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RESEARCH ARTICLE

Comparison of The Physical Fitness Parameters of Special Education Vocational School Students and Inclusion High School Students

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Abstract
This study compared the physical fitness parameters of intellectually disabled special education vocational school students with those of inclusive high school students using the causal comparison method. Participants consisted of 22 (15 male, 7 female) from Special Education Vocational School and 25 (20 male, 5 female) inclusion students receiving inclusive education at high school. A physical fitness form was used to collect data on body mass index (BMI), standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30 m sprint, and push-ups. The T-test was applied to data exhibiting normal distribution, while the Mann-Whitney U test was used for data not normally distributed. Among the parameters showing normal distribution, there were significant differences between the two different student groups in the standing long jump, flexibility, left-hand reaction, leg strength, and right-left hand grip strength. Although a significant difference was observed in the right-hand reaction, no significant differences were detected for the other non-normally distributed parameters of BMI, back strength, 30-m sprint, and push-ups. Our results indicated that students with intellectual disability (ID) enrolled in inclusive education at the high school level performed better in all physical fitness tests conducted compared to their peers in special education vocational schools.

Keywords
Special Education Vocational School, Inclusive Education, Intellectual Disability, Students With Special Needs, Physical Fitness

INTRODUCTION

Intellectual disability (ID) is defined as a significant limitation in both mental functions and adaptive behaviors pertaining to numerous daily, social, and practical skills (APA, 2022). Early diagnosis and placement are crucial to support these deficiencies and to enable those with ID to benefit from an educational environment best suited to their needs. Following a medical diagnosis of ID in Turkey, an educational evaluation is conducted by the Guidance Research Centers and individuals are placed in the most suitable educational environment. Such settings include special education schools, special education vocational schools, and inclusive schools where students with ID can receive an inclusive education with their typically developing peers. Multiple transitions occur in the educational lives of individuals with ID, including moving from kindergarten to elementary school, elementary to middle school, middle school to high school, and entering adult life. Prior to reaching adulthood, high school education is as critical as the other educational levels. Upper secondary education should support the goal of jobs for all by providing qualifications and guidance for either admission to higher education or entry into employment (Gustavsson et al. 2021). Students with ID may enroll in special education vocational high schools if they do not sufficiently benefit from inclusive education. In such educational settings, individuals with ID are

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expected to focus on obtaining skills related to employment or daily life (Wendelborg et al. 2017).

In Turkey, both inclusive and special education vocational schools exist for individuals with mild ID in the transition from secondary school to high school, a transition that is at once necessary and critical. During this period, greater independence is encouraged while the child undergoes physical changes and prepares for adult life (Lane et al. 2015; Mandy et al. 2015). Studies have reported that inclusive high school students with ID are afforded much less attention (Lightfoot & Bond, 2013; Bouck, 2012). Most of the research on transition for students with ID focuses primarily on out-of-school transition or early childhood (Marshall et al. 2018; Bouck, 2016). In addition, the number of studies on the physical fitness of children with ID in high school are limited (Bossink et al. 2017). The less active lifestyles led by individuals with ID (Skowronski et al. 2009) are reflected in their physical fitness levels, which negatively affect their adult life skills (Cuesta-Vargas & Pérez-Cruzado, 2014; Vargas et al. 2022). Physical fitness, defined as the capacity of an individual to perform work, is one of the factors that determines effective functioning in life skills in addition to having a significant impact on health (Bibro & Żarów, 2021). To be considered physically fit, one must possess the ability to actively execute daily tasks without feeling tired as well as the necessary energy to spend one's free time in joyful pursuits (Gallahue et al.2014; Baltacı, 2016). For this reason, it is important to assess the physical fitness levels of individuals with ID at the high school level, the last stage before the transition to adult life. By examining the effects of physical education programs applied in accordance with the curricula of two different types of schools on the physical fitness of students with ID within the scope of this research, we can achieve greater understanding of the physical fitness levels of these individuals, thus contributing to the literature on this subject.

Physical education and sports programs are assumed to contribute to the development of individuals' physical fitness and to improve the efficacy of their adult life skills, with suggestions in alignment with the desired results. The focus of the present study was the comparison of the physical fitness parameters of students with ID attending special education vocational school students versus those in inclusive high schools, in an attempt to answer the research question "Is there a difference between the physical fitness levels of the students according to the type of school?. The answer to this question will not only provide information about the physical fitness levels of individuals with ID educated in different types of schools but also hopefully generate ideas for future research as well as for policymakers, thanks to the suggestions that emerge.

MATERIALS AND METHODS

In this study, the causal comparison research method, a type of quantitative research design, was employed.

Participants

A total of 47 students with mild intellectual disabilities educated in schools affiliated with the Ministry of National Education in the 2021-2022 academic year were included in the study. While 22 of these students (7 girls, 15 boys) attended special education vocational schools between the ages of 16-21 (mean: 17±1.3), the other 25 students (5 girls, 20 boys), with ages ranging from 13-18 (mean: 15 ±1.4), received inclusive education in high schools located in the city center.

Data Collection Tools

Ethical approval for this study was granted by the directorate of the Scientific Research and Ethics Committee of Muş Alparslan University (document date and number 01.03.2022-42225). Parental consent was obtained in writing from the families of the students included in the study. Information regarding the participants was gathered from the relevant special education classroom teachers and school administration. The physical fitness parameters of the participants were measured and entered on the Physical Fitness Test Information Form and the following data were collected for each study participant.

Age, Body Weight, and Height

The ages of the students participating in the study were recorded by referencing the official records of the institutions they were attending. Their weights were measured using a Fakir brand electronic scale with a capacity of 150 kg and a sensitivity of 0.01 kg, with the students removing their shoes prior to being weighed. Measurements were taken with the head held upright, the soles of the feet flat on the scale, the knees stiff, heels together, and the body in an upright position. The results obtained were recorded in the Physical Fitness Test Information Form in kilograms. For the

height measurements of the students, they were instructed to stand without shoes, with the heels close, body and head upright, and eyes facing forward. When the sliding caliper apparatus touched the head, the height value obtained was entered in cm in the Physical Fitness Test Information Form (Lange et al. 2021).

Body Mass Index (BMI)

Body mass index (BMI) was calculated by dividing the body weight (kg) of the students participating in the study by the square of their height (m) (Krause et al. 2016).

Standing Long Jump

The participants' feet were placed on a starting line and they were instructed to jump forward as far as possible by pulling their arms back and leaning their torso forward. The students were directed to fall on both feet with their arms in front, and the distance between the starting line and the point where their heels contacted the ground was then measured. Two trials each were performed and the score was recorded in cm. According to the scoring in the evaluation scale, the farthest distance jumped by each participant was scored between 0-12 (Logan et al. 2017).

Flexibility (Sit-Reach) Test

The sit-and-reach test was used to measure flexibility. Students were directed to remove their shoes and place the soles of their feet on the support section of the flexibility board. They then reached forward with both arms without bending their knees, pushing the ruler on the flexibility board slowly with their fingertips, extending as far as possible for 1-2 seconds. The test was repeated twice and the best result was recorded in centimeters in the Physical Fitness Test Information Form in centimeters (Fiori et al. 2020).

Right-Left Hand Reaction Time Test: New Test 1000

During this test, the students and the tester sat opposite each other at a table opposite each while the tester guided the student by giving them the necessary information. The instrument used in this test measures visual or auditory simple reaction time and visual selective reaction time. The number of alerts can be adjusted and each alert interval occurs randomly. The test environment was free of possible environmental effects that could impair the student's ability to concentrate during the test. The test was performed with the student's hands on their knees and in an upright position while observing the stimulus relayed by the tester. Prior to evaluating each student's measurements, three attempts were made to measure the reaction times. The visual and auditory reaction times for each hand were then measured, with three repetitions allowed for each. The best score for each was recorded (Mayda et al. 2016).

Measuring Back and Leg Strength

The Takei digital dorsal leg dynamometer (model TKK 5402, Takei Scientific Instruments Co. Ltd., Tokyo, Japan) was used to evaluate back and leg strength. To measure back strength, the students first fixed their feet on the dynamometer board, while their knees and arms remained taut. They then gripped the dynamometer firmly in their hands, with their backs straight and torsos bent slightly forward. The measurement was completed by pulling the dynamometer bar vertically upwards utilizing maximum power. During the measurement of leg strength, the students' knees were slightly bent and their feet were fixed on the dynamometer board. They held their arms taut and brought their backs and trunks to an upright position while the dynamometer bar was firmly attached. Finally, they lifted the dynamometer vertically with maximum force using their leg strength, thus completing the measurement. Following 3-5 minutes of warm-up, each strength measurement was repeated 3 times and the best results were recorded. The relative strengths of each measurement were subsequently calculated (Senturk et al. 2021).

Right-Left Hand Grip Force

A Takei brand Hand Grip 5401 hand dynamometer, which measures strength from 0-100 kg, was used to determine grip force. The dynamometer was first adjusted to fit the students' hands, then their arms were extended straight at a 10-15 degree angle from the shoulder. The students were instructed to squeeze the dynamometer with maximum force while standing upright, with their arms at their sides but not touching the body. Two measurements were made separately each for the right and left hands, and the best result for each was recorded in kg in the Physical Fitness Test Information Form (Guidetti et al. 2010).

Speed Measurement

To assess the speed of the participants, the 30-m sprint test was employed. Prior to the start of the test, a distance of 30 m was measured. At the starting line, the students assumed a crouching position and were instructed to run with maximum power until reaching the finish line. A Casio brand stopwatch was used to measure their speed. Each

student was allowed two attempts, with the time for each sprint measured using two different chronometers (the average time of the two chronometers for each attempt was considered a single measurement). The fastest time was then recorded in the Physical Fitness Test Information Form (Battaglia et al. 2013).

Push-Up Test

The push-up test was used to determine the upper extremity strength and endurance of the students. When performing this movement, the students were positioned facing the floor, with their arms stretched and their fingertips touching the floor. The students were asked to bend their arms at the elbows and direct their torsos toward the ground. The number of times the students were able to perform push-ups with maximum strength was recorded on the Physical Fitness Test Information Form (Guidetti et al. 2010).

Data Analysis

In this study, the SPSS 22.0 statistical package program was used to analyze the data. Prior to analyzing the data, a normality test was performed. The T-test, one of the parametric tests, was employed for data exhibiting normal distribution, while the Mann-Whitney U Test, a nonparametric test, was used for non-normally distributed data. A value of $p < .05$ obtained from the analyses was accepted as statistically significant, and the findings were arranged in tables.

RESULTS

This section presents the findings of the statistical analyses of the data obtained in the study.

Table 1. Statistical distributions for inclusion students

Parameter	Min.	Max.	X_{median}	Standard Deviation
Age	13.00	18.00	15.8000	1.41421
Height (cm)	149.00	188.00	166.3200	10.74213
Weight (kg)	36.00	105.00	57.9200	14.31759
Body Mass Index (BMI)	14.79	31.35	20.7420	3.61910
Standing Long Jump	95.00	195.00	146.3200	25.08107
Flexibility	4.00	33.00	16.2000	7.42181
Right-Hand Reaction	.38	1.11	.5253	.14502
Left-Hand Reaction	.32	.60	.4936	.07670
Leg Strength	24.50	141.50	60.4600	30.59477
Back Strength	20.50	100.50	54.5800	23.35847
Right-Hand Grip	13.20	48.00	28.8760	9.21278
Left-Hand Grip	13.80	44.60	28.5040	8.64858
30-m Sprint	4.54	8.04	6.3744	.84967
Push-Ups	1.00	20.00	9.8800	5.42617

Table 1 shows the descriptive statistics pertaining to the age, height, weight, and BMI of the inclusion students with mild ID, together with the following physical fitness parameters: the standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30-m sprint, and push-ups.

In Table 2, the descriptive statistics for age, height, weight, and BMI of the students with mild ID attending special education vocational school are presented, as well as data on their physical fitness parameters, including the standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30-m sprint, and push-ups.

Table 2. Statistical distributions for special education vocational school students

Parameter	Min.	Max.	X_{median}	Standard Deviation
Age	16.00	21.00	17.7273	1.38639
Height (cm)	143.00	183.00	164.0455	10.25149
Weight (kg)	40.00	112.00	63.2273	18.84001
Body Mass Index (BMI)	17.91	37.65	23.3518	5.98536
Standing Long Jump	44.00	166.00	105.7273	33.99325
Flexibility	1.00	28.00	10.5455	7.00834
Right-Hand Reaction	.22	1.26	.8438	.26154
Left-Hand Reaction	.56	1.53	.8345	.24130
Leg Strength	20.00	80.50	41.5227	16.90765
Back Strength	21.00	62.00	42.7955	15.03461
Right-Hand Grip	12.00	34.90	23.0745	6.45600
Left-Hand Grip	7.06	34.09	23.5518	7.59502
30-m Sprint	4.74	10.45	6.1482	1.40563
Push-Ups	1.00	24.00	9.0455	8.19685

Table 3 presents the results of the Mann-Whitney U test performed to determine whether significant differences existed between students with mild ID enrolled in special education vocational school versus those who inclusive schools in terms of the following parameters: BMI, right-hand reaction, back strength, left-hand reaction, 30-m sprint, and push-ups. A statistically significant difference was found in favor of the students receiving inclusive education with respect to right-hand reaction (U = 76.000, $p < .05$). However, no statistically significant differences were observed for BMI (U = 209.500, $p > .05$), back strength (U = 205.500, $p > .05$), 30 m sprint (U = 192.500, $p > .05$), or push-ups (U = 229.500, $p > .05$).

Table 3. Mann-Whitney U test comparison of physical fitness levels of students by education type

Parameter	Education Type	n	Mean Rank	Sum of Ranks	U	z	*p*
Body Mass Index (BMI)	Special Education Vocational Students	22	26.98	593.50	209.500	1.397	.163
	Inclusion Students	25	21.38	534.50			
Right-Hand Reaction	Special Education Vocational Students	22	33.05	727.00	76.000	4.247	**.000***
	Inclusion Students	25	16.04	401.00			
Back Strength	Special Education Vocational Students	22	20.84	458.50	205.500	1.482	.138
	Inclusion Students	25	26.78	669.50			
30-m Sprint	Special Education Vocational Students	22	20.25	445.50	192.500	1.759	.079
	Inclusion Students	25	27.30	682.50			
Push-Ups	Special Education Vocational Students	22	21.93	482.50	229.500	.973	.331
	Inclusion Students	25	25.82	645.50			
	Total	47					

*$p < .05$

In Table 4, the results of the t-test conducted to detect significant differences in the standing long jump, flexibility, left-hand reaction, leg strength, right-hand grip, and left-hand grip strength of students with mild ID attending special education vocational school compared with those in who were inclusived are given. Statistically significant differences were found in favor of the students receiving inclusive education for standing long jump ($t(47) = 4.695$, $p < .05$), flexibility ($t(47) = 2.675$, $p < .05$), left-hand reaction ($t(47) = 6.699$, $p < .05$), leg strength, ($t(47) = 2.576$, $p < .05$), right-

hand grip (t(47) = 2.467 $p < .05$) and left-hand grip (t(47) = 2.073 $p < .05$)

Table 4. T-test comparison of physical fitness levels of students by education type

Parameter	Education Type	n	x̄	s	sd	t	*p*
Standing Long Jump	Special Education Vocational Students	22	105.727	33.99325	45	4.695	**.000**
	Inclusion Students	25	146.320	25.08107			
Flexibility	Special Education Vocational Students	22	10.5455	7.00834	45	2.675	**.010**
	Inclusion Students	25	16.2000	7.42181			
Left-Hand Reaction	Special Education Vocational Students	22	.8345	.24130	45	6.699	**.000**
	Inclusion Students	25	.4936	.07670			
Leg Strength	Special Education Vocational Students	22	41.5227	16.90765	45	2.576	**.013**
	Inclusion Students	25	60.4600	30.59477			
Right-Hand Grip	Special Education Vocational Students	22	23.0745	6.45600	45	2.467	**.017**
	Inclusion Students	25	28.8760	9.21278			
Left-Hand Grip	Special Education Vocational Students	22	23.5518	7.59502	45	2.073	**.044**
	Inclusion Students	25	28.5040	8.64858			
	Total	47					

*$p < .05$

DISCUSSION

In individuals with intellectual disabilities, certain deficiencies in areas of motor development may also be observed (Tomaz et al. 2017; Memisevic & Djordjevic, 2018; Şenlik & Atılgan, 2019). As participation in physical education and sports activities affects individuals' physical fitness levels, it may thus help eliminate such deficiencies in children with ID (Mujea, 2014). For this reason, it is important to examine the effects of the practices of the physical education and sports curricula of the schools where these individuals are educated on their physical fitness. Research comparing the physical fitness parameters of special education vocational school students with those of inclusive high schools students is limited (Bossink et al. 2017), with studies on this topic generally concentrating on typically developing students (Sansi & Özer, 2019; Turna et al. 2019; İlhan & Esentürk, 2015; Skowronski et al. 2009; Baynard et al. 2008; Berktas, 2018). Consequently, the present study focused on comparing the physical fitness parameters of students with mild ID enrolled in a special education vocational school versus those inclusive into an inclusive high school.

Regarding the physical fitness levels of the special education vocational school students versus inclusive high school inclusion students included in the study, no statistically significant differences were observed in terms of BMI, 30-m sprint, back strength, or push-ups. Regardless of school type, the physical education and sports classes did not lead to significant differences with respect to these parameters. Since body mass index (BMI) is used as a tool to indicate nutritional status (WHO, 2007), this finding is explained by the fact that the individuals participating in this study live in the same region and likely share similar eating habits. The reason that no significant difference in sprint speed was detected is because that particular characteristic involves a genetic component and can only be improved with the application of close to 100% power (Ben-Zaken et al. 2019). The lack of specialized studies on strength development in physical education practices in schools may explain the similar results between the two groups with respect to back strength and push-ups, as weight training is known to constitute the most efficient and effective method to improve muscle strength (Suchomel et al. 2021; McQuilliam et al. 2020). The fact that practices within the scope of physical education and sports classes fail to take into account specific studies on speed parameters as well may be interpreted as having a significant effect on the development levels of students with regard to these

parameters. In this context, the physical fitness parameter results obtained from physical education and sports practices for individuals with mild ID in different school environments in Turkey also support our research (Berktas, 2018; Ayan et al. 2019, Konar & Şanal, 2020). In contrast, international studies on inclusive and special education vocational school students with ID have reported significant differences in physical fitness parameters (Frey & Chow 2006; Shilpa & Reeta, 2012; Porretta & Winnick, 2016).

The present study found that the inclusive high school students performed the standing long jump better than the special education vocational school students. Szabó et al. (2015) obtained similar results for the standing long jump when comparing the motor skills of individuals with ID, while the findings of Le Cheminant (2019) and Ariffin et al. (2020) were contrary to those of our study. The standing long jump, an anaerobic movement, is known to crystallize as a skill in the age range of 7-10 (Demirci & Demirci, 2014). However, it can be improved to a certain extent by undertaking physical education and athletic activities, and thus functions as an important indicator regarding an individual's level of physical activity (Çayır, 2019). Apropos of this, we may note that inclusive high school students appear to participate more actively in physical education classes and that their peers exert more of an influence on these individuals. Educational programs conducted with typically developing peer groups have been reported to have extremely positive effects on the development of children with ID (Carter et al. 2010).

Concerning flexibility, the present study found that the students attending an inclusive high school again performed better than their non-inclusive counterparts. Flexibility develops based on physical education and sports activities, and thus deteriorates and regresses when physical activity is reduced (Demirci, 2009; Top, 2015). A review of the literature has revealed that studies comparing the flexibility levels of individuals with ID determined that those individuals with mental disabilities who regularly participated in physical activity, physical education, and sports generally possessed greater flexibility. (Akın & Yüksel, 2016; Uçan et al. 2018).

Another parameter examined within the scope of the current study is reaction times. A short reaction time indicates a speedy response on the part of an individual to a stimulus (Giagazoglou et al. 2013). Looking at the reaction times of the students included in this study, we find that the right- and left-hand reaction times of the inclusion students were shorter than those of the special education vocational school students, results that were consistent with those reported in the literature on this topic (Kargar & Talebi, 2021; Yildirim et al. 2010). Reaction time is a critical parameter in the evaluation of reaction skills, which have significant effects on the performance of daily life skills (Rao et al. 2017). We may therefore conclude that the reaction skills of students enrolled in inclusive high schools are superior and that further positive results may obtain given that reaction skills are reflected in daily life skills.

Fernhall & Pitetti's (2000) study on leg strength in individuals with ID compared with their typically developing peers concluded that the latter were stronger. Chaiwanichsiri et al. (2000) obtained similar results in their study comparing the physical fitness of individuals with ID versus those with typical development. In the present study, the leg strength values of the inclusion students were higher than those of the special education vocational school students. However, other studies have reported results contrary to those obtained in our study (Carmeli et al. 2002). Inclusion students aim to adapt to typically developing individuals during the educational process and act in tandem with them as much as possible. Thus, they may show similar development in motor skills to typically developing children, as well as in other developmental areas (Hehir et al. 2016). The greater leg strength exhibited by the inclusion students compared to those in the special education vocational school results from the fact that the former spend more time with typically developing children and hence adapt to them in terms of physical activity.

Turning to hand grip strengths, the values of the inclusion students were higher for both hands than those of the special education vocational school students. In a study conducted by Top (2021) on the motor skill levels of inclusion students versus special education school students, certain motor skills of the former were found to be superior to those of the latter. Hartman et al. (2015) also obtained results that support our findings in their study on the development of physical fitness in children with ID.

Studies have shown that typically developing peers serve as models for inclusion students, affording them opportunities to learn and reinforce what they have learned. Such a situation instills a sense of independence in these students, helping to enrich their world by providing new sources of caution as well as novel behavioral examples (DiSalvo & Oswalt 2002; Leaf et al. 2009). In addition, the participation of individuals with ID in educational activities together with their typically developing peers in a relaxed, natural setting has been found to be more effective and beneficial than methods involving only the researcher/teacher or other arrangements (Fox et al. 1986; Goldstein & Wickstrom, 1986). Hence, we can infer that educating inclusion students in the same environment as their typically developing peers affects their physical fitness parameters.

Conclusions

In conclusion, although no statistically significant differences were observed for certain parameters (push-ups, sprinting speed, and back strength) within the scope of this study, upon thorough examination of all the statistical results obtained, inclusion students with mild ID performed better on all physical fitness parameters than those enrolled in special education vocational schools. This may be due to the fact that students who receive inclusive education at the high school level are integrated into the same environment as students with typical development, with whom they spend more time together, participate in physical education and sports classes together, and thus are more aligned with their typically developing peers in terms of physical fitness (Beilock et al. 2002; Cenikli et al. 2018). A review of the literature revealed several studies suggesting that inclusive education, carried out in accordance with its purpose, contributes positively to the motor skills of individuals with disabilities (Pan, 2008; Top 2021; Kodish et al. 2006; Berktaş, 2018). In line with these results, we believe that it would benefit students with ID to be integrated with their typically developing peers during physical education and sports classes in special education vocational schools. Thus, we recommend that both the education ministry at the national level as well as local governments implement projects to achieve this end.

Conflict of interest

No potential conflict of interest was reported by the author(s).

Ethics Statement

Ethical approval for this study was granted by the directorate of the Scientific Research and Ethics Committee of Muş Alparslan University (document date and number 01.03.2022-42225).

Author Contributions

Study Design, SBS and SD; Data Collection, MM; Statistical Analysis, SD; Data Interpretation, MM and SD; Manuscript Preparation, SBS and SD; Literature Search, SBS, and MM. All authors have read and agreed to the published version of the manuscript.

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