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RESEARCH LEVEL OF GROSS MOTOR DEVELOPMENT AND AGE EQUIVALENTS OF CHILDREN 7 TO 9 YEARS

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ABSTRACT: *The purpose of the study is to identify the age group of children 7, 8 and 9 who have experienced delays in gross motor development. Instrument used in this study is Test Gross Motor Development / TGMD-2 (Ulrich, 2000) which was adopted at the international level. Gross motor development data were obtained by video recording (Sony (DRC-SR42 with a 40x optical zoom capability, and software Ultimate Studio 14) on locomotors and manipulative skills. A total n = 192 persons, children of 7 years (7.17 ± .297), 8 years (8.53 ± .430) and 9 years (9.30 ± .431) at Sekolah Kebangsaan Mutiara Perdana, Bayan Lepas, Penang were involved as subjects. The MANOVA analysis showed that, Wilk's Lambda value = .06, [F (8,372) = 137.97, p <.05] was significant. Children age 9 years experienced delays AEL (4.61 ± .69), AEM (5:52 ± .62) and GMDQ (7.26 ± .2.14) compared to children age 7 years AEL (5.62 ± .69), 6:40 AEM ± .76), GDMQ (16:06 ± 2:13), and children age 8 years AEL (5.83 ± .63), AEM (4.77 ± .77) and GMDQ (9:46 ± 2.42).*

KEYWORDS: Test Gross Motor Development, Age equivalent Locomotors, Age equivalent Manipulative and Gross motor development.

INTRODUCTION

Physical education plays a role in contributing to the growth and development of children as a whole through the learning experience to meet the needs of the psychomotor, cognitive, and affective domain (Abdullah Sani, 2003; Darst & Pangrazi, 2006; Dauer & Pangrazi, 1995; and Freeman, 2001). All children will go through a learning process based on Physical Education syllabus as set out in the primary school integrated Curriculum (KBSR). In the Physical Education curriculum, children have been served with the order of subjects according to three main pillars that anchor fitness, skill and sportsmanship. Core fitness focus of this study as the backbone consists of teaching about fitness in gross motor skills involving the locomotors and manipulative skills. Children age seven to nine years will be involved in teaching and learning process based on skills. Children will apply all the locomotors and manipulative skills they have learned during the level one when they set foot into Phase Two. Elements of gross motor development will be polished, nurtured and educated through the eyes of Physical Education in KBSR (1983), used in all primary schools across the country. Gross motor development is very important as basic movement to allow children to engage in physical activity and learning activities. Development has been defined by Gallahue and Ozmun (2006), as a process of continuous change in motor behavior during the life cycle . Haywood & Getchell, (2009), also explains the development of

gross motor as a change in the ability of nerve-muscle system in the control of motor skills throughout life as a results from the interaction between tasks, the individual and the environment. In Gross motor movement and behavior, children need guidance and ongoing training so that they can maintain the movement that are related. According to Ahmad Hashim (2004), Physical Education primary goal is to provide opportunities to all school children of school in efficiency control of gross motor skills.

LITERATURE REVIEW

Gross motor development is an important element to be developed according to chronological age so that children will not fine difficult to engage in more complex motor behavior at a higher age (Thelen & Smith, 1994; Ulrich & Ulrich, 1993; Wan Asma, 2000). If review of the developmental aspects of the subject content of Physical Education and Health (CDC, 2001), are done gross motor development of children, can be achieved. However, the children seemed to be interested in being involved in teaching of the activities but it failed to generate interest in them directly.

Laura Gray, Hennie Ng and Doreen Bartlett (2010), found that the development of motor skills for children are affected by time, experience and knowledge. Gross motor development has varied complexity, especially in terms of repetitive movements and sequential movement using gross motor skills of children. In addition, the development of gross motor skills for children vary according to their age level of increase (Addison, 2005; Parke, 2003). The resulting movement of the body in children is through the combined senses of sight, mind and movement (Largo, Fischer & Rousson, 2003). Gross motor development is especially critical in the formation of the gross motor skills of children. According to Gallahue & Ozmun (2006), children age 7, 8 and 9 years old should have mastered the basic movement phase of gross motor development. Gross motor development at this age should be in accordance with chronological age (Ulrich, 2000). Gross motor development of children ages 7.8 and 9 years should be at a good level (Ulrich, 2000). Researchers attempted to detect whether there are development and improvement of gross motor development scores (GDMQ) the child's ability to perform locomotors and manipulative activities in line with their age level.

The Health and Physical Education teachers should be exposed to and focus on how to measure the performance of children in terms of increasing the level of physical fitness. This occurs because, educators teaching the subject is less knowledgeable in gross motor development of school children. Physical Education teachers are not exposed to practical measurement of any form of test about the gross motor development at school level. The Physical Education curriculum does not have the tools and ways to measure this aspect. This resulted in many educators of children age 7.8 and 9 years not knowing the level of gross motor development and therefore, they are not being monitored. Gross motor development is important because it contributes to the involvement of children in sports activities in the future (Stodden, Goodway, Langendorfer, Roberton, Rudisill, Garcia, & Garcia, 2008; Harter, 1999). Children who do not have competency in gross motor development are not unable to perform with efficiency. They are most likely to be help back in gross motor development (Gallahue, 2006; Harter, 1978; Rudisill, 1989; Ulrich, 2000; Santrock, 2011). Measurement component of motor development is often used as a basis for assessing the progress of an individual based on chronological age.

METHODOLOGY

This research uses exploratory design (exploratory). This study aims to evaluate the score of locomotors, manipulative standard scores, age equivalent score of locomotors, manipulative scores and age equivalent score of gross motor development in children ages 7, 8 and 9 years. Figure 1 shows the conceptual framework of the study.

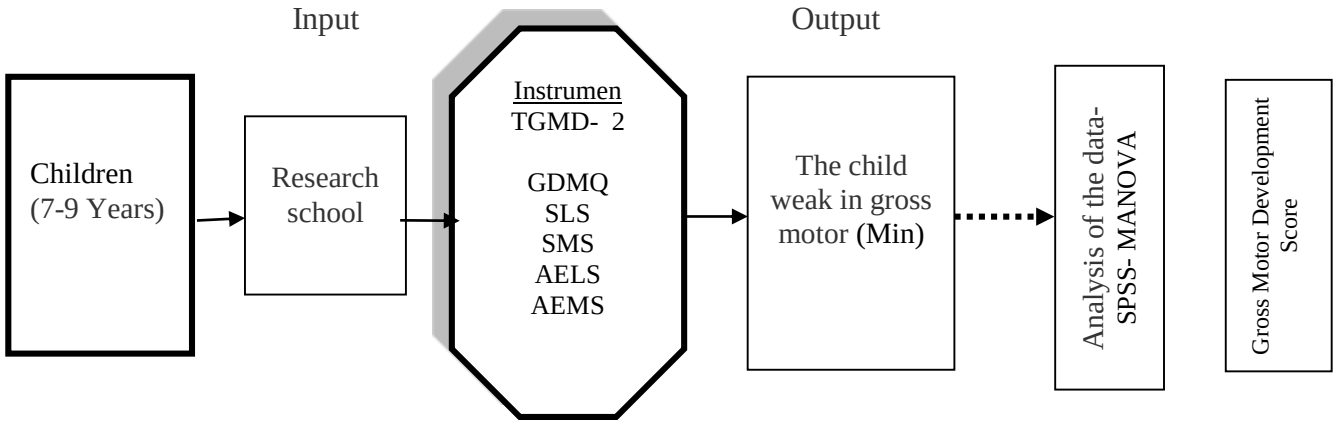

Figure 1: Conceptual Framework shows the level of Gross Motor Skills of Children 7, 8 and 9 years.

The Study Sample

Overall a total of 192 male children from the National School Mutiara Perdana, Bayan Lepas, and Penang are selected as subjects. A total of 64 subjects per age group of 7 years, 8 years and 9 years.

Measuring Instruments Of Gross Motor Development.

TGMD Test-2 (Ulrich, 2000) is used as an instrument in this study. According to Ulrich (2000), locomotors skills are defined as running, Gallop, hop on one foot, jump with both legs, and fled from the side eject. While manipulative skills are defined as hitting, bouncing, catching, kicking, throwing and rolling ball. According to Wouter, Kristine, Christiane, and Caroline, (2008), this test can be used to identify children who are significantly behind their peers in gross motor development. Construct validity TGMD-2 test for locomotors component (r = .68 - 78) and manipulative component of (r = .66 - .87). The overall value of Cronbach Alpha test TGMD-2 for each test item is between .82 to .83.

Equipment and Procedure Review

Research related to the level of gross motor development of children involves the following equipment: (1) four sets of Sony (DRC-SR42) with a 40x optical zoom capability, (2) Four tripod (SteinZeiser SZ-01), (3) Software Ultimate Studio 14 (4) a desktop computer (5) Pro CS4 Adobe Premiere (6) Skital (7) Tape Measure (8) Bladder Nut (9) Rubber Ball 4 Inch (10) Plastic Bat (11) batting tee (12) Basketball (13) Plastic Ball (4 Inch) (14) Football (15) Tennis Ball (16) Baseball / Soft Ball (17) Score Form (Motor Development Test Ulrich, 2000), (18) Handheld digital.

Data analysis

Statistical analysis of gross motor development test in this study is done using computer software SPSS for Windows 14.5. Descriptive and inferential statistical analysis One-way MANOVA method used in this study.

RESULTS

Overall a total of 192 male children from the National School Mutiara Perdana, Bayan Lepas, Penang are selected as subjects. A total of 64 subjects per age group 7 years, 8 years and 9 years each, successfully completed the study within the prescribed time.

Descriptive On the Gross Motor Development Of Children Age 7, 8 And 9 Years. Descriptive method was used to obtain values of mean and standard deviation scores based on the SLS, SMS, AELS, AEMS and GDMQ. Descriptive analysis in Table 1, showing the whole subject of chronological age is between 6.67 years to 9.83 years (M = 8:34, SD = 96). Overall, subjects obtained mean SLS (M = 5.75, SD = 2.20), AELS (M = 5:36, SD = .84), SMS (M = 5.18, SD = 2.70), AEMS(M = 5:56, SD = .98) and GDMQ (M = 72.79, SD = 7.13). The findings showed that children age 7 years is of chronological age of 6.67 years to 7.50 years (M = 7.17, SD = .298), 8-year period between 7:50 to 8.92 (M = 8.53, SD = .430) and 9-year period between 8:23 to 9.83 (M = 9.30, SD = .430). Overall, the scores indicated the position of children aged subjects were actually in the proper age group, according to the conditions placement of children in Year One, Year Two and Year Three based on the year the child was born.

Variables	Class	N	Minimum	Maximum	*mean*	*SD*	Overall *Mean*	Descriptive Rating
AGE (IV)	7 Years	64	6.67	7.50	7.17	.297		-
	8 Years	64	7.50	8.92	8.53	.430		-
	9 Years	64	8.23	9.83	9.30	.431		-
SLS (DV)	7 Years	64	3.00	11.00	7.65	.128		Average
	8 Years	64	4.00	10.00	6.25	.127	5.75	Below average
	9 Years	64	1.00	7.00	3.34	.127		Very poor
AELS (DV)	7 Years	64	3.25	8.00	5.62	.690		Below average
	8 Years	64	5.00	8.00	5.83	.633	5.36	Below average
	9 Years	64	3.25	6.25	4.61	.629		Poor
SMS (DV)	7 Years	64	5.00	12.00	8.40	1.411		Below average
	8 Years	64	1.00	10.00	3.21	1.558	5.18	Sangat Rendah
	9 Years	64	1.00	7.00	3.91	1.276		Poor
AEMS (DV)	7 Years	64	4.25	9.25	6.40	.768		Below average
	8 Years	64	3.50	8.50	4.77	.774	5.56	Below average
	9 Years	64	3.00	6.75	5.52	.619		Poor
GDMQ (DV)	7 Years	64	73.00	106.00	88.18	6.411		Below average
	8 Years	64	58.00	94.00	68.40	7.269	72.7	Very poor
	9 Years	64	46.00	76.00	61.79	6.441		Very poor

Table 1: Descriptive statistics for Overall Score Based on Age

Note: SPL = Score locomotors Standard; AELS = Score Age Equivalents locomotors; SPM = Score Manipulative Standard; AEMS = Score age Equivalents manipulative; GDMQ = Gross Motor Development Score

IV = Independent Variables
DV = Dependent Variables

Refer to Table 1, the descriptive rating (Ulrich, 2000) for the SLS, AELS, SMS, AEMS and GMDQ show that the performance of children age 7 years indicated level of locomotors Standard Score, the level below the average for the Standard of Living Score, Age Equivalents locomotors Score, Age Equivalents Manipulative Score and Gross Motor Development Score. Performance of the subject children age 8 years showed that Score locomotors Standard, Score locomotors Standard , Age Equivalents locomotors score and Age Equivalents manipulative below the average level and earned a very low level in the Score Standard score of Living and Gross Motor Development than the age of 7 years. Subjects age 9 years acquired low levels of locomotors Age Equivalents score, Score Age Equivalents Manipulative Score but very low in locomotors Standard Score and Gross Motor Development Score over 7 and 8 years of age. This finding indicated that the subjects of children age 9 years experienced lowest gross motor developmental level when compared with children of 7 years and 8 years.

Table 2:The analysis showing the age equality

Age	Mean Value				
	Chronological Age	**Age Equivalents locomotors**	**Age Equivalents Manipulative**	**lokomotif Delay**	**manipulative Delay**
7 Years	7.17	5.62	6.40	1.55	0.77
8 Years	8.53	5.83	4.77	2.70	3.76
9 Years	9.30	4.61	5.52	4.70	3.79

Table 2 showed of the subjects of 7 years' experience delays in AELS (M = 1:55) and the delay in AEMS (M = 0.77), the subject experienced a delay of eight years in AELS (M = 2.70) and delay in AEMS (M = 3.76), the subject of 9 years experienced a delay in AELS (M = 4.70) AEMS checkers (M = 3.79). Children aged 7 years 1 day to 7 years 11 months 29 days counted as 7 years, children aged 8 years 1 day to 8 years 11 months 29 days counted as 8 years and children aged 9 years 1 day to 9 years 11 months 29 days counted as 9 years (Ulrich, 2000). The findings show that children 9 years of age have experienced delays in locomotors and manipulative equivalents higher than children age 7 years dan 8 years. Based on these findings then, subjects age 9 years showed gross motor development problems.

MANOVA analysis was used to determine significant different of combined score of locomotors, age equivalents locomotors score, scores manipulative standard, age equivalent manipulative scores and scores of gross motor development among children of primary school boys aged 7, 8 and 9 years. Table 3 showed the results of statistical analysis, $F(8,372) = 137.97$, $p < .01$, Wilks' Lambda = .06, partial eta square ($\eta 2$) = .75, were significant. This finding indicate a significant difference to the standard combination of locomotors scores, age equivalent score of locomotors, manipulative standard scores, age equivalent score of manipulative and gross motor development scores in children of primary school boys age 7, 8 and 9 years. The analysis showed that age

accounted for 75% of the total variance of gross motor development of children in the primary school.

Table 3:MANOVA analysis showed that Gross Motor Development of Child Age 7, 8 and 9

Variable	7 year (n=64)		8 year (n=64)		9 year (n=64)	
	M	***SD***	***M***	***SD***	***M***	***SD***
SLS	7.65	1.28	6.25	1.27	3.34	1.27
SMS	8.40	1.4	3.21	1.55	3.92	1.27
AELS	5.62	.69	5.83	.63	4.61	.69
AEMS	6.40	.76	4.77	.77	7.26	2.14
GMDQ	16.06	2.13	9.46	2.42	7.26	2.14

Multivariate test

	value	F	df Hipotesis	Ralat df	Sig.	Partial Eta square
Wilks' Lambda	.064	137.972(b)	8.000	372.000	.000	.748

* * p < .01

Effects of test subjects

Dependent variable	Type III Total square	error	Df	Mean square	F	Sig.	Partial Eta square
SPL	619.125	189	2	309.563	189.421	.000	.66
SPM	1013.635	189	2	506.818	251.424	.000	.72
SUKL	55.174	189	2	27.587	64.989	.000	.407
SUKM	84.974	189	2	42.487	80.917	.000	.461
SPMK	2681.94	189	2	1340.97	267.29	.000	.739

*p < .01

SLS= Score locomotors Standard; AELS = Age Equivalents locomotors Score; AEMS= e Standard Manipulative Score; AEMS = Age Equivalents manipulative Score; GMDQ= Gross Motor Development Quitrent

Univariate F tests of locomotors score of children, aged 7, 8 and 9 years showed that F (2.189) = 189.42, p <.01, partial ɳ2 = .67, were significant. Mean scores for locomotors score of children aged 7 years (M = 7.65, SD = 1.28) higher than that of children aged 8 years (M = 6.25, SD = 1.27) and 9 years (M = 3.34, SD = 1.27). Children aged 9 years significant difference in locomotors Standard Score provide the lowest mean value. Univariate F tests on the score of manipulative children, aged 7, 8 and 9 years showed that F (2.189) = 251.42, p <.01, partial ɳ2 =

73 were significant. Children aged 7 years had the highest mean (M = 8:40, SD = 1.41) compared with children aged 8 years (M = 3.21, SD = 1:55) and children aged 9 years (M = 3.92, SD = 1.27). Univariate F tests of locomotors Score Age equivalent showed F (2.189) = 65, p <.01, partial η2 = .41, were significant. Children aged 8 years had the highest mean (M = 5.83, SD = .63), compared with children aged 7 years (M = 5.62, SD = .69) and a child of 9 years (M = 4.61, SD = .69). The findings showed that children aged 9 years had the lowest mean compared to children age 7 years and 8 years. Univariate F test for Equality Age Living Score showed F (2.189) = 80.9, p <.01, partial η2 = .46, were significant. Children aged 7 years had the highest mean (M = 6:40, SD = .76), compared with children aged 8 years (M = 4.77, SD = .77) and children age 9 years (M = 5:52 , SD = .62). Univariate F tests on the Gross Motor Development Score showed F (2.189) = 267.3, p <.01, partial η2 = 73 were significant. Children aged 7 years had the highest mean (M = 16.06, SD = 2.13), compared with children aged 8 years (M = 9:46, SD = 2.42) and children age 9 years (M = 7.26, SD = 2.14). Analysis using Turkey (Pairwise Comparisons) found that children ages 7, 8 and 9 years are significantly different from each other in all the problems. Based on the findings of this study concluded that children aged 9 years experienced in the development of gross motor compared to children age 7 and 8 years.

DISCUSSION

The findings based on descriptive rating indicated that the performance of children age 7 years were at average level and the level of locomotors Standard Score below the average for Standard Manipulative Score, Gross Motor Development Score, Age Equivalent Score locomotors and manipulative Score. Performance of the subject children age 8 years showed that Standard locomotors Score, Score Age Equivalent, Age Equivalents locomotors and manipulative score below the average level and earned a very low level in the Standard of Living Score and Gross Motor Development than the age of 7 years. This difference can be attributed to natural growth process when there was increasing age of the child as stated by Malina et al., (2004). High score in Standard locomotors and manipulative Score directly affected gross motor development scores in this study. Subjects age 9 years acquired low levels of locomotors Score, Age Equivalents Score and Age Equivalents Manipulative Score but very low in locomotors Standard Score and Gross Motor Development Score than the age of 7 years and 8 years. This finding indicated the subjects of children 9 years experienced lowest gross motor developmental level of the lowest when compared with children 7 years of research subjects and 9 years based on the mean scores of the SLS, AEKS, SMS, AEMS and GMDQ. This finding explained that the performance skills of the child should be increased when the age of children increased (Malina and Katzmarzky, 2006), but children age 9 years showed no such effect so appropriate step given should be for the child recovery.

This situation may occur because children do not know the gross motor skills. According to Okley & Booth (2004) and Harriet (2006), poor knowledge of locomotors skills was because these skills required whole body movement and it involved stability and flexibility. This finding explained that the problem in locomotors skills was closely related to problems in the manipulative skills. The finding was in line with findings by Agnes & Daniel (2009), which stated that manipulative skills have an impact on locomotors skills as manipulative skills required knowledge and skills in handling equipment while performing a skill. Difficulty of control and knowledge of the

equipment have an impact on gross motor skills. Children 9 years of age did not seem to show patterns of gross motor development but good according to chronological age. This age group was still left behind in the Age Equality manipulative locomotors and Age Equivalents. Delay in the Age of Equality locomotors and manipulative Age showed that children age 9 years experienced serious problems in gross motor development compared with children age 7 and 8 years. Delays in gross motor skills development explained that the pattern of motor development vary because not all children achieved a similar point at the same age (Jill Young, Samuel & Rafidah Kastawi, 2009).

Children nine years of age who suffered from gross motor development should be supported by providing an appropriate intervention program to improve gross motor development according to their chronological age. According to Model Gallahue (1996), children at the age of 9 years should be ready for gross motor development and according to chronological age. Age Equality in locomotors and manipulative Age Equivalents Score, children nine years of age should have mastered basic locomotors skills and manipulative skills well. This situation is supported by the findings of Abigail Fisher (2008), that increasing age in childhood will affect not only physical characteristics but also influence their skills. Next, based on findings, children at the age of 9 years experienced as a critical phase in the gross motor development. This age group was very low in locomotors and Living Standards Score, although these children have attended school Physical Education curriculum low (CDC, 2003). Gross motor development was not according to their chronological age. This condition may also be added to the problem of physical education teachers who did not control small parts in gross motor skills and it provided a significant effect on gross motor proficiency of children.

CONCLUSION

Gross motor development of children should receive attention and being monitored by the teachers who teach physical education. They have to ensure that children do not experience problems in the development of gross motor skills. Unfortunately, the teachers did not know the sub-skills tested in determining the level of gross motor development of children ages 7.8 and 9 years. This factor may have a major impact on the proficiency of the movement and development of gross motor skills of children ages 7.8 and 9 years. This occurs because the physical education curriculum for trainee teachers at the Institute of Teacher Education is seen as not providing teachers with the need to test gross motor development of children (BPG, 2007). The teachers should strive to attract children to participate actively in the learning of Physical Education in schools.

The problem of testing the knowledge of science gross motor development among children occurred because of Physical Education, trainee teachers at the Institute of Teacher Education do not provide knowledge about the TGMD-2 test, the method of implementation and the need to test gross motor development of children. Relevant parties should introduce relevant test and measurement test of gross motor development of children to teacher trainers and teachers in order to help and child in gross motor development in line with their chronological age. Knowledge should be given to teachers teaching the subject to help them develop teaching and learning programs for children.

In determining the gross motor development of children develop according to chronological age, educational administrators need to ensure that teachers of Physical Education options should perform their roles in helping to develop gross motor development of children. Children who do not have good gross motor development according to chronological age, more frequently face injuries when involved in sports activities (Dilip, Patel, Helen, Ratt, Donald, & Greydanus, 2002). In addition, the Physical Education curriculum will always get the attention of all parties that may constitute gross motor skills of children.

FUTURE RESEARCH

It is recommended that testing or measurement of gross motor development will be used as the main fields for physical education teachers as these will assist them in planning teaching and learning of children, developing a small game program for children with delayed physical development and strive to improve the level of gross motor development to a higher level. Knowledge about the level of gross motor development of children can help them choose the appropriate sport for life-long participation requirements (Ahmad Hashim, 2004). This is important because early childhood education will continue to experience delays in their gross motor development as adults if they are left untreated.

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