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Nagoor Meera Abdullah
Mohamad Nizam Mohamed Shapie
Faculty of Sports Science and Recreation, Universiti Teknologi Mara, Shah Alam, Malaysia

Mawarni Mohamed
Zarizi Ab Rahman
Faculty of Education, Universiti Teknologi Mara, Malaysia

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Corresponding Author:

Nagoor Meera Abdullah
Email: nagoor@uitm.edu.my
Faculty of Sports Science and Recreation,
Universiti Teknologi Mara, Shah Alam, Malaysia

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Nagoor Meera Abdullah[1], Mawarni Mohamed[2], Mohamad Nizam Mohamed Shapie[3], & Zarizi Ab Rahman[4]

[1,3]Faculty of Sports Science and Recreation, Universiti Teknologi Mara, Shah Alam, Malaysia

[2,4]Faculty of Education, Universiti Teknologi Mara, Malaysia

ABSTRACT

In sports, physical activities, and daily life activities muscular leg power is very essential. Standing Long Jump (SLJ) is a reliable field test that usually been to assess leg power. The purpose of this study is to determine the objectivity, reliability, construct validity evidence among students who are visually-impaired. The evidence of the objectivity, reliability, validity, norm need to establish in the particular population to support the interpretation of the outcome. This study involved 35 male subjects who have visual disabilities and two raters for reliability and validity. The ICC, test-retest, and Pearson Correlation was used to determine the objectivity and reliability of the SLJ. Independent sample t was used to determine the construct validity evidence. Findings showed the ICC was high among male rates (.97). The consistency of the instrument also excellent among subjects (r = .81). Paired sample t-test showed t value (M= 1.76, SD= 0.293) (t (34) = 13.32, p = .000 was significant. Findings showed there are significant different between the final test mean M= 1.76), SD = 0.293) is better than the initial test mean (M=1.68, SD= 0.298) for male subjects. The difference showed the SLJ has the construct validity evidence in this population. The need for having valid and reliable testing instruments will enhance the success of the evaluation and the interpretation for all subjects.

Keywords: *Objectivity, Reliability, Construct Validity, Standing Long Jump, Students who are Visually Impaired.*

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INTRODUCTION

Physical fitness illustrates a physiologic state of well-being that allows individuals to meet the demands of both health-related and skill-related fitness (Abdullah, et al., 2016). Performing physical activity (PA) is an essential to maintain and improve health, including physical, mental, and emotional health (Ortega, Ruiz, Castillo & Sjostrom 2008; Eime, Harvey, Charity & Payne 2013; Hajek & Stead 2013). Many evidences support the importance of physical activities to improve musculoskeletal health, cardiovascular fitness, and body composition as well as overall physical fitness (Ortega et al. 2008). It also helps to increase the ability to perform daily tasks, sports, or occupations without undue fatigue (Thomas and Palma 2018). Physical activity also helps to develop muscle power for young people and adults, for the able as well as disabled people. Muscular power is the ability to generate maximum force in the fastest possible time (Miller, 2014). The importance of muscular power is well established in human sports performance (Taipale et al.2013; Ronnestad et al.2012). Muscular power is also essential for health outcomes among youth. Muscular power is correlated with bone health by increasing the bone mass and density (Ginty et al.2005).

Jumping is a fundamental human movement that requires complex motor coordination of both upper and lower body segments (Ashby & Heegaard 2002). The Standing Long Jump (SLJ), also called the Broad Jump is a test widely used to measure the explosive strength and power of the lower limb (Cvejic Pejović & Ostojić 2013). It is a simple yet reliable test to measure muscular power, quick to perform and requires minimal equipment. The test result is the jump distance which only requires a measure tape. It is determined by the horizontal distance from the take-off line to the mark made by the heel on landing, or the nearest point of contact to the take-off line at landing (Espinosa-Sanchez 2017). This test can be applied to those persons who are visually-impaired. Some past studies stress on the importance of vision in the performing of the approach run in horizontal jumps. However, humans rely on other important sensory inputs as well. Berg and Mark (2005) proposed a multisensory hypothesis for step length adjustment in running, which considers the athletes' kinaesthetic perception while the target is localised visually. The question that arises is how long jumpers with visual impairment (VI) manage to fulfil the requirements for an accurate approach (Theodorou et al.2012).

To justify a meaningful data collection, the reliability and validity evidence of the SLJ instrument in among students with visual impairment aged between 15-18 years old male population need to be establish. This procedure is critical in testing and measurement because a test that yields scores that allow valid interpretations for six years old children might not yield scores for 15 years old (Miller, 2014; Baumgartner, Jackson, Mahar & Rowe 2007). Therefore, a test only generates valid information for individuals similar in age, gender, and experience to those on whom the original validation conducted. Thus, even the instrument of SLJ has been proved the reliability and validity in other population, but it seems no reliable and valid to be used among male students who have visual disabilities aged between 15-18 years old. Therefore, the reliability and validity evidence SLJ in this population needs to establish. So, the purpose of this study to establish reliability and validity evidence lower body muscular power assessed by SLJ among male students who have visual disabilities aged between 15-18 years old.

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LITERATURE REVIEWS

SLJ is reliable in the education system in Malaysia to assess the leg power for students in school, college, and universities, especially in Physical Education and sport science class. Ministry of Education in Malaysia also use SBJ as one of the instruments to assess leg power in the selection process for Physical Education program in the Institute of Teacher Education in Malaysia (MOE, 2019). Standing long jump can be considered as a complex movement that requires a high level of coordination skills in order to achieve maximum performance of the jump (Hraski, Hraski & Prskalo 2015).

In the SLJ movement sequence, two main phases are distinguished: (a) Preparation (arms swing and flexion of hips, knees and ankles) and (b) Action (takeoff, flight, landing and standing recovery) (Hay & Reid, 1988; Malina et al., 2004). At the preparation phase the swing of the arms shifts the COM to the edge of the supporting base (the takeoff distance). Both the takeoff and landing distances are strongly affected by leg length, where they are greater in an individual with longer legs, while the flight distance mainly depends on leg muscle power (Pasand et al.2015). Consequently, during physical development, children may increase SLJ performance simply because height and leg length are increased (Wakai et al.2005).

Reliability is one of the sensitive characteristics of a good test. It is consistently unchanged over a short period of time (Baumgartner, Jackson, Mahar & Rowe, 2007). An individual, whose power ability has not changed, is measure twice, within two days consecutively, the two scores will be identical or consistent. The reliability is vital, and for a measurement to have validity, it must be reliable (Baumgartner, Jackson, Mahar & Rowe, 2007). Khoo & Li (2016) reported that the type of reliability included using different sets of items from the same measurement instrument (internal-consistency), across time (test-retest), by different persons (variation between two or more raters) and on the same occasion (intra-rater).

Baumgartner, Jackson, Mahar & Rowe, (2007) and Miller (2014) also asserts lack of agreement among scorers, lack of consistent performance by the individual tested, failure of an instrument to measure consistently are the factors of measurement error. The higher the error in any assessment information, the less reliable it is, and the less likely it is to be useful. Hence, the lower the measurement error, the higher the reliability and thus, the measurement instrument is said to be in good quality. There are a few methods to estimate reliability such as test-retest, internal consistency, intraclass correlation, parallel forms method, and split-half method (Hashim, 2015; Miller, 2014; Baumgartner, Jackson, Mahar & Rowe, 2007). The new definition of validity is related to the type of validity evidence (Baumgartner, Jackson, Mahar & Rowe, 2007). Validity evidence refers to empirical evidence that supports the adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment (Messick, 1989b). While Cronbach (1971), asserted that what needs to be valid is the meaning or interpretation of the scores. Baumgartner, Jackson, Mahar & Rowe (2007) and Cronbach (1971), also stated that we do not validate the test, but collect evidence to validate the interpretations made from the test score. Validity evidence must be collected to support the interpretation of the scores, either logically or statistically. A few methods of the construct validity evidence of physical activity can be investigated. According to Mahar & Rowe (2002), some part of validity theory in psychology and educational measurement do not seem fit to the different types of research in exercise science. Therefore, a strong program and method of

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construct validation that will fit a wide variety of constructs and contexts, especially those relating to the study of physical activity needs to be established. According to Baumgartner, Jackson, Mahar & Rowe, (2007), construct validity evidence for exercise science and physical education can be determined based on judgement by expertise in related area of the variables, comparison of the performance of the group before and after instruction or training, and statistical procedure namely factor analysis to identify constructs and the test that yield score leading to valid interpretation. Miller (2013) also reported comparing the mean difference for elite and non-elite performer one of the procedures to determine the construct validity evidence. That method is also known as known different evidence validity which is referring to a test that discriminates between two groups known to differ on the variable interest (Davidson, 2014; Mahar & Rowe, 2002). This type of evidence is similar to the "known groups" method, originating by Cronbach and Meehl (1955). Mahar and Rowe (2002) asserted construct validity evidence exist if two or more populations differ on a construct, this should be reflected in significant mean differences on a measure of that construct. The previous researcher in exercise science and physical education has used several methods in determining the reliability and construct validity evidence of SLJ. Study by Ab Rahman, Z. et al., (2021) used the known method group to determine the construct validity evidence for Standing Broad Jump among adolescences.

Reid, Dolan, & De Beliso, (2017) was used interclass and intra class reliability coefficients (ICC) to determined reliability of the test battery. According to the researcher, it was found that SBJ is a highly reliable (interclass r = .99, intraclass r = 0.99) field test to assess leg power for collegiate track and field athletes. While Almuzaini & Fleck (2008) also used the intra class correlation coefficient (ICC) to determined reliability of the SBJ test and found high reliability for SBJ (ICC r = .97).

However study by Ayan-Perez, Cancela-Carral, Lago-Ballesteros, & Martinez-Lemos, (2017) was used test-retest and Pearson correlation coefficients to examine the reliability of vertical jump for children. Previous stydy by Ab Rahman, Z., (2021) also used the same method to asses the consistency of test and the finding showed the test was excellent among males and female subjects (r = 96, r = .90). Castro-Pinero, Ortega, Artero, Girela-Rejon, Mora, Sjostrom, M., & Ruiz, (2010) also added nor fatigue effects were found and the SBJ test is reliable for the assessment of lower body muscular strength for both male and female adolescentsThus the interval between test and retest is 24 hours considering no fatigue effect for lower body muscular strength.

Balance control becomes a major problem for all blinded subjects but in older individuals with visual impairments this condition is even more severe. Earlier studies reported that vision plays a major role in postural control and that postural sway increases in the absence of vision (Spera, Belviso , Sirico , Palermi , Massa , Mazzeo , Montesano 2019). It is justifying to mention that balance is very crucial element when involving jumping and landing among blinded subjects.

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METHODOLOGY

Reliability and validity evidence for the SLJ was determined by test-retest, pearson correlation and comparative design suggested by (Miller, 2014; Baumgartner, Jackson, Mahar, & Rowe, 2007). However, the objectivity between raters was conducted by ICC.

A total of thirty five subjects who have visual disabilities (35 males) age between 15 to 18 years old and two assistant raters and were involved in this study consisting of two males from the Faculty of Sports Science and Recreation. Therefore, the ICC method was used to obtain the inter rater reliability. Each of the raters is given intensive training on the administration to enhance the objectivity of the raters. The raters will provide the same protocol before they administer the test. Each rater will measure SLJ to all the subjects separately and independently on the same day. The time interval will be given to the ratee after each test completed. Test-retest with 24 hours' time interval and Pearson Correlation was used to determine the reliability of the instruments. The shorter of time interval are considering because no fatigue effects were found for the SLJ and enhancing the reliability of the instrument (Bishop, 2008). On the other hand, evidence of construct validity was obtained by getting the scores from the subjects. Independent t-test was conduct to determine significant difference between two groups.

In this study, 6 weeks for instructional programs. (6 weeks-proposed by Bompa 2018) and then resting the group for final ability. Since the group should have improved in ability as a result for instruction or training, the instrument have construct validity evidence if the final test mean is significantly better than the initial test mean. According to Baumgartner, Jackson, Mahar, & Rowe, (2007) the comparison of the performance before and after instruction can be used to determine the construct validity evidence. This before testing the initial ability and apply some instructional for multiple weeks, then retest for final ability. If the second test significantly better than first test mean, the instrument have construct validity. Paired sample t test was conducted to determine the mean different between first test and final test.

RESULTS

Data was analysed using SPSS for Windows ver.22.0. Descriptive statistical methods were used to determine the mean and standard deviation. While ICC for objectivity, test- retest, Pearson correlation for reliability evidence, and dependent t test used to establish construct validity evidence, Table 1 shows a high degree of reliability was obtained between raters for SLJ. The average measure for ICC was .970 with a 95% confidence interval from .946 to .984 (F (35, 35) = 66.639, $p<.001$) Findings also showed a high degree of reliability was found between the inter raters for SLJ measurements. The average measure ICC was .972 with a 95% confidence interval from .972 to .992 (F (35, 35) = 66.639, $p<.001$).

Table 1: Intraclass Correlation Coefficient (ICC) between raters for SLJ

		95% Confidence Interval		F Test with True Value 0			
	ICC[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Average Measure	.970[a]	.946	.984	66.639	35	35	.000
	.985[c]	.972	.992	66.639	35	35	.000

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Table 2: Reliability Evidence for SLJ Instruments

		Test	Retest
Test	Pearson Correlation	1	.807**
	Sig. (2-tailed)		.000
	N	35	35
Retest	Pearson Correlation	.807**	1
	Sig. (2-tailed)	.000	
	N	35	35

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 revealed the reliability evidence for SLJ of the male subjects. Findings indicate the SLJ instrument has high reliability both in male subjects (r = .81) after test-retest.

Table 3: Descriptive statistics for SLJ

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	SLJ1	1.6854	35	.29882	.05051
	SLJ2	1.7634	35	.29327	.04957

Table 4: Paired sample Test for SLJ 1 and SLJ 2

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	SD	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	SLJ1 - SLJ2	-.07800	.03462	.00585	-.08989	-.06611	-13.328	34	.000

The analysis of Paired Sample T test was conducted to compare mean score for SLJ before and after instruction/training for two weeks. Result showed the final test mean M= 1.76), SD = 0.293) is significantly better than the initial test mean (M=1.68, SD= 0.298) (, t (34) = 13.32, p = .000. Mean score for final test is (M= 1.76, SD= 0.293) (t (34) = 13.32, p = .000.

DISCUSSION

This finding illustrates the ICC for rater 1 (.97), and rater 2 (.98) was excellent. Portney & Watkins (2000) suggested that ICC values less than 0.5 are indicative of poor reliability, values between 0.5 and 0.75 indicate moderate reliability, and values between 0.75 and 0.9 indicate good reliability. Values greater than 0.90 indicate excellent reliability. Baumgartner, Jackson, Mahar, & Rowe (2007) stated that the inter scorer objectivity coefficient should be at least .80. Hence, this study showed that different raters could accessibly administer the SLJ protocols without the raters having different scores. The consistency of the instrument was determined by test-retest, and Pearson Correlation showed r = .97 and r = .98 was very high. Miller (2014), did suggested the correlation coefficient for reliability between ±.80 to 1.00 (very high), ±.60 to .79 (high), ±.40 to .59 (moderate), ±.20 to .39 (low), below .20 (extremely low). The high reliability of the instrument due to the close time interval (24 hours) between the test and retest. Bishop (2008) suggested the shorter time interval, the higher the reliability of the instrument. The Longest time intervals may cause some physical changes and affect the measurement process.

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The findings of the Dependent Sample T-test showed there are significantly different for leg power between elite and non-elite players. This finding indicates that the SLJ test can discriminate the subjects' abilities in terms of leg power. One of the characteristics of a good test should be able to discriminate students' abilities (Jacob & Rothstein, 2016). The validity of the instruments will determine whether it can be measured the construct and yield valid interpretation. The known difference evidence can be used to determined construct validity evidence if two or more populations differ on a construct (Mahar & Rowe, 2002). Students who have visual disabilities possess a satisfactory level of performance in SLJ since they are not trained at maximum. This can have been seen when Theodorou et al (2012) when conducted a comparison suggests that F12 class visually impaired high level athletes demonstrate a level of consistency in their approach run analogous to elite level non-visually-impaired athletes. Students who have visual disabilities have poor vision to determine foot placement for the take-off phase, to achieve precise foot placement on the board and regulate the final strides of the run-up using visual information that provides continuous control based on a perception-action coupling (Hindawi et al 2014).

CONCLUSION

Establishing reliability, validity evidence, and norm reference for the candidate in sports setting is very important in assessing and measuring the physical performance among students who are visually-impaired. The need for having valid and reliable testing instruments will enhance the success of the evaluation and the interpretation for all students. The results of this study will also provide useful feedback to the trainers to identify the students in terms of lower body power. This is by having the students to maintain as much of their horizontal velocity and maintain good posture allowed for further jumps. People are wondering how athletes who have visual disabilities manage to regulate their stride pattern in a similar fashion to their non-visually impaired counterparts, despite the fact that visual information is limited. This is something that researcher need to dig into very deeply and thoroughly.

Author's Contributions

Nagoor Meera Abdullah - Concept and design of the study

Mawarni Mohamed - Proof reading and manuscript editing

Mohamad Nizam Mohamed Shapie - Acquisition of data and manuscript preparation

Zarizi Ab Rahman - Analysis and interpretation of data

Declaration

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript. We certify that the submission is original work and is not under review at any other publication.

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REFERENCES

Abdullah, N. M., Mohamed, M., Tumijan, W., Parnabas, V., Ponnusamy, V., Shapie, M. N. M., & Omar-Fauzee, M. S. (2016). The Differences in Physical Fitness Levels Between Hearing and Visually Impaired Students. In *Proceedings of the 2nd International Colloquium on Sports Science, Exercise, Engineering and Technology 2015 (ICoSSEET 2015)* (pp. 203–213). https://doi.org/10.1007/978-981-287-691-1_22

Ab Rahman, Z., Kamal, A. A., Noor, M. A. M., & Geok, S. K. (2021). Reliability, Validity, and Norm References of Standing Broad Jump. *Revista Geintec-Gestao Inovacao E Tecnologias*, *11*(3), 1340-1354.

Almuzaini, K. S., & Fleck, S. J. (2008). Modification of the standing long jump test enhances ability to predict anaerobic performance. *The Journal of Strength & Conditioning Research*, 22(4), 1265-1272.

Ashby B.M, Heegaard J.H. (2002). Role of arm motion in the standing long jump. *Journal of Biomech*, 35(12):1631- 1637.

Ayan-Perez, C., Cancela-Carral, J. M., Lago-Ballesteros, J., & Martinez-Lemos,I. (2017). Reliability of sargent jump test in 4-to 5-year-old children. *Perceptual and motor skills*, 124(1), 39-57.

Baumgartner, T. A., Jackson, A. S., Mahar, M.T., & Rowe, D.A., (2007). *Measurement for Evaluation in Physical Education and Exercise Science (No. Ed. 6)*. WCB/McGraw-Hill.

Bishop, P. A. (2008). *Measurement and Evaluation in Physical Activity Applications*. Arizona. Holcomb Hathaway.

Berg, W.P., and Mark L.S. (2005). Information for step length adjustment in running. *Human Movement Science,* 24, 496–531.

Bompa, T., Buzzichelli, C. (2018). *Periodisation: Theory and methodology of training. 6th Ed.* Human Kinetics Publishers, Champaign, Il.

Castro-Pinero, J., Ortega, F. B., Artero, E. G., Girela-Rejon, M. J., Mora, J., Sjostrom, M., & Ruiz, J. R. (2010). Assessing muscular strength in youth: usefulness of standing long jump as a general index of muscular fitness. *The Journal of Strength & Conditioning Research*, 24(7), 1810-1817.

Cronbach, L. J. (1971). Test validation. In R. L. Thorndike (Ed.), *Educational measurement (2nd ed).* Washington, DC: American Council on Education.

Cronbach, L. J., & Meehl, P. E. (1955). *Construct validity in psychological tests*. Psychological Bulletin, 52, 281 302.

Cvejić D, Pejović T, Ostojić S. (2013). Assessment of physical fitness in children and adolescents. *Physical Education and Sport* Vol. 11, No 2, pp. 135 – 145.

Davidson M. (2014) *Known-Groups Validity*. In: Michalos A.C. (eds) Encyclopedia of Quality of Life and Well Being Research. Springer, Dordrecht.

Eime R. M., Young, J.A., Harvey, J.T., Charity, M.J., Payne, W.R.A. (2013). systematic review of the Psychological and social benefits of participation in sport for children and adolescents: Informing development of a conceptual model of health through sport. *Int. J. Behav. Nutr. Phys. Act*, 10, 98.

Espinosa-Sánchez, M. (2017). A standing long jump study in preadolescents aged 9-13. *Journal of Sport and Health Research*. 9(2): 233-246.

Hajek,P., Stead,L.F. (2012).Global Recommendations on Physical Activity for Health; WHO Press:Geneva , Switzerland, 4. Paoli, A.; Bianco, A. Not all exercises are created equal. *Am. J. Cardiol*., 109, 305.

Hraski,M., Hraski,Z. Prskalo, I. (2015). Comparison of Standing Long Jump Technique performed by Subjects from Different Age Groups. *BALTIC JOURNAL OF SPORT & HEALTH SCIENCES* No. 3(98); 2–12.

Hashim, A. & Gunathevan. (2015). 900 Push-Up Test Norms Sport Science Students Sultan Idris Education University. *International Journal of Development and Emerging Economics,* 3(1), 1-9.

Hay J.G, Reid J.G. (1988). *Anatomy, mechanics, and human motion*, Prentice Hall.

Hindawi, O., Abu Altaieb, M.H., Judge, L.W., Fischer, J., Ay, K.M., Mansi, T. (2014). The effect of feedback on some kinematic variables for class F13 visually impaired athletes in long jump. *International Journal of Academic Research* Part B; 6(6), 337-340. DOI: 10.7813/2075-4124.2014/6-6/B.52.

Jacob, B., & Rothstein, J. (2016). The measurement of student ability in modern assessment systems. *Journal of Economic Perspectives*, 30(3), 85-108.

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of chiropractic medicine,* 15(2), 155-163.

Malina R.M, Bouchard C, Bar-Or O. (2004). *Growth, maturation, and physical activity. 2nd Edition,* Human Kinetics Books, Champaign, Illinois.

Mahar, M. T., & Rowe, D. A. (2002). *Construct Validity in Physical Activity*. Physical activity Assessments for health-related research, 51.

Messick, S. (1989b). Validity. In R. L. Linn (Ed.), *Educational measurement (3rd ed.).* New "York: Macmillan.

Miller, D. (2014). *Measurement by the physical educator why and how.* McGraw-Hill Higher Education.

Ministry of Education. (2019). *Skill Test Manual for Physical Education. Malaysia Institute of Teacher Education.* Ministry of Education.

Ortega, F.B., Ruiz, J.R., Castillo, M.J., Moreno, L.A., Urzanqui, A., Gonzalez-Gross, M., Sjostrom, M.,Gutierrez, A., Group, A.S. (2008). Health-related physical fitness according to chronological and biological age in adolescents. The AVENA study. *J. Sports Med. Phys. Fit*, 48, 371–379.

Ortega, F.B., Ruiz, J.R., Castillo, M.J., Sjostrom,M. (2008).Physical fitness in childhood and adolescence: A powerful marker of health. *Int. J. Obes*, 32, 1–11.

Portney, L. G., & Watkins, M. P. Prentice Hall; New Jersey: 2000. Foundations of clinical research: applications to practice.

Reid, C., Dolan, M., & DeBeliso, M. (2017). The reliability of the standing long jump in NCAA Track And field athletes. *International Journal of Sports Science*, 7(6), 233-238.

Spera, R., Belviso, I., Sirico, F., Palermi,S., Massa, B., Mazzeo,F., Montesano, P. (2019).Jump and balance test in judo athletes with or without visual impairments. JOURNAL OF HUMAN SPORT & EXERCISE VOLUME 14, Proc4 S937-947.

Thomas, E., Palma, A. (2018). Physical fitness evaluation of school children in Southern Italy: A cross sectional evaluation. J. Funct. Morphol. Kinesiol, 3, 14; doi:10.3390/jfmk3010014.

Theodorou A., Skordilis E., Tasoulas E., Sotiris, P., Panoutsakopoulos. V., Smirniotou A., Josep, P-R., Miguel T-J. and Panteli F. (2011). *Stride length regulation at the approach phase of long jump in visually impaired (F12 class) athletes*. Presented at the 30th Annual Conference of Biomechanics in Sports – Melbourne 2012.

Wakai M, Linthorne N.P. (2005). Optimum take-off angle in the standing long jump. *Human Movement Science,* 24(1): 81-96.