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EVALUATION OF STANDING LONG JUMPING FUNDAMENTAL SKILL DEVELOPMENTAL SEQUENCE IN CHILDREN

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ABSTRACT

Fundamental Movement Skills (FMS) are skills that enable children to interact and explore their environment. The standing long jump has been included in numerous motor and physical fitness batteries with the primary purpose of determining jumping ability in relation to maximum distance. The purpose of this study was to investigate the developmental sequence of basic skills in children 2 to 6 years old standing long jump in Shiraz-Iran.

Data was collected by video film from three angles, face, back and side. Pattern of pair's Long jump assessment by use stepwise Clark and Phillips (1985) scale and movement patterns general characteristics were analyzed. The Research was conducted on the sample of 151 preschool children (85 boys and 66 girls) aged 2-6 years from Shiraz- Iran.

Age and gender differences were calculated by the Univariate analysis of variance. The results of the analysis of variance showed no significant differences were found in the quality of the standing long jump performance between boys and girls and based on age groups.

Keywords: Developmental Sequence, Fundamental Movement Skills, Standing Long Jump, Children

INTRODUCTION

Motor development is a continuous process through which a child acquires movement patterns and skills. The development of motor competence is dependent upon and influenced

by the growth and maturity characteristics of the child (morphological, physiological and neuromuscular), as well as environmental factors (specific practice, rearing atmosphere, play opportunities and objects **[21].**

Fundamental movement skills (FMS) are skills that unable children to interact and explore their environment. Besides being fundamental and irreplaceable in most human abilities and features, these movement structures make a firm base for the development of more advanced and complex movement skills **[14].**

Jumping is a fundamental human movement that requires complex motor coordination of both upper and lower body segments **[3].**

Jumping is a fundamental movement that occurs when the body is projected into the air by force generated in one or both legs and the body lands on one or both feet. Jumping can be accomplished in several ways. Keogh and Sugden (1985), however, suggested that a more sensible way to consider the beginning of jumping development is to examine jumping patterns that involve a two-footed takeoff. The two-footed jumping patterns that have received the most attention are the vertical jump and the horizontal or standing long jump. In the horizontal jump, the body is propelled both upward and outward **[28].**

Standing long jump (SLJ) is a multi-joint movement that is commonly used to assess explosive leg power **[24].** Due to its simple and time-efficient implementation that does not require any equipment, it is routinely used by coaches of several sports for talent selection and prediction of potential **[4].** Also, SLJ performance is significantly correlated with physical characteristics, such as lean leg volume **[10]** and other explosive muscular strength tests of the lower body **[5].** However, body dimensions may significantly affect performance when SLJ is used for the assessment of leg muscle power in children, since taller individuals may jump longer than shorter ones with the same leg muscle power **[7].** The most important factors for this outcome are the higher center of mass and the longer leg length in taller children **[2]**, which increase the trajectory of the center of mass and thus SLJ performance. Wakai and Linthorne (2005) divided SLJ performance (distance) into three parts: (a) the take-off distance, which is defined as the horizontal distance between the take-off line and the jumper's center of mass at the instant of take-off, (b) the flight distance, which is the horizontal distance travelled by the center of mass while airborne and (c) the landing distance, which is defined as the distance between the center of mass and the heels of

the feet at the instant of landing. Both the takeoff and landing distances are strongly affected by leg length, i.e. they are greater in an individual with longer legs, while the flight distance mainly depends on leg muscle power. Consequently, during physical development, children may increase SLJ performance simply because height and leg length are increased **[32]**.

An additional important factor that may influence SLJ performance is skill. Skill in children does not only depend on practice, but it is influenced by neuromuscular maturation **[2].** Compared with vertical countermovement jump, SLJ requires more coordination of movements, timing and technique, since both the takeoff angle and the position of the limbs during takeoff and landing may change the horizontal distance jumped **[1,7,22,27].**

In that respect, individuals with greater strength that allows them to lift their legs higher during landing, and/or children with a more mature neuromuscular system may have an advantage. Gender may affect SLJ performance with boys performing better than girls **[5,18,26]**, but this occurs only during puberty and not in early childhood.

The results Nikolic et al (2013) with titled Standing Long Jump Performance Quality: Age and Gender Differences indicated significant differences between age groups (5-6 and 6-7 years) were jumping in all the variables, but was not observed significant differences in the quality of performances between boys and girls horizontal jumping.

The purpose of this study was to investigate the developmental sequence of basic skills in children 2 to 6 years old standing long jump in Shiraz-Iran.

SUBJECTS AND METHODS

Participants

Research was conducted on 151 preschool children from Shiraz (85 Boys and 66 Girls) between 2-6 years of old .The participants were selected randomly and divided into four age groups (2-3, 3-4, 4-5 and 5-6 years) . The Mean age of boys (2.49±1.07 yr) and Girls (2.44±1.07 yr), the Mean weight of Boys (18.11±2.70 kg)and Girls (16.92 ± 4.02 kg) Mean height of boys (104±1.39 cm) and Girls (97.61±1.61 cm) and Mean time spent in preschool for Boys (1.88±1.07 yr) and Girls (1.77± 1.10 yr).

Data collection instruments

Data were collected by film from three angles, angles, face, back and side. Pattern of pairs Long jump assessment by use stepwise Clark and Phillips (1985) scale and movement patterns general characteristics were analyzed. In this study, pairs long jump task including a jump from on line by all force. This action was repeated for each subject once. In pattern

of pair's Long jump were studied two movement parts leg and hand.

Legwork part consists of four stages:

First Stage: One foot take off;

Second Stage: Knee extension first;

Third Stage: Simultaneous extension;

Fourth Stage: Heels up first, In fact, this component is developed in the long jump.

Handwork part consists of four stages:

First stage: no action;

Second stage: arms swing forward;

Third stage: arms extend, then partially flex;

Fourth stage: arms extend, then fully flex, in fact, this component is developed in the long jump.

Statistical Analysis

Children were video-taped from three angle of the jumping position at a distance of 2 meters. Every examinee performed one jump. Also, the length of the jump was measured (JUMP). Data were evaluated afterwards by viewing the recorded jump performance in slow motion. Normal distribution of variables was tested by Kolmogorov-Smirnov test. For determining statistical significance of differences in each variable between groups of subject, univariate analysis of variance (ANOVA) was used. Statistical significance was set at $p<0.05$. Statistical analyses were performed using the SPSS version 19.0 for window.

RESULTS

The results showed the highest percent (53.8%) in the age group (2-3) of girls was in first stage of leg part (one foot take off) and the lowest percent (11.1%) was in first stage of hand part (no action). The highest percent (33.3%) in the age group (3-4) of girls was in second stage of leg part (Knee extension first) and the lowest percent (18.2%) was in forth stage of hand part (Arms extend, then fully flex). The highest percent (44.4%) in the age group (4-5) of girls was in first stage of hand part (No action) and the lowest percent (15.4%) was in first stage of leg part (one foot take off). The highest percent (36.4%) in the age group (5-6) of girls was in forth stage of hand part (Arms extend, then fully flex) and the lowest percent (15.4%) was in second stage of leg part (Knee extension first). The highest percent (52.2%) in the age group (2-3) of boys was in first stage of leg part (One foot take off) and the lowest percent (6.2%) was in forth stage of hand part (Arms extend, then fully flex). The highest percent (32.3%) in the age group (3-4) of boys was in second stage of leg part (Knee extension first) and the lowest percent (12.5%) was in forth stage of hand part (Arms extend, then fully flex). The highest percent (50%) in the age group (4-5) of boys was in forth stage of hand part (Arms extend, then fully flex) and the lowest percent

(6.7%) was in first stage of hand part (No action). The highest percent (33.3%) in the age group (5-6) of boys was in first stage of hand part (No action) and the lowest percent (4.3%) was in first stage of leg part (one foot take off).

Univarate analysis of variance (table 2) determined no statistically significant differences between the participants according to age in all variables, namely: One foot take off (F=0.36; p= 0.54), Knee extension first (F=0.29; p= 0.58), Simultaneous extension (F=0.16; p= 0.68), Heels up first (F=0.47; p= 0.49), No action (F=0.74; p= 0.38), Arms swing forward (F=0.70; p= 0. 40) Arms extend, then partially flex (F=0.01; p= 0.91), Arms extend, then fully flex (F=0.16; p= 0.68).

In the all variables there was no significant difference between girls and boys, , namely: One foot take off (F=0.34; p= 0.79), Knee extension first (F=0.56; p= 0.63), Simultaneous extension (F=1.46; p= 0.22), Heels up first (F=1.07; p= 0.36), No action (F=1.95; p= 0.12), Arms swing forward (F=1.19; p= 0. 31) Arms extend, then partially flex (F=0.69; p= 0.55), Arms extend, then fully flex (F=0.57; p= 0.63).

Table 1: The descriptive information by age groups and gender

	Percent of girls				Percent of boys			
	2-3	3-4	4-5	5-6	2-3	3-4	4-5	5-6
One foot take off	53.8	23.1	15.4	7.7	52.2	26.1	17.4	4.3
Knee extension first	23.8	33.3	38.1	4.8	19.4	32.3	32.3	16.1
Simultaneous extension	21.2	23.1	34.6	21.2	15.6	23.4	35.9	25
Heels up first	17.5	25	35	22.5	25.5	19.1	38.3	17
No action	11.1	22.2	44.4	22.2	33.3	26.7	6.7	33.3
Arms swing forward	26.2	23.8	31	19	14.6	25	37.5	22.9
Arms extend, then partially flex	15.6	28.1	25	31.3	10.8	18.9	37.8	32.4
Arms extend, then fully flex	18.2	18.2	27.3	36.4	6.2	12.5	50	31.2

Table 2: Difference between qualities of the acquired standing long jump based on age

Age	2-3		3-4		4-5		5-6		F	P
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
One foot take off	0.55	0.50	0.26	0.44	0.13	0.34	0.07	0.26	0.36	0.54
Knee extension first	0.32	0.47	0.50	0.50	0.40	0.49	0.21	0.41	0.29	0.58
Simultaneous extension	0.61	0.49	0.79	0.41	0.93	0.25	0.96	0.18	0.16	0.68
Heels up first	0.55	0.50	0.55	0.50	0.72	0.45	0.60	0.49	0.47	0.49
No action	0.17	0.38	0.17	0.38	0.11	0.32	0.25	0.44	0.74	0.38
Arms swing forward	0.52	0.50	0.64	0.48	0.70	0.46	0.67	0.47	0.70	0.40

Arms extend, then partially flex	**0.26**	**0.44**	**0.47**	**0.50**	**0.50**	**0.50**	**0.78**	**0.41**	**0.01**	**0.91**
Arms extend, then fully flex	**0.08**	**0.28**	**0.12**	**0.33**	**0.25**	**0.43**	**0.32**	**0.47**	**0.16**	**0.68**

Table 3: Differences between girls and boys in the quality of the acquired standing long jump

Gender	**Boys**		**Girls**			
Variables	**Mean**	**S.D**	**Mean**	**S.D**	**F**	**P**
One foot take off	**0.27**	**0.44**	**0.22**	**0.42**	**0.34**	**0.79**
Knee extension first	**0.37**	**0.48**	**0.33**	**0.47**	**0.56**	**0.63**
Simultaneous extension	**0.82**	**0.38**	**0.84**	**0.36**	**1.46**	**0.22**
Heels up first	**0.61**	**0.49**	**0.66**	**0.47**	**1.07**	**0.36**
No action	**0.22**	**0.41**	**0.16**	**0.37**	**1.95**	**0.12**
Arms swing forward	**0.60**	**0.49**	**0.66**	**0.47**	**1.19**	**0.31**
Arms extend, then partially flex	**0.50**	**0.50**	**0.51**	**0.50**	**0.69**	**0.55**
Arms extend, then fully flex	**0.21**	**0.41**	**0.18**	**0.21**	**0.57**	**0.63**

DISCUSSION

Research on the early childhood years, however, has changed the focus to the development of process characteristics. Frequently, the performance of the standing long jump is a problem for children due primarily to the angle of projection and the required coordination of arm action with leg movements. Mastery of the standing long jump is usually not observed before age 6 and sometimes even in adolescence and adulthood **[13].**

The primary aim of this research was to determine age and gender differences in the quality of the performance of a fundamental motor skill - the standing long jump.

Although children develop motor skills are not age-related phenomenon, but most forms of children's potential to develop these skills are at the end of six years. Several factors are such as individual differences, opportunities, experiences and environmental conditions can to create differences in reaching to the advanced their skills. Gender differences may also be one of the causes of these differences. However, this difference in terms of training opportunities and environmental accommodations for the cultural attitudes for greater freedom to participate in activities for boys compared with girls.

On the basis of the conducted analyses and the obtained results, it is evident that there is no a significant difference in the knowledge level of performance of the standing long jump in all components.

The obtained results were not consistent with the results of previous research. For instance, Gabbard (2000) suggests that successful

performance level of the standing long jump is not recorded up to 6 years of age **[13]**, and a similar sequence continues in adolescence and adulthood, mostly in the form of limited arm swing and incomplete leg extension at take-off **[16].** Qualitative improvements in jumping vary among children. For example, Clark and Phillips (1985) observed that 30% of the 3 to 7 years old had the same level of leg and arm action **[9]**. Some had more advanced leg action than arm action, but some had more advanced arm than leg action. If one component was more advanced than the other, it was usually by one step, but some children were two steps more advanced in one component than the other. Several developmental sequences were noticed in the observational studies of the standing long jump **[8,31].** The long jump requires that the body be propelled forward and upward. This necessitates that the center of gravity be slightly ahead of the base of support at take-off, which may create difficulty in maintaining forward balance; there is a strong tendency for the novice to step out with one foot to avoid falling. Such reflection causes asymmetrical leg action at takeoff, flight and landing **[16].** To improve this leg action, the jumper needs to first make a symmetrical, two-footed take-off, flight and landing; and second, fully extend the ankles, knees and hips at take-off, following a deep preparatory crouch. The trunk leans forward at least 30 degrees from the vertical.

Gender differences in the quality of the standing long jump acquisition were not obtained, which is consistent with the results of the research conducted on a sample of 7 year-old children **[23].** A longitudinal study **[15]**, where the level of knowledge was assessed with composite model, showed that there was no difference between genders in achieving advanced levels of the standing long jump, i.e. both genders showed equal progression from the 1st to 5th level of knowledge. Significant difference in the variable jump length in favor of boys may be explained by the results of previous studies **[11]** where boys were superior in the results of the standing long jump. Also, a comprehensive meta-analysis **[17]** showed that girls were superior at the age of 2 years and boys at the age of 6 years. It seems the differences are conditioned by different interests for physical activities and play and also by different social expectations **[20].**

CONCLUSION

The research conducted on a sample of 151 preschool children examined age and gender differences in the quality of the acquired knowledge of the standing long jump. The level of motor knowledge was evaluated by a

component approach, which assessed the performance of the standing long jump for each component separately. Component approach provides a more precise description of the developmental changes compared to the composite approach. Thus, the progress in each component can be precisely determined, enabling better monitoring of the individual progress of each child. The results obtained in the research showed no significant differences by age in all components. Gender differences in the adoption quality of the standing long jump were not observed which is consistent with the previous research. Evaluation of motor knowledge in preschool children enables higher quality organization of kinesiological activities intended for children at that age. The obtained data indicate that preschool teachers and generalist teachers should have an individualized approach in the adoption process and the improvement of motor knowledge.

REFERENCES

[1] Aguado X, Izquierdo M, Montesinos JL. 1997. Kinematic and kinetic factors related to the standing long jump performance. Journal of Human Movement Studies, 32(4): 156-169.

[2] Benefice E, Malina R. 1996. Body size, body composition and motor performances of mid-tomoderately undernourished Senegalese children. Annals of Human Biology, 23(4): 307-321.

[3] Ashby BM, Heegaard JH. 2002. Role of arm motion in the standing long jump. Journal of Biomech, 35(12):1631-1637.

[4] Burr JF, Jamnik RK, Baker J, Macpherson A, Gledhill N, McGuire EJ. 2008. Relationship of physical fitness test results and hockey playing potential in elite-level ice hockey players. Journal of Strength and Conditioning Research, 22(5): 1535-1543.

[5] Castro-Pinero J, Gonzalez-Montesinos JL, Mora J, Keating XD. 2009. Percentile values for muscular strength field tests in children aged 6 to 17 years: Influence of weight status. Journal of Strength and Conditioning Research, 23(8): 2295-2310.

[6] Castro-Pinero J, Ortega FB, Artero EG, Girela-Rejon MJ, Mora J, Sjostrom M, Ruiz JR. 2010. Assessing muscular strength in youth: usefulness of standing long jump as a general index of muscular fitness. Journal of Strength and Conditioning Research, 24(7): 1810-1817.

[7] Chamari K, Chaouachi A, Hambli M, Kaouech F, Wisloff U, Castagna C. 2008. The five-jump test for distance as a field test to assess lower limb explosive power in soccer players. Journal of Strength and Conditioning Research, 22(3): 944-950.

[8] Clark JE, Phillips S. 1985. A developmental sequence of the standing long jump. In: J.E. Clark, & J. Humphrey (Eds.), Motor development: Vol. 1. Current selected research (pp.73-85). Princeton, NJ: Princeton Books.

[9] Clark JE, Phillips S, Petersen R. 1989. Developmental stability in jumping. Developmental Psychology, 25: 929-935.

[10] Davies BN. 1990. The relationship of lean limb volume to performance in the handgrip and standing long jump tests in boys and girls aged 11.6-13.2 years. European Journal of Applied Physiology, 60: 139- 143.

[11] Demura S, Murase T, Okajima Y. 1990. Development of motor ability by sex differences in preschool children. Japanese Journal of school health, 32: 532-538.

[12] Ellias JD, Carron AV, Bailey DA. 1975. Physical performance in boys from 10 through 16 years. Human Biology, 47: 263-281.

[13] Gabbard CP. 2000. Lifelong Motor Development. 3rd edition. Toronto: Allyn & Bacon.

[14] Gallahue DL, Donnelly FC. 2003. Developmental physical education for all children (4th ed.). Champaingn, IL: Human Kinetics.

[15] Haubenstricker JL, Branta CF, Seefeldt VD. 1999. History of the motor performance study and related programs. In: JL Haubenstricker & DL Feltz (Eds.): 100 Years of Kinesiology: History, research and reflections (pp. 103-125). East Lansing, MI: Department of Kinesiology, Michigan State University.

[16] Haywood KM, Getchel N. 2009. Life span motor development. 5th edition. Champaign Illinois: Human Kinetics, 11-140.

[17] Ikeda T, Aoyagi O. 2008. Meta-analytic of gender differences in motor performance and their annual changes among Japanese preschool-aged children. School Health, 4: 24-39.

[18] Katic R, Bala G, Barovic Z. 2012. Gender differentiations of cognitive-motor functioning in prepubertal and

pubertal children. Collegium Antropologicum, 36(2): 563-572.

[19] Keough J. 1969. Change in motor performance during early school years. Technical report 2-69 (usphs grant HD 010559), department of physical education, university of California, Los Angeles (and document 01239, 61).

[20] Malina MR, Bouchard C. 1991. Growth, maturation and physical activity. Human Kinetics Books: Champaign: 187-204.

[21] Malina MR. 2004. Motor development during infancy and early childhood: overview and suggested direction for research. International Journal of Sport and Health Science, 2: 50-66.

[22] Meylan CMP, Cronin JB, Oliver JL, Hughes MG, McMaster DT. 2012. The reliability of jump kinematics and kinetics in children of different maturity status. Journal of Strength and Conditioning Research, 26(4): 1015-1026.

[23] Mohammadzadeh H, Ashtari MR, Ghorbani S. 2007. The description and comparison of selective fundamental motor skills (standing long jump and hopping) of seven years old boys and girls in Urmania. Journal of Harakat, 33: 87-104.

[24] Moresi MP, Bradshaw EJ, Greene D, Naughton G. 2011. The assessment of adolescent female athletes using standing and reactive long jumps. Sports Biomechanics, 10(2): 73-84.

[25] Nikolić I, Mraković S, Horvat V. 2013. Standing long jump performance quality: Age and gender differences. EBSCO Host Connection, 15(1): 173-183.

[26] Ozsaker M. 2011. Investigation of physical performance parameters of children aged 12-14 years. International Journal of Human Sciences, 8(2): 499-509.

[27] Pandy MG, Zajac FE. 1991. Optimal muscular coordination strategies for jumping. Journal of Biomechanics, 24(1): 1-10.

[28] Payne VG, Isaacs LD. 2002. Human motor development: A lifespan approach, 5th ed. Boston, MA: McGraw-Hill.

[29] Payne VG, Isaacs LD. 2012. Human motor development: a lifespan approach. 8th Edition. New York: McGraw-Hill Humanities, 352-380.

[30] Revie G, Larkin D. 1993. Problems with teacher identification of poorly

coordinated children. Achper, National Journal, 40(4): 4-9.

[31] Roberton MA. 1984. Changing motor patterns during childhood. In: J. R. Thomas (Eds.), Motor development during childhood and adolescence (pp. 48-90). Minneapolis: Burgess.

[32] Wakai M, Linthorne NP. 2005. Optimum takeoff angle in the standing long jump. Human Movement Science, 24(1): 81-96.

[33] Williams W. 2003. Using your personal digital assistant to store lesson plans. Journal of Physical education, Recreation & Dance, 73(3): 16-18.