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Professional paper

A COMPARISON STUDY FOR BALANCE ON INTELLECTUAL DISABILITIES OF CHILDREN BY GENDER

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Abstract

Being differently abled is a complex phenomenon that reflects an interaction between the features of a person's body and the features of the society in which he or she lives. This study aims to compare the balance of intellectual disabilities in children by gender. The test manual was taken from the Guidelines to FUN Fitness Tests and Measures. In this study participated 34 children. Tests were performed such as: single leg stance - eyes open, and single leg stance - eyes closed. The measurements were made in the period March- April 2023, in 4 cities in Albania.
Results for single leg stance- eyes open right foot show: (boys 22.1seconds and girls 15.9 seconds) and left foot (boys 18.5 seconds and girls 8.5 seconds). Results for single leg stance- eyes closed right foot show (boys 10.8 seconds and girls 8.1 seconds) and left foot (boys 8.0 seconds and girls 8.3 seconds. In the conducted study, from the statistics analysis, we conclude that in the single leg stance - eyes open test boys have a better balance than girls (for left foot F= 7.47 and Sig= 0.010 and for right foot is F= 0.929 and Sig= 0.343). While in all in the other tests we noticed that both boys and girls have equal balance.

Keywords: Balance, Intellectual disabilities children (ID), Foot, Comparison, Single Leg Stance.

1. Introduction

Intellectual disability (ID) is a term used when a person has certain limitations in cognitive functioning and skills, including conceptual, social and practical skills, such as language, social and self-care skills. These limitations can cause a person to develop and learn more slowly or differently than a typically developing person. Intellectual disability can happen any time before a person turns 22 years old, even before birth. According to the American Association of Intellectual and Developmental Disabilities, an individual has an intellectual disability if he or she meets three criteria:

- IQ is below 70.
- There are significant limitations in adaptive behavior in one or more of the following areas: conceptual, social or practical skills (skills that are needed to live, work, and play in the community).
- The condition manifests itself before the age of 22.

Intellectual disability is the most common developmental disability (Special Olympics). The latest studies conducted in developed countries show that "disability prevalence is increasing", "the type of disability prevalence is changing" and "disability prevalence due to physical health conditions is decreasing, while

disability prevalence due to neurodevelopmental and mental health problems is considerably increasing" (Kemp, C. (2013).

WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. (news-room/fact sheets)

Literature indicates that people with ID of different age groups have poor strength, poor muscle mass and high body fat percentage and consequently are disposed to cardiovascular health problems (Pitetti K. H. & Yarmer D. A. (2002).

Studies emphasize positive PA effects on increasing agility, power, functional mobility, speed, reaction time and physical fitness (Bartlo P. & Klein P. J. (2011); Jeng S.-C., Chang C.-W., et al (2017).

Sport inclusion – like the Unified Sports Program (Castagno K. S. (2001); Özer D., Baran F., et al(2012) and the Special Olympics swim training (Wright J. & Cowden J. E. (1986). – can have positive effects on youth's cardiovascular endurance, self-concept, self-esteem, social competence, behavior and attitude.

Scholars reported that PA and sport-related activities seem to improve psychological well-being (Hutzler Y. & Korsensky O. (2010), social and cognitive functioning (Andriolo R. B., El Dib R., et al(2010); Houwen S., van der Putten A. & Vlaskamp C. (2014), and QoL (Bartlo P. & Klein P. J. (2011) and to decrease challenging behavior (Ogg-Groenendaal M., Hermans H. & Claessens B. (2014), in adults with ID.

For people living with intellectual disability, physical activity has been shown to improve physical function. The interventions reviewed largely focused on balance and strength activities over 6–24 weeks and reported significant improvement in static balance, dynamic balance and static-dynamic balance compared with controls (Physical Activity Guidelines Advisory Committee. 2018; Maiano C, Hue O, Morin AJS, et al (2018); Maiano C, Hue O, et al (2019).

Postural control is a complex process based on the interaction between visual, vestibular and proprioceptive sensory systems. Reducing the influence of one system leads to postural adaptation due to compensation by one of the other systems (Legrand, A., Quoc, E. B., Vacher, S. W., et al. (2011).

Balance control is a fundamental prerequisite for the motor development of children that typically is evaluated by using functional tasks with balance constraints, for example, bipedal and/or uni pedal stance with eyes open and eyes closed. (Doyle, R. J., Hsiao-Wecksler, et al. (2007).

Regarding children with intellectual disabilities many authors have explored postural control and physical activity parameters related to the type of intellectual impairment, for example, autism spectrum disorders (Minshew, N. J., Sung, K., Jones, B. L., & Furman, J. M. (2004); (Philips, A. C., & Holland, A. (2011). However, limited studies have been done on posture assessment in a heterogynous group including children with different intellectual disabilities.

Also, researchers have found that when balance tasks are simple, for example, standing on two feet with eyes open on a firm surface, there is little difference between individuals with and without disability, while the increase of task difficulty (e.g., standing with eyes closed) also tend to increase postural instability

when compared with typically developing peers (Graham, S. A., Abbott, A. E., Nair, A., et al (2015); Stins, J. F., Emck, C., de Vries, E. M., Doop, S., & Beek, P. J. (2015).

Balance exercises can be done anytime, anywhere. Examples include standing on one foot, walking heel to toe (as if on a tight rope), or side leg lifts. These exercises are useful in preventing falls and building confidence. (health-fitness). This study aims to compare the balance of intellectual disabilities in children by gender.

Table 3: Descriptive Statistics for Participants

2. Methods

City	N	Boys	Girls
Tiranë	6	4	2
Shkodër	18	12	6
Përmet	5	3	2
Roskovec	5	4	1

The test manual was taken from the Guidelines to FUN Fitness Tests and Measures. Through these tests, we can notice where the children can have a better balance, or with which leg they can keep the balance longer. And also to see how the balance is presented and whether there are any improvements over the years.

Subjects were measured for balance, where have performed the same tests, in the same conditions. Tests such as: Single Leg Stance - Eyes Open, and Single Leg Stance - Eyes Closed. In this study participated 34 children. The measurements were made in the period March-April 2023, in 4 cities in Albania, after having approval from the local authorities and parent consent. In the city of Tirana, 4 boys and 2 girls participated, in Përmet 3 boys and 2 girls, Shkodër 12 boys and 6 girls and in the city of Roskovec 4 boys and 1 girl participated. Before performing the tests, the subjects did a warm-up for non-damaging reasons. For this study the data we used SPSS, for calculation of the results obtained from this research study.

3. Protocol of the test

Single Leg Stance – Eyes Open

The Single Leg Stance Test with eyes open is a simple method to quantify balance with the assistance of visual cues. The test requires the athlete to stand on one leg with the eyes open. Balance must be maintained as long as possible.

Mode of Administration:

a) Athlete stands on both legs with feet shoulder width apart.
b) Athlete is placed within arms' reach of a chair for security.
c) The athlete is instructed to place hands on hips.
d) Athlete is instructed to "slowly lift one leg and balance. I will time you until you lose your balance."
e) PT demonstrates the test.
f) PT stands in front of athlete to encourage the athlete to continue without fear of falling. PTA or student stands behind athlete for safety.
g) PT coaches athlete with a "ready, set, now stand on one leg.

Scoring

a) PT or PTA starts a stopwatch timer when he/she says "ready, set, now stand on one leg."
b) Timer continues until balance is lost, or foot of the flexed leg touches the ground.
a) The time completed before loss of balance (up to 20 seconds) is recorded. (Special Olympics. FUN fitness (2020).

Figure 1

Single Leg Stance – Eyes Closed

The Single Leg Stance Test with eyes closed is a simple method to quantify balance without the assistance of visual cues. The test requires the participant to stand on one leg, with eyes closed or wearing a blindfold. Balance must be maintained as long as possible.

Mode of Administration:

a) Athlete stands on both legs with feet shoulder width apart.
b) Athlete is placed within arms' reach of a chair for security.
c) The athlete is instructed to place hands on hips.
d) Athlete is instructed to "slowly lift one leg, then close your eyes and balance. I will time you until you lose your balance."
e) A blindfold may be used if the athlete is unable to maintain his/her eyes shut, and only if the athlete agrees to be blindfolded.
f) PT demonstrates the test.
g) PT stands in front of athlete to encourage the athlete to continue without fear of falling. PTA or student stands behind athlete for safety.
h) PT coaches athletes with a "ready, set, stand on one leg, now close your eyes."
i) Test continues until athlete loses balance or puts the other foot down (maximum time = 20 seconds).

Scoring

b) PT or PTA starts a stopwatch timer when he/she says "ready, set, stand on one leg, now close your eyes."
c) Timer continues until balance is lost, or foot of the flexed leg touches the ground.
d) The time completed before loss of balance (up to 10 seconds) is recorded. (Special Olympics. FUN fitness (2020).

Figure 2

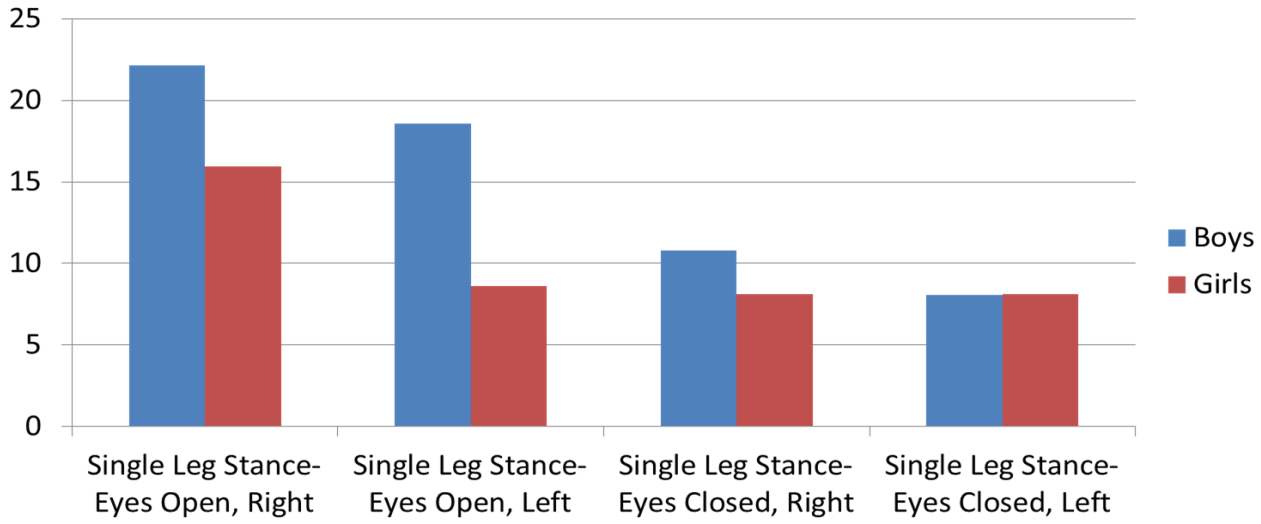
4. Results

Data from the table 2 show the mean, SD and Std. error mean of boys and girls after they performed the balance test single leg stance eyes open/close; right/left. The mean of balance test eyes open; right leg is 22.143 sec and 21.2 SD for boys and 15.9 sec 17.7 SD for girls. Balance test eyes open; left leg show the mean 18.6 sec 19.4 SD for boys and 8.598 sec 7.9 SD. The mean and the standard deviation of balance eyes close; right leg is 10.8 sec 12.4 SD for boys and 8.1 sec 6.1 SD. The boys have the mean and standard deviation of balance eyes close; left leg 8.1 sec and 6 SD while girls are presented with the mean 8.3 seconds. 8.2 SD.

Table 4: Group

Group Statistics					
Test: Balance	Gender	N	Mean	Std. Deviation	Std. Error Mean
Single Leg Stance – Eyes Open, Right	Boys	22	22.143	21.2049	4.5209
	Girls	11	15.946	17.7591	5.3546
Single Leg Stance – Eyes Open, Left	Boys	22	18.556	19.4218	4.1407
	Girls	11	8.598	7.9628	2.4009
Single Leg Stance – Eyes Closed, Right	Boys	17	10.814	12.4368	3.0164
	Girls	9	8.122	6.0729	2.0243
Single Leg Stance – Eyes Closed, Left	Boys	17	8.052	6.0240	1.4610
	Girls	9	8.316	8.1511	2.7170

Table 5 Group Statistics



Tables no 4 present the mean and the standard deviation of balance tests with eyes close/open and right/left leg-up in 2023, 2021 and 2017. The mean and the standard deviation of balance test eyes open; right leg-up is 20 seconds 20 SD in 2023, right leg-up is 10.1 seconds 6.8 SD in 2021 and 10.7 seconds 7.8 SD in 2017. Balance test eyes open; left leg-up has the mean 15.2 seconds 4.9 SD, left leg-up has the mean 8.7 seconds 4.9 SD in 2021 while in 2017 this mean was 10.7 seconds 7.1 SD. In 2023 the mean of balance test eyes close; right leg-up was 9.8 seconds 10 SD, right leg-up was 6.5 seconds 6.1 SD while in 2021 this mean is

6.7 seconds 5.1 SD. The last balance test with eyes close and left leg-up displays in the table has the mean 8 seconds 6 SD in 2023, 5.7 seconds 3.6 SD in 2017 and 5.3 seconds 5.3 SD in 2017.

Table 4: Summary of the Measured Variable- Single Leg Stance test

Test: Balance 2023	N	Mean	Std. Deviation
Single Leg Stance - Eyes Open, Right	33	20	20
Single Leg Stance - _Eyes Open, Left	33	15.2	17
Single Leg Stance - Eyes Closed, Right	26	9.8	10
Single Leg Stance - Eyes Closed, Left	26	8	6

Test: Balance 2021	N	Mean	Std. Deviation
Single Leg Stance - Eyes Open, Right	30	10.1	6.8
Single Leg Stance - Eyes Open, Left	30	8.7	4.9
Single Leg Stance - Eyes Closed, Right	30	6.7	5.1
Single Leg Stance - Eyes Closed, Left	30	5.7	3.6

Test: Balance 2017	N	Mean	Std. Deviation
Single Leg Stance - Eyes Open, Right	32	10.7	7.8
Single Leg Stance - _Eyes Open, Left	32	10.7	7.1
Single Leg Stance - Eyes Closed, Right	32	6.5	6.1
Single Leg Stance - Eyes Closed, Left	32	5.3	5.3

Figure 5, shows whether the physical activity of these children has improved or not? If it is given the right importance or not. And based on the data we conclude that there is a noticeable difference between the years regarding the balance of these children. Where in the Single Leg Stance – Eyes Open, test we see that there is a noticeable improvement in the balance, while for the Single Leg Stance – Eyes Closed test we notice that the result is increasing but with a very narrow result compared to the Single Leg Stance – Eyes Open test.

Also in this graph, we notice that these children have better balance with the right leg than the left leg in both tests that were performed.

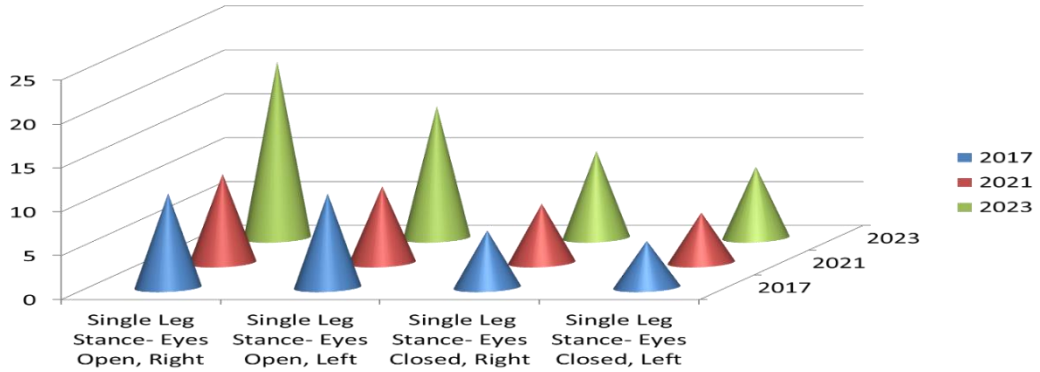


Figure 5: *Summary of the Measured Variable- Single Leg Stance test*

5. Discussion

According to the study, we noticed that in the Single Leg Stance test with eyes closed, the balance of participants is worse than in the test with eyes open. And we can see this deterioration even in normal people. Where several studies have reported that the balance skills of non-disabled persons worsened on one –leg stance with closed eyes (e.g., Hakkinen, Holopainen, Kautiainen, Sillanpaa, & Hakkinen, 2006), indicating that the visual system plays a major role in maintaining balance (Lord, 2006; Hallemans, Orbitus, Meire, & Aerts, 2010), and postural instability increases in absence of vision (Blomqvist et al., 2013; Giagazoglou et al., 2009). Interestingly that for participants in the study, Balance Index scores were higher on the right leg in both positions, with open and closed eyes, than on the left leg. The studies that have explained this finding can be for example, Schmid et al. (2007) in their study discussed that such outcome might indicate that visual proprioceptive information is more sensitive than mechanical proprioceptive information from the vestibular and somatosensory systems. The proprioception inputs could be overloading the left leg, as previous studies have suggested that unilateral stance tasks might depend on some neuromuscular requirements (Hazime, Allard, Ide, Amorim, & Tanaka, 2012) and muscular strength (Giagazoglou et al., 2009, Horvat et al., 2003; Shumway-Cook, & Woollacott, 2003).

6. Conclusions

In the conducted study, from the statistics analysis, we conclude that in the single leg stance, - eyes open test boys have a better balance than girls (for the right foot is F= 0.929 and Sig= 0.343 and for left foot F= 7.47 and Sig= 0.010). While in all in the other tests we noticed that both boys and girls have equal balance. We also conclude that in the Single Leg Stance test eyes open, both genders, boys and girls, have a better balance ability than with Single Leg Stance test eyes closed.

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