraduate
5	Nuran	34	F	Undergraduate
6	Özge	27	F	Undergraduate
7	Bilge	32	F	Undergraduate

Table 6 Description of volunteer physical education teachers

	Code name	Age	Gender	Education
1	Aslı	23	F	Undergraduate
2	Evin	24	F	Undergraduate

Table 7 Results for the ASD and TD students' pre-test assessment of fundamental movement skills in TRG and CG before IPA program

Variables	ASD						U	TD						U	p
	TRG			CG				TRG			CG				
	n	MR	SR	n	MR	SR		n	MR	SR	n	MR	SR		
Run	13	11.46	149	9	11.56	104	58	14	12.18	170	9	11.17	105	60	.870
Gallop	13	9.96	129	9	13.72	123	38	14	13.43	188	9	9.78	88	43	.188
Hop	13	12.04	156	9	10.72	96	51	14	12.75	178	9	10.83	97	52	.490
Skip	13	11.35	147	9	11.72	105	56	14	12.00	168	9	12.00	108	63	1
Horizontal Jump	13	10.54	137	9	12.89	116	46	14	13.25	185	9	10.06	90	45	.261
Slide	13	10.35	134	9	13.17	118	43	14	11.68	163	9	12.50	112	58	.770
Lokomotor	13	10.08	131	9	13.56	122	40	14	13.32	186	9	9.94	89	44	.242
Two-hand strike	13	11.00	143	9	12.22	110	52	14	11.50	161	9	12.78	115	56	.650
One-hand strike	13	11.00	143	9	12.22	110	52	14	13.86	194	9	9.11	82	37	.095
Dribble	13	11.50	149	9	11.50	103	58	14	11.89	166	9	12.17	109	61	.923
Catch	13	11.19	145	9	11.94	107	54	14	12.96	181	9	10.5	94	49	.377
Kick	13	11.04	143	9	12.17	109	52	14	12.14	170	9	11.78	106	61	.897
Overhand throw	13	11.85	154	9	11.00	99	54	14	12.19	181	9	10.56	95	50	.408
Underhand throw	13	12.50	162	9	10.06	90	45	14	10.93	153	9	13.67	123	48	.332
Ball skills	13	11.12	144	9	11.12	108	53	14	12.64	177	9	11.00	99	54	.569

MR Mean rank, *SR* sum of ran

Table 8 Results for the ASD and TD students' post-test assessment of fundamental movement skills in TRG and CG after IPA program

Variables	ASD						U	p	TD						U	p
	TRG			CG					TRG			CG				
	n	MR	SR	n	MR	SR			n	MR	SR	n	MR	SR		
Run	13	14.88	193	9	6.61	59	14	.003*	14	14.75	206	9	7.72	69	24	.003*
Gallop	13	12.27	159	9	10.39	93	48	.464	14	15.21	213	9	7.00	63	18	.002*
Hop	13	12.15	158	9	10.56	95	50	.399	14	14.89	208	9	7.50	67	22	.008*
Skip	13	12.08	157	9	10.67	96	51	.521	14	16.50	231	9	5.00	45	0	.000*
Horizontal Jump	13	11.35	147	9	11.72	105	56	.880	14	13.82	193	9	9.17	82	37	.101
Slide	13	11.50	149	9	11.50	103	58	1.00	14	14.79	207	9	7.67	69	24	.010*
Locomotor	13	12.85	167	9	9.56	86	41	.239	14	16.18	226	9	5.50	49	4	.000*
Two-hand strike	13	12.12	157	9	10.61	95	50	.585	14	16.36	229	9	5.22	47	2	.000*
One-hand strike	13	12.88	167	9	9.50	85	40	.074	14	16.43	230	9	5.11	46	1	.000*
Dribble	13	11.35	147	9	11.72	105	56	.789	14	14.14	198	9	8.67	78	33	.025*
Catch	13	10.73	139	9	12.61	113	48	.486	14	15.46	216	9	6.61	59	14	.001*
Kick	13	11.88	154	9	10.94	98	53	.725	14	15.14	212	9	7.11	64	19	.004*
Overhand throw	13	12.00	156	9	10.78	97	52	.519	14	15.96	223	9	5.83	52	7	.000*
Underhand throw	13	12.35	160	9	10.28	92	47	.373	14	15.71	220	9	6.22	56	11	.001*
Ball skills	13	11.46	149	9	11.56	104	58	.973	14	16.50	231	9	5.00	45	0	.000*

MR mean rank, *SR* sum of rank

*$p < .05$

Table 9 Results for the ASD and TD students' pre-test and post-test assessments of fundamental movement skills in TRG and CG before and after IPA program

Variables	Ranks	ASD								TD							
		TRG				CG				TRG				CG			
		n	MR	z	p	n	MR	z	p	n	MR	z	p	n	MR	z	p
Run	Increase	10	2.5	−2.68	.007*	1	3.5	−1.78	.074	8	1.5	−2.51	.012*	3	4.13	−0.42	.670
	Decrease	2	7.3			4	1			1	5.44			4	3.83		
	Same	1				4				5				2			
Gallop	Increase	6	0	−2.2	.027*	4	5	−0.1	.915	12	2.5	−3.02	.003*	4	4.25	−0.14	.887
	Decrease	0	3.5			2	2.75			1	7.38			4	4.75		
	Same	7				3				1				1			
Hop	Increase	1	0	−1.0	.317	0	1	−1	.317	9	6.75	−1.32	.187	2	3.65	−0.85	.395
	Decrease	0	1			1	0			4	7.11			4	3.25		
	Same	12				8				1				3			
Skip	Increase	4	0	−2.0	.046*	1	1	−0.44	.665	14	0	−3.32	.001*	3	4.38	−0.63	.527
	Decrease	0	2.5			1	2			0	7.5			4	3.5		
	Same	9				7				0				2			
Horizontal Jump	Increase	4	0	−1.89	.059	2	1.75	−0.55	.581	7	4.13	−1.49	.136	4	4.25	−0.14	.886
	Decrease	0	2.5			2	3.25			4	7.07			4	4.75		
	Same	9				5				3				1			
Slide	Increase	4	0	−1.84	.066	2	2	−0.37	.705	8	2.5	−2.4	.016*	1	3.5	−0.15	.131
	Decrease	0	2.5			2	3			1	5.31			5	3.5		
	Same	9				5				5				3			
Lokomotor	Increase	11	1.5	−2.97	.003*	4	5	−0.28	.778	12	1	−3.24	.001*	2	4.42	−1.19	1.00
	Decrease	2	8			4	4			1	8			6	4.75		
	Same	0				1				0				1			
Two-hand strike	Increase	9	0	−2.7	.007*	4	4.5	−0.81	.778	14	0	−3.32	.001*	4	5.25	0.00	1.00
	Decrease	0	5			1	2.63			0	7.5			2	10.5		
	Same	4				4				0				3			
Onehand strike	Increase	4	0	−1.8	.068	0	1	−1	.317	12	6.75	−2.5	.012*	4	5.5	−0.58	.557
	Decrease	0	2.5			1	0			2	7.63			4	3.5		
	Same	9				8				0				1			
Dribble	Increase	1	0	−1.0	.317	1	0	−1	.317	11	1,5	−2.96	.003*	5	6	−0.94	.343
	Decrease	0	1			0	1			1	6.95			1	3		
	Same	12				8				2				3			
Catch	Increase	4	4.3	−0.4	.666	4	4	−0.53	.595	10	3	−2.63	.009*	3	4	−0.35	.726
	Decrease	2	3.1			2	3.25			2	7.2			4	4		
	Same	7				3				2				2			
Kick	Increase	7	1.5	−2.3	.020*	4	2	−1.51	.131	12	0	−3.1	.002*	5	5.13	−0.24	.809
	Decrease	1	4.9			1	3.25			0	6.5			4	4.9		
	Same	5				4				2				0			
Overhand throw	Increase	3	2	−1.1	.257	1	0	−1	.317	13	1	−3.2	.001*	4	3.63	−0.49	.619
	Decrease	1	2.7			0	1			1	8			4	5.38		
	Same	9				8				0				1			
Underhand throw	Increase	1	0	−1.0	.317	1	0	−1	.317	14	0	−3.32	.001*	4	4.63	−0.07	.944
	Decrease	0	1			0	1			0	7.5			4	4.38		
	Same	12				8				0				1			
Ball skills	Increase	11	2.5	−2.9	.004*	6	2.5	−1.82	.068	14	0	−3.29	.001*	3	3	−0.42	.647
	Decrease	1	6.9			2	5.17			0	7.5			5	7		
	Same	1				1				0				1			

MR mean rank

*p < .05

Table 10 Results for the TD peers' pre-test assessment of FAS and ACL in TRG and CG before IPA program

Variables	TRG			CG			U	p
	n	MR	SR	n	MR	SR		
FAS	14	12.79	179	9	10.78	97	52	.487
ACL	14	12.64	177	9	11.00	99	54	.569

MR mean rank, *SR* sum of rank

Table 11 Results for the TD peers' post-test assessment of FAS and ACL in TRG and CG after IPA program

Variables	TRG			CG			U	p
	n	MR	SR	n	MR	SR		
FAS	14	13.54	189	9	9.61	86	41	.173
ACL	14	10.46	146	9	14.39	129	41	.173

MR mean rank, *SR* sum of rank

Table 12 Results for the TD peers' pre-test and post-test assessments of FAS and ACL in TRG and CG before and after IPA program

Variables	Rank	TRG				CG			
		n	MR	z	p	n	MR	z	p
FAS	Increase	10	7.83	− 1.53	.124	6	6.33	− 0.41	.677
	Decrease	3	6.75			3	4.33		
	Same	1				0			
ACL	Increase	9	8.13	− 0.91	.361	5	3.83	− 0.91	.362
	Decrease	4	6.50			3	4.90		
	Same	1				1			
	Increase	9	9.30	− 0.37	.705	5	3.67	− 0.98	.326
	Decrease	4	5.00			2	2.50		
	Same	1				4			

MR mean rank

Table 13 Results for the ASD students' pre-test assessment of SSRS-PF in TRG and CG Before IPA program

Variables	TRG			CG			U	p
	n	MR	SR	n	MR	SR		
SSRS								
Responsibility	13	11.85	154	9	11.00	99	54	.763
Co-operation	13	11.69	152	9	11.22	101	56	.866
Self-control	13	11.15	153	9	11.11	100	55	.811
Assertion	13	11.77	145	9	12.00	108	54	.760
PB								
Externalizing	13	11.23	107	9	11.89	107	55	.813
Internalizing	13	11.31	106	9	11.78	106	56	.862
Hyperactivity	13	11.50	103	9	11.50	103	58	1.00

MR mean rank, *SR* sum of rank

Table 14 Results for the ASD students' post-test assessment of SSRS-PF in TRG and CG after IPA program

Variables	TRG			CG			U	p
	n	MR	SR	n	MR	SR		
SSRS								
Responsibility	13	11.04	143	9	12.17	109	52	.687
Co-operation	13	11.77	153	9	11.11	100	55	.814
Self-control	13	10.15	132	9	13.44	121	41	.232
Assertion	13	11.04	143	9	12.17	109	52	.684
PB								
Externalizing	13	11.69	152	9	9.33	84	42	.248
Internalizing	13	12.65	164	9	9.83	88	43	.303
Hyperactivity	13	11.92	155	9	10.89	98	53	.710

MR mean rank, *SR* sum of rank

Table 15 Results for the ASD students' pre-test and post-test assessments of SSRS-PF in TRG and CG before and after IPA program

	Rank	TRG				CG			
		n	MR	z	p	n	MR	z	p
Responsibility	Increase	2	4.43	1.01	.312	4	5.80	−0.77	.440
	Decrease	7	7.00			5	4.00		
	Same	4				0			
Co-operation	Increase	4	6.38	−0.94	.342	1	4.14	−1.55	.120
	Decrease	8	6.75			7	7.00		
	Same	1				1			
Self-control	Increase	3	5.93	1.44	.148	2	4.67	−1.40	.159
	Decrease	7	4.50			6	4.00		
	Same	3				1			
Assertion	Increase	6	6.83	−0.15	.875	4	4.50	0.00	1.00
	Decrease	6	6.17			4	4.50		
	Same	1				1			
Externalizing	Increase	5	5.80	−0.15	.877	5	2.00	−1.80	2.07
	Decrease	5	5.20			1	3.80		
	Same	3				3			
lnternalizing	Increase	6	3.50	−1.43	.151	5	.00	−2.07	.038*
	Decrease	3	5.75			0	3.00		
	Same	4				4			
Hyperactivity	Increase	0	.00	0.00	1.00	0	.00	0.00	1.00

MR mean rank

*p < .05

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