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Original Research

PROFILING OF ANTHROPOMETRIC, BODY COMPOSITION, AND PHYSICAL FITNESS IN INDIVIDUALS WITH DISABILITIES USING THE MALAYSIA INSPIRE I-TALENT MANUAL

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ABSTRACT

Introduction: People with ID were reported prone to be overweight (22.5%) and obese (23.8%) compared to the general population and demonstrated poor level of physical fitness. **Aims:** This study aims to identify the anthropometric measurement and physical fitness profile in individuals with intellectual disability (ID) and examine the best factors that significantly contribute to explosive strength and balance performance. **Method:** 124 individuals with ID in Kelantan were recruited in this study. Anthropometry, body composition, and physical fitness were measured using Inspire i-Talent manual. **Results:** Individuals with ID in this study were overweight (24.27 kg/m^2) and their fitness levels were considered generally poor. Stepwise regression analysis revealed that lower limb explosive power variable ($R= 0.864$, $R^2= 0.747$, $F= 34,947$, $p<0.05$) can be anticipated from medicine ball throw, fat percentage and 505 agility test values. In addition, for upper body explosive power ($R= 0.863$, $R^2= 0.745$, $F= 4.223$, $p= 0.042$) it can be forecasted from standing long jump, body weight, gender, static balance, and arm span. Lastly, standing long jump and 505 agility tests could be the main predictor of static balance ($R= 0.597$, $R^2= 0.356$, $F= 6,586$, $p= 0.011$). **Conclusion:** Present finding can be used as a reference for researchers in Malaysia when prescribing and implementing physical assessment in ID population.

Key Words: Hand grip, exercise, balance, agility, jumping.

INTRODUCTION

Individuals with intellectual disability (ID) are defined by a presence of incomplete or arrested mental development. ID is the most prevalent disability of all development disabilities. People with ID are characterized by significant limitations in both cognitive functions and adaptive behaviour that covers conceptual, social, and practical skills (NICHCY, 2012). Additionally, according to the tenth revision of the World Health Organization (WHO), ID is a disorder defined by the presence of incomplete or arrested mental development. It is principally characterized by the deterioration of concrete functions at each stage of development that contribute to the overall level of intelligence, such as cognitive, language, motoric, and socialization functions. When comparing to

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the normally developed peers, ID people are more likely to be obese, less likely to be physically active and are two times at risk of getting chronic diseases, such as diabetes and respiratory illness (Barwick et al., 2012). Findings from different countries reported the higher prevalence of obesity and overweight among people with ID were as follows, UK (20.7% and 28%) (Bhaumik et al., 2008) and South Korea (34.3% and 17.6%) (Jeong and Chun, 2021) respectively. Also, another study conducted in Australia reported that prevalence of being obese (23.8%) and overweight (22.5%) was higher among people with ID compared to the general population (Krause et al., 2016). Emerson and Hatton (2013) indicated the importance of ID people to participate in physical activity because of the predisposed risks to several health problems associated with inactive lifestyle.

Physical fitness testing benefits various population, including ID people. Physical fitness is known to be related to body health and functioning, therefore, it is crucial to obtain overall information on health and physical fitness level using standardized testing procedures. Previous studies found that ID people demonstrate unhealthy aging as compared to their able-bodied peers (de Winter et al., 2012). Assessing physical fitness allows exercise practitioners to monitor and understand age-related declines in physical functioning among ID people. However, measuring physical fitness in ID people involves some challenges mainly because of their physical and cognitive abilities (Lahtinen, Rintala and Malin, 2007). For instance, it is difficult to execute physical fitness tests in accordance with the test manual when they are having difficulty to understand instructions, therefore, leading to participation drop-out and invalid test results (Hilgenkamp, van Wijck and Evenhuis, 2013).

The development of gross motor skills is essentials in learning and acquiring information of simple and complex skills in daily activities (Stork and Sanders, 2008). Yang, Lin and Tsai (2015) revealed that gross motor skills are significantly related with body mass index (BMI). Sulton and Jajat (2019) reported lacked gross motor skills was associated with high BMI among children with ID. Moreover, lacked gross motor skills discouraged the participation in physical and sports activities, hence increasing the prevalence of obesity within the ID population (Westendorp et al., 2011). Anthropometry parameters could predict an individual sports or physical potentials, particularly in specific performance or skills that require specific physical demands (Norton and Olds, 2001).

It has been well documented in the previous study among the able-bodied individuals that anthropometry has a significant impact on different physical fitness performance (Kirk, 2016). To optimize the physical performance individuals need to demonstrate an excellent body composition, BMI and fitness level. Increased body weight results in an increase of fat reserves in the adipose cells and muscle glycogen (Murbawani and Gizi, 2017). Therefore, reducing body fat percentage is recommended to improve the physical conditions, that will enhance the ability to deliver required sports skills. Inspired i-Talent is a guideline manual that was developed by National Institute of Malaysia with the purpose to measure fitness level among disabled population in Malaysia.

The manual has been used widely in Malaysia for the talent identification program among people with disabilities, rather than evaluating the fitness level among them. To the best of our knowledge, studies adapting the Inspired i-Talent manual is lacking despite the fitness norms were publicly published. Therefore, the current study aims to produce a physical fitness profile among individuals with ID in Kelantan based on Inspired i-Talent manual guidelines as well as predicting the significant factors for the performance of upper-lower limb explosive strength, and balance.

METHODS

Participants

One hundred twenty-four ID participants (males, n= 70; and females, n= 54) were recruited from a Non-Governmental Organization (NGO) and 31 Community-Based Rehabilitation (CBR) centres in the state of Kelantan. Certified teachers from each CBR determined the participants to take part in the study based on the inclusion and exclusion criteria. Participation in this research is on a voluntary basis. Initial approval from parents or legal guardian, teachers and physician were secured for the volunteered participants. Parents were required to sign the informed consent as an approval for their children's participation in the study. The research ethics committee granted ethical approval for the study (Ethical approval code: USM/JEPEM/20040246).

The inclusion criteria for this study were: (1) physically active; (2) mild category ID individuals (i.e., slow learner, dyslexia, and autism); (3) aged between 18 - 30 years old; (4) possessing a normal Body Mass Index (BMI) [18.5-25 kg/m^2]; (5) holding person with disabilities identification card; and (6) are not taking any medication during the study period. In addition, participants should have a fair literacy ability and are able to understand and follow general instructions. The exclusion criteria were: (1) participants who are on medication or taking any supplement prior to the study period; (2) having any health problem (e.g., asthma, cardiac problem, diabetes, spinal cord injury); (3) and having history of physical injuries in the past 6 months and are free from any acute medical illness in the past 48 hours, such as diarrhea, fever, and physical injuries from falls that may influence the test and deteriorate the participants' health conditions; (4) participants with physical disabilities or multiple disabilities.

Before obtaining the participants' consent, an information sheet on the study was handed to the participants, in which they were informed of the study procedures including the experimental protocols and risks upon their participation in the study. Participants are free to withdraw from the study anytime without feeling any obligation to continue, if they experience discomfort or pain after performing the tests. Participants acknowledged that there were no negative consequences to their refusal to participate in this study.

Measurement Anthropometric and Body Composition Measurements

Anthropometric measurements including standing height, sitting height and arm span procedures were adapted from the international standards for anthropometric assessment by Stewart et al.(2011). Standing height and sitting height were measured using a Seca Stadiometer. The accuracy of the measurement is up to 0.1 cm. Participant's arm span was measured using measuring tape via the horizontal distance between the tip of the middle (longest) finger of both hands extended to the side and maximum to the level of the shoulders (90-degree abduction) without bending their elbow. Body composition was assessed using OMRON HBF-214 Monitor scale. This tool is widely used to assess the body composition. Data including weight (kg), height (cm), body fat percentage (%), and fat free mass (FFM) were documented. Body Mass Index (BMI) was calculated using a BMI formula; BMI = Body Weight (kg) / Height^2 (cm).

Physical Fitness Test Batteries

Explosive strength was evaluated using the following test batteries (Augustyn, 2005); the upper body explosive strength was gauged using 3-kg medicine ball throw; lower body explosive strength was evaluated using standing long jump (Castro-Piñero et al., 2010), in which the ball thrown and jump distance was recorded in cm. Agility was assessed using 505 agility test (Buchan et al., 2012), in which the time to complete the test was recorded in the seconds. Speed performance was assessed using 20-m sprint (Augustyn, 2005), in which the sprint time was recorded in seconds. The balance performance was assessed using static balance test (Lahtinen, Rintala & Malin, 2007), in which the longest time of the dominant leg remained stationary while the non-dominant leg was lifted above the ground and was recorded in seconds.

Statistical analysis

IBM Statistical Package for Social Sciences (SPSS) Version 25.0 was utilised to perform the statistical analyses. The distribution of the data normality was assessed using the Shapiro-Wilk test. The results were presented as means and standard deviations for the participant's anthropometric, body composition, standing long jump, 505 agility test, 20-meter sprint and static balance test. Descriptive analysis was used on anthropometric and body composition variables. Independent t-test was used compare the physical fitness performance with Inspire i- Talent norms. Stepwise Linear Regression was used to ascertain which factor best to predict explosive strength on upper and lower body and balance. Standardized β-coefficients, t and p-values were disclosed. Significant level was set at $p<0.05$

RESULTS

Characteristics of participants with ID

Descriptive analysis was conducted to determine the anthropometry and body composition of participants (Table 1). Based on the findings, the participants can be categorized as overweight.

Table 1. Descriptive data of anthropometric and body composition of participants

Variables	**Values (N=124)**
Age (year)	23.9 ± 3.72
Standing height (cm)	154.83 ± 11.34
Sitting height (cm)	79.19 ± 5.03
Arm span (cm)	152.76 ± 17.83
Body weight (kg)	57.88 ± 14.93
Fat free mass (%)	28.58 ± 10.73
Fat percentage (%)	25.40 ± 9.71
BMI (kg/m^2)	24.27 ± 6.41

Values mean ± standard deviation (SD), BMI, Body Mass Index. N=124

Comparison of physical fitness component with Inspire i-Talent norms

The physical fitness scores of the participants are presented in Table 2. The components of physical fitness include balance (static), explosive strength (upper and lower body), agility and speed. The physical fitness tests scores then were divided and compared based on the participant's gender according to the reference data in Inspire i-Talent manual 1.0.

The multiple regression analysis of physical fitness parameters

The multiple regression analysis for physical fitness parameters was presented in Table 3. The result of the analysis revealed that lower body explosive strength was a significant sign of upper body explosive strength (β= 0.964, $p<0.05$), static balance (β= 0.086, $p<0.05$). Moreover, the results revealed the upper body explosive strength can be predicted by body weight (β= 2.213, $p<0.05$), gender (β = 29.619, p= 0.008), arm span (β= 0.614, p= 0.042) and static balance (β= 1.217, p= 0.013). Lower body explosive strength can be predicted by upper body explosive strength (β= 0.964, p= <0.05) and

body fat percentage (β = -1.671, $p<0.05$), and agility (β = -13.039, $p<0.05$). Few regression equations were developed to predict the lower body explosive strength, upper body explosive strength and balance among individuals with intellectual disabilities. The regression equation are as follows:
Upper body explosive strength = -134.443 + [0.964 x standing long jump (cm)] + [2.213 x weight (kg)] + [29.619 x gender*] + [1.217 x static balance (s)] + [0.614 x Arm span (cm)], Lower body explosive strength= 140.566 + [0.268 x medicine ball throw (cm)] -[1.671 x fat percentage (%)] - [13.039 x 505 agility (s)], Balance= 20.554 + [0.086 x Standing long jump (cm)] - [2.19 x 505 agility (s)]

Table 2. Comparison of physical fitness performance of ID participants with Inspire i-Talent norm.

Physical Fitness Performance	Gender	Score	i-Talent Norms	*p*-value
Standing Long Jump (cm)	Male	140	**3** (110-185)	< 0.05
	Female	83	**4** (77-109)	< 0.05
Medicine ball throw test (cm)	Male	316	**3** (191-389)	< 0.05
	Female	211	**4** (151-220)	< 0.05
Static Balance test (s)	Male	23.74	**2** (23.00-24.69)	< 0.05
	Female	17.59	**3** (15.00-18.79)	< 0.05
505 Agility test (s)	Male	3.9	**5** (>2.91)	< 0.05
	Female	4.8	**5** (>3.51)	0.352
20-m Sprint test (m/s)	Male	4.86	**3** (4.24-5.50)	< 0.05
	Female	6.55	**4** (6.21-6.65)	< 0.05

Values mean ± standard deviation (SD), N= 124.
*p < 0.05 significantly difference compared participants fitness score and i-Talent norm
1 = Excellent, 2 = Good, 3 = Average, 4 = Poor, 5 = Very Poor

Table 3. Multiple linear regression for physical fitness parameters in individuals with ID

Physical fitness test	Variables	R^2	p	Unstandardized β	Standardized β	SE	t	*p*
	Constant			-134.44				
Medicine ball throw	Lower body explosive strength (cm)	0.745	0.042	0.964	0.527	0.123	7.863	<0.05
	Weight (kg)			2.213	0.353	0.307	7.203	<0.05
	Gender			29.619	0.158	10.953	2.704	0.008
	Static balance (s)			1.217	0.143	0.481	2.531	0.013
	Arm span (cm)			0.614	0.117	0.299	2.055	0.042
	Constant			140.566				
Standing	Upper body	0.747	<0.05	0.268	0.49	0.029	9.117	<0.05

Physical fitness test	Variables	R^2	p	Unstandardized β	Standardized β	SE	t	*p*
long jump	explosive strength (cm)							
	Fat percentage (%)			-1.671	-0.317	0.255	-6.542	<0.05
	Agility (s)			-13.039	-0.323	2.206	-5.912	<0.05
	Constant			20.554				
Balance	Lower body explosive strength (cm)	0.356	0.011	0.086	0.398	0.021	4.051	<0.05
	Agility (s)	0.356	0.011	-2.19	-0.252	0.854	-2.566	0.011

DISCUSSION

Anthropometry and Body Composition of Participants

The result of this study revealed that the BMI of the participants with ID was 24.27kg/m^2, which indicates the participants can be categorised as overweight based on the Asia-Pacific cut off point. Based on the findings, the BMI for male participants was in normal range as compared to female participants. Overweight and obesity is one of the major health issues that consistently rising throughout the world (reference). The prevalence of overweight and obesity in the population with ID is higher compared to the general population (Zhu et al., 2022), causing a major concern in this population, particularly increased risk of major health problems such as cardiovascular problem, diabetes and hypertension. Also, Chow, Choi and Huang (2018) study which was conducted in group homes in Hong Kong, reported the mean value of body fat percentage of individuals with ID was slightly higher (26%) than in the result of the present study (25.4%). The authors also reported that the individuals with ID in the group home in Hong Kong was extremely sedentary with low physical activity and physical fitness level. Because the high commonness of overweight and obesity in people with ID was found in various countries regardless of gender and age (Lloyd, Temple and Foley, 2012), it is important to promote physical activity among this population.

Physical Fitness of Participants

As compared to the normative-referenced described in the I-talent manual, the physical fitness level in participants with ID is categorized as poor. Previous studies reported the physical fitness level among individuals with ID was low throughout their lifespan (Hilgenkamp, van Wijck and Evenhuis, 2012; Oppewal et al., 2013). Chow, Choi and Huang (2018) conducted a study among individuals with ID aged 18 to 65 years and reported that the physical fitness of the participants was relatively low, due to their sedentary lifestyle.

In the present study, the explosive strength of the participants can be categorized below average, in which the result is consistent with previous findings that individuals with ID had poor muscular strength and explosive strength (Mohammadi et al., 2021). Also, Zhang, Piwowar and Reilly (2009) reported poor physical fitness especially in muscle strength and power in individuals with ID, which significantly lower than their normal peers. Orssatto et al. (2020) suggested that the muscular explosive strength and maximal strength were important components that is related to individual functional capacity. These physical fitness components were essential in performing physical activities such as jumping (e.g., jumping over obstacles), sprinting, and lifting. All of those activities involved generating maximal force in a short amount of time.

Improving balance is essential for the development of functional skills due to its importance in providing stability and coordination (Cowley et al., 2010). Individuals with ID is typically associated with poor motor abilities, and they commonly experience difficulties to maintain their balance during running, jumping, hopping, throwing and to rapidly alternate their movement.(Jose Irineu Gorla, Paulo Ferreira de Araújo and Jose Luiz Rodrigues, 2003). According to the normative-referenced data in i-Talent, the balance in individuals with ID in the present study was categorized as average. It can be proposed that individuals with ID demonstrate a limitation in motor development, including balance skills. In addition, maintaining balance is a complex skill that is influenced by different factors such as muscular strength, proprioception, reaction speed, and motor coordination (Kloubec, 2010). Individuals with ID were typically reported to have lower muscular strength as compared to their developing peers, which possibly due to physical inactivity that may also associated with musculoskeletal issues, insufficient of activation in the motor units by the central nervous system, and some inherent dysfunctional muscles properties, such as atrophies or hypotonia (Borji et al., 2014). It was suggested that enhancing the muscular strength by functional training will improve static and dynamic balances in individuals with ID. Lee and Lee (2018) reported an improvement in high-speed squat training for both static and dynamic balances. It can be implied that functional training can improve balance and strength in individuals with ID, in which the physical movement utilizes various muscle areas, and activates proprioception in the joints. Also, more comprehensive and qualitative information are sent to the cerebellum in the brain (Boyle, 2016). Therefore, individuals with ID may improve their balance by engaging to functional training that focusing on lower limb strength and core. Having a good balance may reduce the risks of falling and injuries in individuals with ID.

It is interesting to note that, previous study by Hammami et al. (2017) indicated that agility is associated with balance. Improving agility is important as developing balance, due to both components are fundamental to functional skills and daily activities. According to the normative-referenced in i-Talent, participants in the present study demonstrated a poor performance in agility test. Poor agility in individuals with ID causes difficulty in executing coordinated movements (Carmeli et al., 2008), lacked perceptual ability, and slow mental development (Krystyna Gawlik and Zwierzchowska, 2004)., It is necessary to improve agility in people with ID for their effective delivery of skills in physical activities as well as preventing them from injuries. Burns (2015) reported thegame intelligence (i.e., ability to process information quickly under dynamic situation) in individuals with ID is normally underdeveloped, which explains the poor reaction time and psychomotor when performing movement during PA (Bouffard and Wall, 1990).

With regards to sprint performance, it requires high-intensity bursts of physical effort that mainly relies on power and force production. Elsabet (2022) reported a significant relationship between explosive strength in the lower body and sprinting performance, suggesting the longer distance in standing long jump implies less time spent in sprinting. This means a short sprinting time can be achieved with a great muscular explosive strength in the lower extremity. Diker et al. (2021) indicated a strong relationship between lower body explosive strength and sprint, which aligns with the result of the present research on poor sprinting performance of individuals with ID. Poor performance of explosive strength in the lower body resulted in increased time spent in 20-m sprint of the individuals with ID in the current study. Moreover, the result can be explained by shorter stride length and slower acceleration (Andrews, Goosey-Tolfrey and Bressan, 2009). Also, Kriswanto (2021) indicated that the height, leg length, size, explosiveness of muscular contraction are important factors in optimizing sprinting performance, therefore, enhancing those physical attributes will result in greater effects on sprinting ability of participants.

To summarize, increasing physical activity and engaging the participants into exercise activities may bring positive impact on improving the physical performance on agility, power, functional mobility, speed, reaction time and physical fitness (Jeng et al., 2017). Focusing on physical activity is important for population with ID as a way to increase their fitness level and daily functioning.

Multiple regression analysis of physical fitness performance

The multiple regression analysis revealed that lower body explosive strength is a significant predictor for upper body explosive strength and static balance . Agility is a significant sign of lower body explosive strength, and static balance. Moreover, the results revealed that upper body explosive strength can be predicted by body weight, gender, arm span and static balance. Lower body explosive strength can be predicted by upper body explosive strength and body fat percentage.

The lower body explosive strength is a factor that can predict explosive strength in the upper body, which is in line with the previous finding by Mirzaei, Loti and Saeidi (2011) who reported the lower body explosive strength was significantly correlated with the upper body explosive strength. The core body muscles mediate in transferring force from the lower body to the upper body and vice versa. It is assumed that participants who demonstrated poor performance in medicine ball throw test will demonstrate poor performance in standing long jump.

The present result suggests that lower body explosive strength and agility is a key factor to predict the participants' ability in maintaining static balance. The present finding is consistent with the previous study conducted in normal athletic population involving lower body explosive strength (Çimen Polat, 2018) and agility (Hammami et al., 2017), which were found to be associated with balance. In addition, it was reported that accurate coordination in timing the action of skeletal muscles is fundamental for balance and agility (Malina, Bouchard and Bar-Or, 2004). Therefore, a strong explosive strength in the lower body and good coordination contribute to the ability to maintain balance of the participants in the current study.

With regards to the lower body explosive strength, the agility was reported in the previous studies to be significantly related with standing long jump (Hammami et al., 2017; Padulo et al., 2017; França et al., 2022).

The present finding suggests that lower body explosive strength is a predictor for the participants' agility , which supports the previous finding that higher explosive strength of the lower limb produced shorter time spent in agility test (Padulo et al., 2017; França et al., 2022). A strong explosive strength in the lower body would help participants to jump and change direction easily because of movements of the knee extensors and plantar flexors muscles (Jones, Bampouras and Marrin, 2009; Meyers et al., 2015).

Balance was determined to be a factor that predicts upper body explosive strength in individual with ID. Having a poor balance may result to reduced muscle strength, thus increased risk of falling and injuries (Perry et al., 2007). This finding is aligned with Jeon and Eom (2021) who reported that the static balance was associated with core muscle endurance and explosive strength that need to be developed before prescribing explosive training (Bruhn, Kullmann and Gollhofer, 2006). Developing balance in individual with ID can improve their body control, stability, and coordination during physical activity.

The result of the present study also highlights the upper body explosive strength as an important factor to predict the explosive leg power. This finding is consistent with Mirzaei, Loti and Saeidi (2011) who reported that the upper body explosive strength was correlated with the explosive strength in the lower body. The strong core muscles are essential to provide stability when carrying out explosive strength activities by engaging with functional core stability training, as demonstrated in study by Cabrejas et al. (2022).

In the current study, the result showed that the length of arm span is a predictor for upper body explosive strength. It is possible that a long arm span may provide a mechanical advantage during the arm swing, which is beneficial to generate high force in the upper body during activities that involve explosive action such as pushing and throwing (Mirzaei, Loti and Saeidi, 2011). Therefore, participants with a long arm span demonstrated a better performance of upper body strength as compared to participants with short arm span.

With regards to body composition, the present study supports the findings that found body weight can predict upper body explosive strength in individuals with ID (Mirzaei, Loti and Saeidi, 2011; Carter-Thuillier et al., 2019; Kutlay, Haslofça and Haslofça, 2020). A significant association existed between body weight and upper body strength, indicating that body weight can predict the upper body explosive strength. Kyriazis et al. (2010) pointed that increased in body mass was associated with absolute muscle mass. Therefore, participants who have high body weight were able to generate more explosive strength during the test.

The present results also suggests that the body fat percentage predicts the lower body power. This finding is consistent with the past study conducted among abled-bodied athletic population, in which the relationship of body fat percentage and body explosive strength was significant (Ćopić et al., 2014). The present finding demonstrates that high body fat percentage is associated with low explosive strength in the lower body. In relation to this finding, Ćopić et al. (2014) reported that the highrate of body fat percentage significantly affected jumping performance of female participants. Slinde et al. (2008) reported that negative association existed between body fat percentage and the explosive strength in the lower body. Therefore, poor jumping performance can be attributed to high body fat percentage among individuals with ID in the present study.

The present result revealed gender differences are one of the key factors that predict explosive strength in the upper body. Male participants in the present study demonstrated better performance than females in the medicine ball throw test, as being shown by Bartolomei et al., 2021. Bartolomei et al. (2021) found males had significantly higher muscular power than females, which resulted to better explosive strength in males than females.

Moreover, it the differences in power output between males and females can be explained by the differences in anthropometric and morphological characteristics of muscles (Bartolomei et al., 2021). Males and females possess a distinct muscle morphological characteristic, for example muscle thickness, pinnation angle, and fascicle length (Bartolomei et al., 2022). The present result suggests that a higher percentage of fat free mass was found in males than females, thus supporting the greater upper body explosive strength in males than females. Therefore, it showed that male individual with ID in this present study is muscular than female.

CONCLUSIONS

The findings reflect that the individuals with ID in the present study were overweight and their fitness performance were considered poor. Male participants, in comparison to female participants, scored higher in all fitness components. In addition, the present study revealed that enhancing the upper and lower body explosive strength will improve medicine ball throw, standing long jump and balance which are the part of components of physical fitness performance among individuals with ID. The information about those relationship may guide the implementation of strategies to improve the level of physical fitness and daily functioning in ID population. The finding of the present study can be used as a future reference in prescribing and implementing physical fitness assessment in individuals with ID.

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