The Effect of Coordination and Balance toward Elementary Students' Locomotor Ability age 7 to 10 in Lima Puluh Kota Regency

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***Abstract*— Based on preliminary studies, the problem in this study is the low level of elementary students' locomotor ability in Lima Puluh Kota Regency. The authors presume students' coordination and balance as influential factors. Therefore, this study aims to figure out the effect of coordination and balance toward the level of students' locomotor abilities. Random sampling was employed to choose 125 students from grade 1, 2 and 3 as the sample of the study. The instrument used to obtain data on coordination is the cable jump test and one-foot stand balance while instrument to test the locomotor ability level is the Test of Gross Motor Development Second Edition (TGMD-2). The results show (1) coordination contributes 9.4%, (2) balance contributes 9.7%, and (3) the effect of coordination and balance on the level of locomotor ability of a student which a calculated value of 0.358> r table is 0.176 and a significant value (Sig) is 0,000 smaller than the probability of 0.05 with a regression value of Y = 29.20 + 0.203X1 + 0.213X2. The results of this study indicate that the level of locomotor abilities possessed by elementary school students is influenced by their coordination and balance. To sum up, the better coordination and balance criteria they have, the better the locomotor ability level they are able to display.**

***Keywords* – Coordination, Balance, Locomotor Ability.**

I. INTRODUCTION

Basic movement must be carried out by children, adolescents and adults to affect the ability of physical activity [1]. The observation of students' basic movement in tertiary level at semester July-December 2018 and January-July 2019 shows no more than 10% getting good score. This fact can be assumed that students' basic movement is still far from the proper condition. The experts said that basic movement is the initial foundation which students must master to do more complex sports movements. Thus, if basic movements are taught to students surely complex sports movements will also be mastered well.

Moreover, other observations have been done at the level of elementary schools and junior high schools in Lima Puluh Kota Regncy. Based on observations and results of student test scores, and supported by interviews with Physical Education teachers in several schools, it can be concluded that the ability of movement displayed by students, especially sports activities, is still in the low level. It is strongly suspected that many students in both elementary schools experience movement delays, whereas for junior high school students cannot display quality of motion that is appropriate for their age.

The fact that students' lack of proper sports movement skills as found in the field makes it difficult for teachers and trainers to implement training programs to create regeneration of young athletes in the educational environment. The main problem figured out in the educational sector is low quality of basic movement, both in terms of their quality and level of development. Many things trigger these problems, some are internal, which originate within the student. Furthermore, it is also caused by externally, both the environment and the attention of parents and teachers about the importance of mastering basic movement skills for students.

Basic movements actually should be taught in educational environment starting as early as possible. However, some studies show that early childhood (known as PAUD in Indonesia) teachers in Indonesia are still not prepared to apply basic movement learning, even most of them in West Sumatra have limited understanding, insight and skills about basic movement material [2]. As a member of a team of trainers and presenters of basic movement learning in early childhood at Padang State University, researchers also obtained information from teachers at early childhood teacher seminars throughout West Sumatra. They justify the fact that basic movement skills are not thoroughly implemented in early childhood students as a result of their less background knowledge and skills.

The ability to move in basic movement skills (fundamental motor skill) illustrates the degree of mastery of skills in using fingers, eye-hand and eye-foot coordination, tempo-balance, and visual perception. [3]. Mastering these basic motion skills not only affects the psychomotor aspects, but also cognitive and associative aspects [27]Therefore, in realizing a good movement, mastery of coordination, perception and balance are a must for each child. Frankly speaking, it is impossible for a child to display movement correctly if they fail to master all of those elements.

Regarding the lack of movement ability displayed by elementary, junior high school and even university students observed in the field, as lecturers in the course of Athletics, the authors intend to figure out the influential factors of this issue. Based on a number of opinions and the results of studies from previous researchers, the authors assume that good movement

is influenced and supported by students' internal elements, namely physical factors which in this study focused on coordination and balance of students.

The basic movement is divided into several parts. Some experts explain this one is grouped into two, namely locomotor movement and object control movement. In physical education and sports activities including the Athletics course, locomotor and object control are the basis of movement required in almost every branch of sport. In this study, the researchers focus the influence of coordination and balance on locomotor movement. This research aims to reveal how much the influence of coordination and balance toward students' locomotor ability.

Locomotor movement is a basic element of motion that must be mastered by every child. It is always related to basic movement of various sports because this one is to move the body from one point to another such as road, jump, run and so on. It consists of walking, running, gliding, jumping, prancing and jumping [4]. Considering the importance of this movement, the authors give attention to coordination and balance as supporting aspects. Coordination is defined as a physical element in integrating all complex movements including locomotor. Balance is a dominant element in every sport movement, without a this ability the movement will not be realized optimally.

II. Locomotor ability, coordination and balance

A. Locomotor Ability

Basic movement is a skill that forms the basis in realizing the right movement. Basic movement skills are needed in an effort to build complex patterns of movement and must be begun to be developed from an early age that is when a child starts moving according to his/her wishes [5]. The results of studies show that that have been carried out show that preschool children who show higher fundamental motor skill (FMS) are more physically active than their classmates who are less skilled [6] [7] [8] [9] [10] [11]. In the other words, students who have good basic movement competence will be more active and dominant in physical activity and sports than those who have low basic movement. This condition allows them to learn more complex sports movements easier.

Nowadays some phenomena about proper basic movement are not in accordance with the desired expectations. Many children in Indonesia still have limited opportunities and abilities to be active in moving [12]. Laban explains that basic movement skills are grouped into three parts, namely: (1) locomotor skills, (2) balance skills and (3) manipulative skills [5]. Basic movement skills that are very important for early childhood are divided into two forms, namely locomotor and object control [13]. Further, Gusril adds that the main basic movement is an inherent pattern of motion that forms the basis for complex skilled movements including: (1) locomotor motion, (2) non-locomotor motion, (3) manipulative motion [14]. The locomotor ability is a fundamental aspect of a child's development to move from point A to point B [15]. Thus it can be understood that locomotor movement is very important and needs to be developed since pre-school age (kindergarten).

Another opinion about locomotor is a movement that moves the body from one point to another. These movements include: a) Run b) Gallop (running Horse) c) Hop (jump with foot injurious) d) Leap (run accompanied by jumping) e) Horizontal Jump (one-way jump as far as possible)[5]. Based on this explanation, it can be assumed that locomotor movement is the ability to move body to another place.

B. Coordination

Coordination is a physical element that has very crucial role in learning movement, the realization of movement, and to see the quality of one's movements in daily activities and in sports. The level of coordination of basic movement is an important factor that drives a child's physical activity from an early age [16]. Some studies argue that the increasing complexity of the movement is in line with the increasing of the level of coordination required to carry out activities and coordinating skills are classified as motor learning, motor scouting, motor adaptation and change direction skills [17]. It can be said that coordination plays an important role in increasing the complexity of the movement so that the ability of coordination needs to be improved continuously.

Moreover, coordination is an important factor that will later affect the basic movement skills possessed by children as well as at the level of higher education [18]. Thus it can be interpreted that this ability is not only needed for early childhood but also at the age of elementary school, high school, or even college level. Coordination is a reciprocal relationship between the central nervous system with the means of movement in regulating and controlling the impulses and work of muscles for the implementation of a movement [19].

Coordination ability strongly supports the mastery of movement skills. Coordination includes eyes-feet, eyes-hands, ears-eyes-feet and so on"[20]. In short, this ability is a cooperative relationship between the central nervous system and the locomotor when contracting in completing motor tasks or interrelated movements. That movement is able to produce precise and directed movement skills including in realizing locomotor movement effectively and efficiently.

C. Balance

Balance is a component needed to successfully complete functional activities including locomotor and manipulative skills in carrying out daily activities such as playing, running and jumping [21]. In doing complex sports movements, it is necessary to have a proper balance. Moreover, the balance of the child is also pertinent for the development of movement functions in sports. Balance (for the human body) is the ability to be zero of the sum of the forces acting on the body,

gravitation of the body, protection of the sequence under the influence of internal and external [22].

Motor skills and balance are the initial phase of physical development in childhood. In order to make more complex movements, children should be trained continuously with several movements such as running, jumping, and sports activities. Improvement in movement skills certainly reduce the risk of injury during physical activity in their age [23]. Dynamic balance is the ability to maintain stability while forecasting and reacting to alteration as the body moves through the infinite [22]. The results of the study prove that balance is a physical element that always plays a role in every dynamic or static movement [26]. Therefore, if students have good locomotor motion, it is believed that they will be able to realize more complex sports movement abilities. This can be achieved of course through balance exercises in a static and dynamic manner.

III. The Data Acquisition Setup

The instrument used to obtain data about eyes-hands coordination is cable jump instrument which is performed for about 30 seconds and counted the number of successful jumps conducted by the students [13]. Further, the One-Food Stand test instrument is used to measure students' balance [24] by assigning them to stand for about 30 seconds for their right-left feet and counted using a stopwatch. Another instrument is TGMD-2 to test the level of locomotor ability [5]. Each student is given the opportunity two times to make the same movement, the movement then is documented in the form of video.

In data collection, there are several tools used including; (1) meter (2), stopwatch (3), handy-cam (4), cone (5), whistle (6) skipping.

Picture 1. Meter

Picture 2. Stopwatch

Picture 3. *Handy-cam*

Picture 4. *Disc cones*

Picture 5. Whistle

Picture 6. *skipping*

IV. The Data Set

The data about the level of locomotor ability of students in Lima Puluh Kota Regency were taken twice for each child in accordance with the skills assessed in TGMD-2 [5]. All locomotor ability movements were documented in the form of video and then coded by using TGMD-2 sheets to determine students' locomotor ability levels.

The term coordination in this study is referred to the coordination of movements between eyes-hands-feet obtained through the Cable Jump test [13]. This test requires each student to jump the rope as much as possible in 30 seconds with two repetitions. The highest value from the 2 repetitions is taken as the data. A stopwatch is used to count the time to be more effective and efficient. The score is correct jump conducted by the student for 30 seconds.

Balance is obtained by giving the One-Food Stand test [24] in which each child is assigned to stand on one foot alternately right and left for 30 seconds each. All tests are given to children aged 7 to 10 years consisting of 52 female and 74 male students.

Kemampuan Lokomotor	Level Kemampuan								Total
	1	%	2	%	3	%	4	%	
Run	3	2%	43	34%	65	52%	15	12%	126
Gallop	25	20%	87	69%	14	11%			126
Hop	52	41%	72	57%	2	2%	0	0%	126
Jump	15	12%	70	56%	35	28%	6	5%	126
Skip	55	44%	53	42%	18	14%			126

Table 1. Percentage of student locomotor ability level in Lima Puluh Kota Regency

This study shows the locomotor level of elementary school students in Lima Puluh Kota in term of skill in doing run from 126 students is only 15 students (12%) reaching level 4 (maximum). In gallop skill, only 14 students (11%) reach level 3 (maximum). Then, in term of hop skill, no one reaches level 4 (maximum). In jump skill only 6 students (5%) reach level 4 (maximum), and the last skip skill only 8 students (14%) reach level 3 (maximum).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.306[a]	.094	.086	9.55889

a. Predictors: (Constant), Koordinasi

b. Dependent Variable: Level Kemampuan Lokomotor

The result above shows Rsquare value for agility variable toward locomotor ability level is 0.094 or contributes for about 9.4%.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.311[a]	.097	.090	9.54146

a. Predictors: (Constant), Keseimbangan
b. Dependent Variable: Level Kemampuan Lokomotor

Moreover, Rsquare value for coordination variable toward locomotor ability level is 0.097 or contributes for about 9.7%.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.358[a]	.128	.114	9.41201

a. Predictors: (Constant), Keseimbangan, Koordinasi

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1591.761	2	795.880	8.984	.000[b]
	Residual	10807.485	122	88.586		
	Total	12399.246	124			

a. Dependent Variable: Level Kemampuan Lokomotor
b. Predictors: (Constant), Keseimbangan, Koordinasi

Table 2. Regression Table of Students Locomotor Ability Level

The output above explains based on the F test or the simultaneous influence between balance and coordination on the level of locomotor ability of elementary school students in Lima Puluh Kota, the Sig F value of 0.000 <0.05.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	29.206	4.978		5.867	.000
	Koordinasi	.203	.097	.203	2.099	.038
	Keseimbangan	.213	.097	.213	2.207	.029

a. Dependent Variable: Level Kemampuan Lokomotor

Table 3. Students Locomotor Ability Level in Lima Puluh Kota Regency

Based on the results, Sig values of balance and coordination are 0.038 and 0.029 which these findings are smaller than the probability value 0.05 to prove that there is an effect of balance and coordination toward the locomotor ability of elementary school students in Lima Puluh Kota regency. Data analysis performed with SPSS version 23 shows the value of Y = 29.20 + 0.203X1 + 0.213X2 which this means that every escalation in one score on balance (0.213X1) and coordination (0.203X2) will increase the level of locomotor ability at a constant 29.20.

Picture 7. Ilustrasion *gallop*

Picture8. Ilustrasion hop

Picture 9. Ilustrasion *jump*

Picture 10. Ilustrasion *run*

Picture 11. Ilustrasion *skip*

Picture 12. Ilustrasion *cable jump*

Picture 13. Ilustrasion *cable jump*

Picture 14. Ilustrasion *one foot stand*

V. Conclusions

The results of this study indicate that the level of locomotor ability is affected by coordination and balance. The better the degree of coordination and balance, the higher student's locomotor ability is. The provision of coordination and balance exercises by the teacher needs to be done so that coordination and balance increase, so that students' locomotor abilities also increase. Teachers are expected to pay more attention to basic movement skills especially the level of development of locomotor abilities possessed by their students to match their age level. Further, the factors related to the level of locomotor ability also need to be considered such as coordination and balance. In the future, the authors plan to propose Physical Education subject with basic-movement-skills-based, especially locomotor abilities. Last but not least, research related to the level of development of locomotor ability needs to be conducted further with a larger sample in order to improve the quality of students' basic movement skills.

References

[1] Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). A

developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *Quest*, *60*(2), 290-306.

[2] Bakhtiar, S., & Famelia, R. (2017, December). Institute Role of Teachers' Education in Improving the Standard of Development Achievement Rate and Standard of Teacher and Education Personnels of Early Childhood Education. In *International Conference of Early Childhood Education (ICECE 2017)*. Atlantis Press.

[3] Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2006). Motor competence and its effect on positive developmental Trajectories of Health. Sports Medicine, 45(9), 1273-1284

[4] Hayati, H. S., Myrnawati, C. H., & Asmawi, M. (2017). Effect of Traditional Games, Learning Motivation And Learning Style On Childhoods Gross Motor Skills. *International Journal of Education and Research*, *5*(7).

[5] Bakhtiar, S. (2015). Merancang pembelajaran gerak dasar anak.

[6] Cliff, D. P., Okely, A. D., Smith, L. M., & McKeen, K. (2009). Relationships between fundamental movement skills and objectively measured physical activity in preschool children. *Pediatric exercise science*, *21*(4), 436-449.

[7] A Fisher, JJ Reilly, LA Kelly, C Montgomery, A Williamson, JY P aton, *et al.* Fundamental movement skills and habitual physical activity in young children Med Sci Sports Exerc, 37 (2005), pp. 684-688

[8] E Robinson, JD Goodway. Instructional climates in preschool children who are at-risk. Part I: object-control skill development Res Q Exerc Sport, 80 (2009), pp. 533-542

[9] Robinson, L. E., Wadsworth, D. D., & Peoples, C. M. (2012). Correlates of school-day physical activity in preschool students. *Research quarterly for exercise and sport*, *83*(1), 20-26.

[10] HG Williams, KA Pfeiffer, JR O'Neill, M Dowda, KL McIver, W H Brown, *et al.* Motor skill performance and physical activity in preschool children Obesity, 16 (2008), pp. 1421-1426

[11] A Sääkslahti, P Numminen, H Niinikoski, L Rask-Nissila, J Viikari, JTuominen, *et al.*Is physical activity related to body size, fundamental motor skills, and CHD risk factors in early childhood? Pediatr Exerc Sci, 11 (1999), pp. 327-340

[12] Famelia, R., Goodway, J. D., Bakhtiar, S., & Mardela, R. (2016, June). Investigating the motor competence and physical activity of Indonesian, Muslim preschoolers from urban and rural areas. In *JOURNAL OF SPORT & EXERCISE PSYCHOLOGY* (Vol. 38, pp. S33-S33). 1607 N MARKET ST, PO BOX 5076, CHAMPAIGN, IL 61820-2200 USA: HUMAN KINETICS PUBL INC.

[13] Goodway, J. D., Ozmun, J. C., & Gallahue, D. L. (2019). *Understanding motor development: Infants, children, adolescents, adults*. Jones & Bartlett Learning.

[14] Gusril. Perkembangan motorik pada masa anak-anak. Padang : UNP Press. 2015.

[15] Rudd, J. (2016). *The efficacy of gymnastics to improve movement skill competence in children* (Doctoral dissertation, Victoria University).

[16] Ružbarská, I. (2016). Physical fitness of primary school children in the reflection of different levels of gross motor coordination. *Acta Gymnica*, *46*(4), 184-192.

[17] Altinkök, M. (2016). The Effects of Coordination and Movement Education on Pre School Children's Basic Motor Skills Improvement. *Universal Journal of Educational Research*, *4*(5), 1050-1058.

[18] Aggeliki Tsapakidou, Sofia Stefanidou & Eleni Tsompanaki. Locomotor Development of Children Aged 3.5 to 5 Years in Nursery Schools in Greece. Review of European Studies; Vol. 6, No. 2; 2014. ISSN 1918-7173 E-ISSN 1918- 7181. Published by Canadian Center of Science and Education.

[19] Kiram, Y. (1994). Kemampuan Koordinasi Gerak dan Klasifikasi Aktifitas. *Padang: FPOK IKIP. Padang*.

[20] Bafirman. *Fisiologi olahraga.* Malang : Wineka Media. 2013.

[21] Franjoine, M. R., Darr, N., Held, S. L., Kott, K., & Young, B. L. (2010). The performance of children developing typically on the pediatric balance scale. *Pediatric physical therapy*, *22*(4), 350-359.

[22] Kesilmis, I. (2017). The comparison of the different balance performance of soccer players versus sedentary. *IJSSPE*, *2*(3), 37-43.

[23] Devinder Kaur Ajit Singh, Nor Najwatul Akmal Akmal Ab Rahman, Roslee Rajikan, Asfarina Zainudin, Nor Azlin Mohd Nordin, Zainura Abdul Karim, Yeap Hui Yee. Balance and Motor Skills among Preschool Children Aged 3 to 4 Years Old. Malaysian Journal of Medicine and Health Sciences (ISSN 1675-8544); Vol. 11 (1) Januay 2015: 63-68.

[24] Muehlbauer, T., Mettler, C., Roth, R., & Granacher, U. (2014). One-leg standing performance and muscle activity: are there limb differences?. *Journal of applied biomechanics*, *30*(3), 407-414.

[25] Muehlbauer, T., Mettler, C., Roth, R., & Granacher, U. (2014). One-leg standing performance and muscle activity: are there limb differences?. *Journal of applied biomechanics*, *30*(3), 407-414.

[26] Oktarifaldi, O., Syahputra, R., Putri, L. P., & Bakhtiar, S. (2019). The Effect Of Agility, Coordination And Balance On The Locomotor Ability Of Students Aged 7 To 10 YearS. *Jurnal Menssana*, *4*(2), 190-200.

[27] Bakhtiar, S., Putra, E. R., Oktarifaldi, O., & Putri, L. P. (2019). The Effect Of Eye-Hand Coordination And Gender On The Level Of Ability In The Control Object Of Paud Students In Pariaman City. *Jurnal Menssana*, *4*(2), 165-174.

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