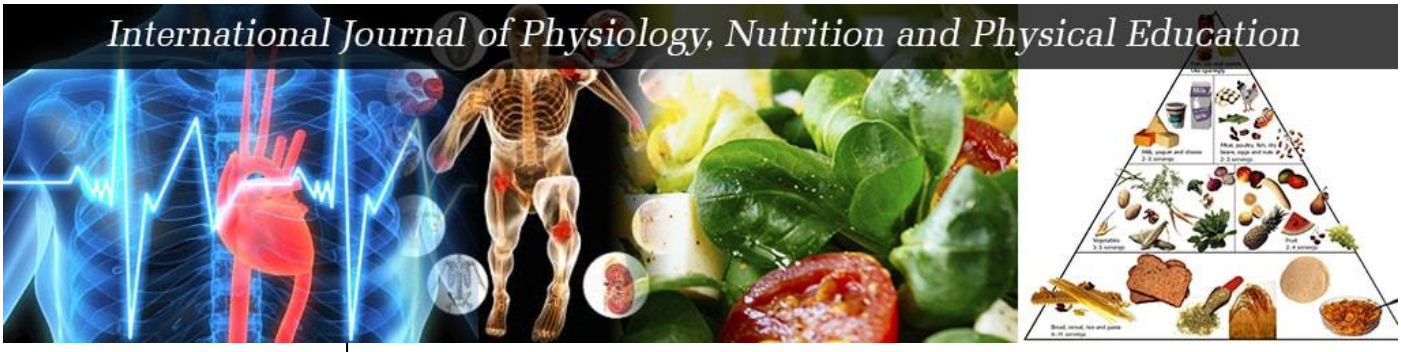

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Gross motor development among 7 – 9 years old children in Sabah

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Abstract
The aim of the study was to examine the gross motor development of children between 7-9 years old in Sabah. A total of 240 children (134 boys, 104 girls) participated in this study from 2 different location; rural and urban area. The children's proficiency in motor skills was assessed with the Test of Gross Motor Development-2 (TGMD-2). The children performed two trials for each gross motor skill which has been divided into two subtests, locomotor and object control. The results showed that there was no significant difference between boys and girls in locomotor skills (p>0.05) but there was a significant difference in one of the object control skills (overarm throw) between boys and girls (p<0.05). There were significant differences between rural and urban children in locomotor skills (run, gallop, and slide) and object control (catch and underarm roll) (p<0.05). The current study demonstrated that children in rural schools displayed better fundamental motor skills development compared to children in urban schools.

Keywords: Gross motor development, fundamental movement skills, physical activity, TGMD-2

1. Introduction
Advanced movements in daily activities are built upon the foundation of fundamental movement skills (FMS) (Clark & Metcalfe, 2002) [3]. The acquisition of FMS during childhood gives a sense of confidence and encourages participation in physical activities and consequently promotes a healthy lifestyle into adulthood (Bakhtiar, 2014) [1]. FMS encompasses locomotor skills (running, jumping etc); manipulative skills (catching, throwing etc.) and stability (balancing, twisting etc).
The notion that FMS develops naturally is true but appropriate practice, feedback, encouragement and learning environments helps the child achieve higher levels of motor proficiency. A lack of learning experiences during childhood impedes the acquisition of FMS (Branta, 2010) [2]. Gibson (2001) [8] proposed that the environment via its affordances provides children with opportunities for outdoor play and independent mobility which directly influences the acquisition of FMS. Large outdoor spaces provide an opportunity for children to move and play; practicing different forms of locomotor, manipulative and stability skills. Play directly influences the level of physical fitness and the confidence in socializing among children (Osiński, 2003).
Although there a multitude of family factors such as parents' education, habits, social values, knowledge about upbringing and nutritional awareness have an influence on the acquisition of FMS (Venetsanou & Kambas, 2010) [20]; contributory factors in the wider environment of the child need to be investigated. The different environments offered in the dichotomous division of urban and rural areas and its impact on FMS acquisition is an area that needs to be studied. Urban areas are characterized by a large concentration of people, better access to educational and health facilities; modern cultural and sports facilities among others (McBrien, Stewart & Ezati, 2016) [12]. On the other hand, rural areas have large open outdoor areas, less organized leisure activities but more opportunities for physical activities.
Leisure activities in urban areas do not focus entirely on physical activities thus differences between rural and urban children in physical fitness have been observed. Studies on physical

fitness among children have shown that rural children have a higher level of strength and endurance but lower levels of speed and flexibility (Reyes, Tan & Malina, 2003) [17]. This difference in the levels of physical fitness has been attributed to the different affordances in rural and urban areas. Rural areas with its natural landform provide opportunities for children to improve their balance, coordination and endurance. Children's playgrounds in urban areas are equipped with fixed equipment in a limited open space, provides opportunities for the development of strength and coordination.

There is a lack of studies focusing on how environmental factors within a country affect the acquisition of FMS (Niemistö *et al.*, 2019) [14]. The researches propose that rural areas in Sabah that are less inhabited and large open spaces provide more opportunities for play and FMS acquisition. In contrast urban areas with a denser population, residing in high rise buildings and scarce open areas would inhibit the development of FMS.

2. Method

2.1 Participants

A total of 240 children (134 boys, 104 girls) aged between 7 to 9 years old (M_{age} = 7.04 ± 1.08) from urban and rural schools in Sabah were randomly selected to participate in this study. The categorization of urban schools (n=3) and rural schools (n = 3) was based on the Sabah State Education Department's categorization. Details of the participants are presented in Table 1. All parents of the participants gave their written consent and the Ministry of Education (MOE) of Malaysia (KPM.600-3/2/3-eras (3247)) approved the study.

Table 1: Characteristic of participants

	Urban Schools	Rural Schools
Number	120 (70 boys, 50 girls)	120 (66 boys, 54 girls)
Age	7.90 ± .78	7.81 ± .67
Height	129.50 ± .08	129.80 ± .07
Weight	29.7 ± 2.70	30.2 ± 2.10
BMI	15.50 ± 1.67	15.80 ± 1.56

2.2 Instrumentation

The Test Gross Motor Development-2 (TGMD-2) (Ulrich, 2000) [19] was used in this study. The aim of this test was to measure the gross motor capabilities that develop in children. There are two different subtests that involved in TGMD, which are locomotor and object control (OC). The locomotor subtests consisted of six skills tests (run, gallop, hop, leap, jump, and slide) and OC subtests consisted of six skills tests (dribble, strike, catch, kick, throw, and roll).

2.3 Procedure

The gross motor skills of the participants were assessed using the Test for Gross Motor Development 2 (TGMD-2) (Ulrich, 2000) [19]. The batteries of tests consist of 13 tests subdivided into two parts; locomotor and object control (OC). Locomotor skills assessed were run, gallop, hop, leap, horizontal jump, skip, and slide; and OC skills assessed were two-hand strike, stationary bounce, catch, kick, overhand throw, and underhand roll. A sequence of tests was counterbalanced and was carried out as presented in the TGMD-2 Examiner's Manual. All performances were recorded and assessed by two raters and the inter-rater reliability coefficient was .96.

The sum of these subtests scores were used to determine the standard score and percentile ranks based on participant's age and gender as specified in TGMD-2 Examiner's Manual (Ulrich, 2000) [19]. Descriptive rating of each participant is reported as in Table 2.

Table 2: Descriptive ratings for subtest standard scores and gross motor quotient

Descriptive ratings	Subtest standard scores	Gross motor quotient
Very superior	17-20	>130
Superior	15-16	121-130
Above average	13-14	111-120
Average	8-12	90-110
Below average	6-7	80-89
Poor	4-5	70-79
Very poor	1-3	<70

2.4 Data analysis

The descriptive statistics and one-way ANOVA was used to analyze the data. Two separate genders (boy, girl) x 2 areas (urban, rural) analyses of variance (ANOVAs) were conducted on the locomotor and OC subtest standard scores to examine possible gender differences, area differences and the interaction of Gender x Area on both subtests. The significant level was set as $p<0.05$.

3. Results

Table 3 shows the results of one-way ANOVA between boys and girls on locomotor and OC. There was a significant difference between boys and girls in the overarm throw but there were significant differences between boys and girls in all the other subtests.

Table 3: Comparison between urban and rural schools on the locomotor and OC

	Boys	Girls	*P*
Run	5.97 ± .76	6.03 ± .74	.101
Gallop	5.27 ± .75	5.23 ± .86	.693
Hop	5.87 ± .77	5.92 ± .82	.302
Leap	5.32 ± .59	5.42 ± .73	.131
Horizontal jump	5.91 ± .75	6.02 ± .82	.249
Slide	5.74 ± .59	5.75 ± .63	.853
Strike ball	5.88 ± .50	5.82 ± .56	.375
Dribble	5.63 ± .91	5.44 ± .94	.108
Catch	5.32 ± .43	5.24 ± .47	.201
Kick	5.86 ± .67	5.68 ± .66	.089
Overarm throw	5.93 ± .74	5.21 ± .86	.022*
Underarm roll	6.01 ± .81	5.91 ±.81	.444

Mean ± SD, $p<.05$*

Table 4 shows the result of one-way ANOVA between urban and rural schools on locomotor and OC. There were significant differences of locomotor skills on the run, gallop and slide, but there were no significant differences on the hop, leap and high jump between rural and urban schools. There were significant differences on the catch and underarm roll but there were no significant differences on the rest of OC between rural and urban schools.

Table 4: Comparison between urban and rural schools on the locomotor and OC

	Urban schools	Rural schools	*p*
Run	5.67 ± .71	6.23 ± .68	.002*
Gallop	4.88 ± .49	5.63 ± .88	.003*
Hop	5.81 ± .73	5.84 ± .67	.685
Leap	5.71 ± .61	5.69 ± .48	.471
High jump	6.42 ± .62	6.50 ± .58	.215
Slide	5.51 ± .50	5.98 ± .61	.012*
Strike the ball	5.83 ± .37	5.87 ± .65	.626
Dribble	5.55 ± .87	5.60 ± .97	.209
Catch	4.81 ± .40	5.92 ± .47	.021*
Kick	5.75 ± .61	5.76 ± .73	.848
Overarm throw	5.47 ± .76	5.67 ± .83	.053
Underarm roll	5.23 ± .81	6.12 ± .81	.003*

Mean ± SD, $p<.05$*

Table 5: Descriptive ratings of Gross Motor Quotient

GMQ	Urban schools	Rural schools
Very superior	-	2
Superior	5	19
Above average	45	51
Average	49	38
Below average	20	10
Poor	1	-
Very poor	-	-
Total	120	120

4. Discussion

The aim of the study was to investigate if there were differences between children in rural areas and children in urban areas in the acquisition of gross motor skills. It was hypothesized that children in rural areas would have a higher level of FMS due to the proximity of outdoor areas that provide a conducive environment in developing FMS.

Gender based differences among the participants was only evident in the overarm throw with the boys performing better than the girls. This could be due to the nature of games played by the boys. There is a popular game among boys in Sabah that requires the overarm throw. Participants of the game, which is similar to dodgeball; attempt to hit other players using a tennis ball. The overarm throw is the most popular technique used to meet the games objective. The absence of significant differences in locomotor skills across genders has previously been reported by Goodway, Robinson & Crowe, 2010 [9]; Goodway, Crowe & Ward, 2003 [10]; Li, 2009 [11]; Seefeldt & Haubenstricker, 1982 [18].

The rural children performed significantly better in 3 out of 6 of the locomotor skills and 2 out of the 6 OC skills. The significant differences were evident in the run, gallop and slide (locomotor); and catch and underarm roll (OC). A majority of the children (60%) from the rural areas were above average under GMQ classification with 2 children in the "very superior" category. Contrastingly 59.7% of the children in the urban areas were in the average and below categories.

The availability of outdoor playing areas for the children in rural areas could be the cause of this finding. Children from rural areas tend to involve themselves more in nature related activities such as climbing (Muslim, Farhana, Hosaka, Numata & Yahya, 2017) [13]. Urban children tend to be involved more in nonphysical leisure activities due to safety concerns and parental unavailability. Parents in urban areas; especially from the lower socio economic status are known to

hold two more jobs in order to meet their household expenses, thus being unable to monitor their children during playtime outdoors.

The overall performance of the participants in the TGMD 2 showed a worrisome trend. Almost half the participants were categorized as average and below in the GMQ. Studies (Okely, Booth & Chey, 2004; Cliff *et al.*, 2012) [16, 4] have shown that obese children have lower levels of FMS. Poor FMS acquisition would discourage the children in participating in physical activities and lead lifestyle health problems in their adult years. It is important for those responsible to acknowledge the findings and intervene in the preschool years; as the acquisition of FMS is highest between the ages of 5 and 7 (Gallahu, Ozmun & Goodway, 2019) [6]. Parents too must take up the responsibility of ensuring that their children participate in physical activities daily; and with the current practice of providing children mobile devices as a form of entertainment should be avoided.

5. Acknowledgement

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