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Relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar

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Abstract

Relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar

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The quality Kindergarten (KG) program for 5-year-old children is a new plan in Myanmar which supports holistic development of a child including gross motor skills and KG is the base level or the first year (not first grade) of primary education. The new KG education system has been implemented in all public schools under the Ministry of Education of Myanmar, private schools and other types of schools since 1st June 2016. The situations of schools and home environments in Myanmar are different among individuals. The aim of this study was to determine relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar. Three linked studies were conducted with total 472 subjects. The first study investigated the test of gross motor development second edition (TGMD-2). The second study examined the gross motor skill development and compared the skills between two genders and two areas. The third study determined the relationships between gross motor skill development and biological as well as environmental factors. The reliability coefficients for the first study were interpreted as good and excellent reliability. The results of the second study showed that there were no significant differences on the locomotor skills between two genders. The boys outperformed the object control skills. The subjects from rural area had better locomotor skills while the subjects from urban area had better object control skills. The results of the third study revealed that the gross motor skill development could be predicted by gender, and presence of playground or open space around the school or home environment. In conclusion, the TGMD-2 is a reliable assessment tool, and the normative reference for the mastery level of the gross motor skills in 5-year-old children is established for future studies not only in Myanmar but also in other countries. Presence of playgrounds or open spaces are important for the gross motor skill development of the children.

Key words: Gross motor skill development, TGMD-2, Socio-demographic factors, Kindergarten children in Myanmar

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List of Abbreviations

ANOVA	Analysis of Variance
BOT-2	Bruininks-Oseretsky Test of Motor Proficiency second edition
CDC	Centers for Disease Control and Prevention
GMFM	Gross Motor Function Measure
GMQ	Gross Motor Quotient
ICC	Intraclass Correlation Coefficient
KG	Kindergarten
LRS	Locomotor Raw Scores
LSS	Locomotor Standard Scores
MABC-2	Movement Assessment Battery for Children second edition
MOE	Ministry of Education
MOHS	Ministry of Health and Sports
NESP	National Education Strategic Plan
OCRS	Object Control Raw Scores
OCS	Object Control Standard Scores
OT	Occupational Therapist
PDMS-2	Peabody Developmental Motor Scales second edition
PECO	Population, Exposure, Comparison, Outcome
PT	Physical Therapist
SES	Socioeconomic Status
SPSS	Statistical Package for the Social Science
TGMD-2	Test of Gross Motor Development second edition
USA	United States of America

CHAPTER 1

INTRODUCTION

1.1. Theoretical background

Development is a process through which the individual changes across the life span and human development can be divided into four main domains; cognitive, affective (socioemotional), motor, and physical domains[1, 2]. Payne and Isaacs have described that motor development has profound effects on the development of cognitive, social, and physical behaviors throughout the lifespan[2]. They have recommended that knowledge of motor development (movement skills throughout the lifespan) has other applications to diagnose problems in those individuals who may be developing abnormally and it is also important for helping individuals to improve their movement performance by establishing developmentally appropriate activities[2].

The knowledge of motor development is also the basis of the practice of Pediatric Physical Therapy[3, 4]. The developmental sequence of motor development offers Physical Therapists a foundation for studying and understanding both typical and atypical development of the children and it may be used as a basis for assessment, treatment and evaluation of motor delays and deficiencies in the children[5]. Aubert has stated that the typical timing of specific motor skills is linked to the determination of a motor age of a child and a greater gap between chronologic age and motor age can be determined as a developmental problem[5].

Effgen has described that movement is the domain of Physical Therapists and it is necessary to have a thorough understanding of the normal acquisition, fluency, maintenance, and generalization of motor skills to better understand their influence on activities and participation[6]. Physical Therapists use functional performances to document the developmental level of the children in relation to age-related standards and to observe the activity strengths and limitations that may be present [3]. The existing literature has highlighted that early assessment for the development of gross motor skills during preschool and elementary schools years is particularly important to monitor changes of motor development, identify delays or deficits of development, and assist Physical Therapists and other health care practitioners to properly design exercise programs[4, 7-9].

1.1.1. Definitions of Motor development

Haywood and Getchell have defined that "Motor development refers to the continuous, age-related process of change in movement as well as the interacting constraints in the individual, environment, and task that drive these changes" in their text "Life span motor development, 6th edition"[10].

Payne and Isaacs defined human motor development as "the study of the changes in human motor behavior over the lifespan, the processes that underlie these changes, and the factors that affect them"[2]. They also recommended the definition of motor development, which had been proposed by Clark and Whitall (1989, p.124) as "the changes in motor behavior over the lifespan and the processes which underlie these changes"[11]. They also referred the definition of motor development as "typical trajectories of behavior across the lifespan" by Ulrich (2007)[12].

Cech and Martin have described that "Motor development is the change in motor behavior experienced over the life span and it is both a process and a product"[13].

Chambers and Sugden have stated that "Motor development is a change, and this change is related to the functional capacity of the individual to perform movement tasks"[1].

VanSant has described that "Motor development refers to the processes of change in motor behavior that occur over relatively extended time periods that are measured in units that reflect age" in concepts of neural organization and movement in therapeutic exercise in developmental disabilities, 3rd edition. The author has defined motor development in that text book as "age-related change in motor behavior, results from internal and external influences and often has been attributed to processes such as maturation, growth, or learning"[14].

The examiner's manual of Test of Gross Motor Development second edition (TGMD-2) referred the definition of motor development by Clark[15] as "change in motor behavior over the lifespan and the processes that underlie the change"[9].

1.1.1.1. Gross Motor Skills

The examiner's manual of the TGMD-2 mentioned the definitions of gross motor skills by Clark[15] as "motor skills that involve the large, force-producing muscles of the trunk, arms, and legs" (p. 245). Gross motor development includes two movement behaviors that are locomotion and object control behaviors[9].

1.1.2. Motor Development Theories

There are numerous theories that have been applied to all aspects of infant and child development[3, 5, 6, 14, 16, 17].

Aubert[5] and Effgen[6] have referred some of the most important developmental theories to Physical Therapists and those are:

a) Neuromaturational theories by Gesell[18], McGraw[19], Bayley[20]
b) Cognitive theories by Piaget[21], Montessori[22]
c) Behavioral theories by Skinner[23], Bandura[24]
d) Ecological systems theories, contextual views by Bronfenbrenner[25], Gibson[26]
e) Dynamic systems theories by Bernstein[27], Thelen and Smith[28]

Effgen[6] has summarized the basic concepts of:

a) Neuromaturational theories as development is tightly tied to central nervous system development, it follows a set, invariant sequence and motor development is cephalocaudal and proximal to distal
b) Cognitive theories as thinking develops in stages of increasing complexity and children organize mental schemes through the use of mental operations
c) Behavioral theories as behavior is shaped by the environment, the stimulus, response, and environmental consequence constitute a contingency of behavior, and consequences of behavior influence future occurrences of the behavior
d) Ecological systems theories, contextual views as the environment has a very strong influence on the development of a child
e) Dynamic systems theories as movement merges based on the internal milieu, the external environment, and task, and movement is not directed by one system, but by many dynamic, interacting systems

Effgen[6] and Cech and Martin[17] have recommended the five interactive and overlapping ecological systems that influenced on the child proposed by Bronfenbrenner[25]. Those are “Microsystem” that is the setting in which the child lives (e.g. physical and social situations of family and school), “Mesosystem” that involves relations of family experiences to school experiences, “Exosystem” that involves the external settings or situations that influence the child, “Macrosystem” that includes the policies of society and culture, and “Chronosystem” that involves the environmental events over time.

1.1.3. Stages of Motor Development

Gallahue et al.[29] portrayed the phases of the motor development into different stages and approximate age periods of development (Table 1-1).

Table 1-1. The phases of motor development

Phases	Stages	Approximate age periods of development
Reflexive Movement Phase	Information Encoding Stage	In utero to 4 months old
	Information Decoding Stage	4 months to 1-year-old
Rudimentary Movement Phase	Reflex Inhibition Stage	Birth to 1-year-old
	Precontrol Stage	1- to 2-year-old
Fundamental Movement Phase	Initial Stage	2- to 3-year-old
	Emerging Elementary Stages	3- to 5-year-old
	Proficient Stage	5- to 7-year-old
Specialized Movement Phase	Transitional Stage	7- to 10-year-old
	Application Stage	11- to 13-year-old
	Lifelong Utilization Stage	14-year-old and up

Payne and Isaacs[2] recommended the six periods of human motor development: reflexive period, preadapted period, fundamental patterns period, context-specific period, skillful period, and compensation period which had been proposed by Clark and Metcalfe[30].

The examiner's manual of the TGMD-2 described four stages of motor development as:
Stage 1 (Reflexive and spontaneous movements period) in neonatal (first 2-3 months) age,
Stage 2 (Preadapted behavior repertoire period) in first 12-14 months of age,
Stage 3 (Fundamental gross motor behavior period) in preschool and early elementary years,
Stage 4 (Sport- and context-specific movements period) in middle elementary through adulthood[9].

1.1.4. Fundamental Gross Motor Behaviors

The fundamental gross motor behaviors or the fundamental movement patterns are basic observable patterns of behavior that are stabilizing, locomotor, and manipulative movements[29].

The locomotor movement category refers to movements that involve a change in location of the body relative to a fixed point on the surface and which includes walking, running, galloping, hopping, leaping, jumping, sliding, and skipping[1, 9, 31-33].

The manipulative movement category refers to both gross and fine motor manipulation, which includes object control skills (ballistic skills) of throwing, rolling, kicking, catching, striking, dribbling, and punting[1, 9, 34-36].

1.1.5. Assessment of Gross Motor Skill Development

The gross motor skill development can be assessed with developmental tests and the appropriate test can be selected based on the purpose of assessment[4].

1.1.5.1. Types of Assessment Tools

Several assessment tools are being used to measure gross motor skill development of children in Pediatric Physical Therapy[3, 4, 7, 37]. The assessment tools can be standardized (set protocol) or non-standardized (therapist selects relevant items) types[37]. The standardized assessment tools are commercially available to Physical Therapists and which have prescribed guidelines for administration to allow the tests to be given in a standard format. The standardized assessment tools have two major types although some may have been designed to capture both elements: those are norm-referenced type and criterion-referenced type[4, 7, 8, 37]. Norm-referenced assessment tools, that measure quantitative performance, have standards or reference points which represent average performances derived from a representative group when criterion-referenced assessment tools, that measure quality of performance, have reference points which may not be dependent on a reference group[4, 7, 8, 37].

The assessment tools can also be categorized into product-oriented assessments and process-oriented assessments. The product-oriented assessments (task-oriented) measure the end result or the outcome of the movement and quantitative performance, similar to norm-referenced assessments[8]. The process-oriented assessments evaluate the performance technique[8].

Among the standardized assessment tools for gross motor skill development of typically developing children, some assessment tools are being commonly used in clinical, educational and research settings[3, 4, 37-39]. Some examples of the standardized assessment tools for the gross motor skill development, which are developed mostly from the United States of America (USA), are Denver II[40], TGMD-2[9], Peabody Developmental Motor Scales second edition (PDMS-2)[41], Gross Motor Function Measure (GMFM)[42], Bruininks-Oseretsky Test of Motor Proficiency second edition (BOT-2)[43], and Movement Assessment Battery for Children second edition (MABC-2)[44] (Table 1-2).

1.1.5.2. Criteria for evaluating Assessment Tools

Malerba[4] has referred the six criteria to choose the appropriate assessment tool proposed by Stangler et al.[45]. The criteria are:

a) Acceptability: acceptance to all who will be affected by the test including the children, their families, the professionals, and the community[45]
b) Simplicity: the test can easily be taught, learned, and administered[45]
c) Cost: includes the actual cost of the test battery, necessary equipment, and preparation for the test[45]
d) Appropriateness: based on the prevalence of the problem to be screened and on the applicability of the test to the particular population[45]
e) Reliability: consistency or repeatability between measurements in a series[45]
f) Validity: the extent to which a test measures what it purports to measure[45]

Payne and Isaacs has also described that the steps to choose the best test for assessment[8]. The first step is consideration of the characteristics of ideal tests which include reliability, validity, and objectivity[8]. The next step is determination of test feasibility which includes consideration of:

a) Amount of time to administer the test[8]
b) Accessibility to administer the test individually or to groups[8]
c) Training and expertise to administer the test and to interpret results of the test[8]
d) Availability of supplies and equipment needed for test administration[8]

Table 1-2. Some examples of standardized assessment tools for gross motor skills

Test	Origin/ Year	Purpose	Ages	Time	User Qualification	Items	Test Areas	Psychometric characteristics
Denver II[40)]	Canada 1990	To identify developmental delays in infants and young children To monitor children who are at-risk for developmental problems	1 week-6years 6 months	15 minutes	PT, OT, Psychologist, Nurses, Early childhood educators	125	Personal Fine motor Gross motor Language	Norm-referenced
TGMD-2[9)]	USA 2000	To assess gross motor functioning in children. To identify children who are significantly behind their peers. To be used for screening, instructional programming, assessment of individual progress, program evaluation, and as a research tool	3-10 years	15-20 minutes to administer and score	PT, OT, diagnostician, adapted and general physical educators, and others who are interested in examining the gross motor skills in children	12	Gross motor • Locomotor • Object control	Norm-referenced And Criterion-referenced
PDMS-2[41)]	USA 2000	To estimate a child's motor competence To compare gross and fine motor disparity To provide qualitative and quantitative aspects of individual skills To evaluate a child's progress,	Birth- 6 years	45-60 minutes	PT, OT, Psychologist, Early intervention specialists, Adapted physical educator	249	Gross Motor • Reflexes • Stationary • Locomotion • Object manipulation Fine motor • Grasping • Visual-motor integration	Norm-referenced

		To provide a research tool.						
GMFM[42)]	Canada 2002	To measure change in gross motor function over time	Up to 5 years with normal gross motor ability	45-60 minutes	PT	88	Gross motor • Lying and rolling • Sitting • Crawling and kneeling • Standing • Walking, running, jumping	Criterion-referenced
BOT-2[43)]	USA 2005	To assess gross and fine motor skills in children To assist in decision making about appropriate educational and therapeutic placement	4-21 years	45-60 minutes	PT, OT, Adapted physical educator	53	Running speed and agility Balance Bilateral coordination Strength Upper limb coordination Response speed Visual motor control Upper limb speed and dexterity	Norm-referenced
MABC-2[44)]	USA 2007	To identify and describe motor impairments in daily life	4-16 years	20-30 minutes	PT, OT	32	Manual dexterity skills Ball skills Balance skills	Norm-referenced

PT: Physical Therapist, OT: Occupational Therapist

1.2. Rationale

1.2.1. Rationale for selection of Kindergarten children in Myanmar

The Republic of the Union of Myanmar (hereafter 'Myanmar' will be used) is located in mainland Southeast Asia and Myanmar has embarked on a period of profound political, economic, and social change involving major transitions[46]. The government of Myanmar has launched an ambitious and wide-ranging series of economic, political, and governance reforms that are impacting all aspects of Myanmar society and education and poverty alleviation have been identified as key drivers for reforming process as education plays a central role in economic growth and national development[46]. Education provides individuals with the opportunity to improve their lives, become successful members of their communities, and actively contribute to national development and it is also fundamental to nation building and national unity[46].

The government of Myanmar has implemented a new National Education Strategic Plan (NESP) during the period 2016-2021 including a key reform focusing on the provision of quality, healthy, play-centered pre-school, and primary education for all children aged 3 to 6 years[47]. A transition year, normally referred to as Kindergarten (KG), between preschool and primary school is internationally recognized as vital for enabling children to adapt to the different educational and social setting of primary school, while continuing to help them make gains in their development[46]. KG provides the children emotional, psychological, physical and intellectual preparations for their new learning environment[46]. The government of Myanmar has implemented quality KG program, as one of the strategies of the NESP, in all public schools, private schools, and other types of schools across Myanmar by the Ministry of Education (MOE) starting from 2016-2017 academic year onwards (since 1st June 2016)[46].

The national education law of Myanmar (2014) states that KG is education that promotes holistic development using appropriate methods for 5-year-old children to ease their transition to first grade or Grade 1 (Chapter 1, Clause-p) and will be regarded as the base level of primary education (Chapter 5, Clause 16-b)[48].

The new KG curriculum, aligned with new primary curriculum supported by the government of Japan, supports the development of children in all developmental skills[46]. The new KG curriculum for 5-year-old children is first revision of curriculum in over 30 years in Myanmar, follows realistic student-based approach to early learning, focuses play-way method for the children to learn not only literacy and numeracy but also gross and fine motor skills, social and thinking skills through playing traditional games, drawing and coloring pictures, folding papers, listening and telling stories, singing, and so on[46]. The schools need new classrooms or renovation of existing classrooms to successfully roll out the new KG education system across the country[46].

There was limited information on proficiency of gross motor skill development of KG children and the research question 1 “What is mastery level of the gross motor skills of 5-year-olds KG children in Myanmar?” was established. Thus, it was necessary to investigate the gross motor skill development of KG children in Myanmar.

The development of a child including the gross motor skill development can be determined by numerous factors[6, 25, 49, 50]. Many children in developing countries are exposed to multiple factors including poverty that affect development of children[49]. Myanmar is one of the developing countries and the environmental factors for the development of the children are different among individuals.

There are approximately 50’000 basic education schools in Myanmar which are public schools managed by the MOE of Myanmar government, private schools, and other types of schools[46]. The free education program of the government provides free textbooks and uniforms to all students and removes registration fees, stationery fees and parent teacher association fees in all public schools[46]. The children from any type of family can be equally enrolled in all public schools. The children only from high income families can be enrolled in the private schools because the private schools charge expensive school fees. However, the facilities between the public and private schools are commonly different. Consequently, the research question 2 “Is there any difference on the gross motor skill development between boys and girls and also between urban and rural areas?” and the research question 3 “Which factors are the predictors of the gross motor skill development of KG children in Myanmar?” were also established. As a result, it was also necessary to determine which factors influence on the gross motor skill development of KG children in Myanmar.

1.2.2. Rationale for outcome measures (Rationale for using the TGMD-2)

The TGDM-2 is a product and process oriented test[8, 9, 37, 39]. It has both norm- and criterion-referenced characteristics that can measures the gross motor abilities in children from 3-10 years of age[8, 9, 37, 39]. The test is used to identify children who are significantly behind their peers in gross motor skill development, to plan an instructional program in gross motor skill development, to assess individual progress in gross motor skill development, to evaluate the success of the gross motor program, and to serve as a measurement instrument in research involving gross motor development[9].

The TGMD-2 is reliable, valid, and well-standardized assessment tool to measure the gross motor skill development of the children with and without disabilities as dependent variable in research[9]. Three sources of error variance, content sampling, time sampling, and inter-scorer differences for the TGMD-2 were confirmed and the reliability coefficients for the locomotor skills, the object control skills and the gross motor composites were greater than 0.85[9]. The TGMD-2 was confirmed content-description validity, criterion prediction validity and construct-identification validity[9]. Content-description validity was

confirmed by using three content experts to judge the assessment to contain gross motor skills frequently taught in the education setting and all items in the TGMD-2 were considered as good items[9]. Criterion-prediction validity was confirmed by administering the Comprehensive Scales of Student Abilities (CSSA) and then administering the TGMD-2 two weeks later[9]. A correlation for the combined locomotor and object control subtests compared with the CSSA showed moderate to strong for criterion-prediction validity)[9]. Thirdly construct-identification validity was confirmed through five separate analyses: age differentiation, group differentiation (gender and ethnic groups), item validity, subtest correlations, and exploratory factor analysis[9].

The TGMD-2 consists of 12 gross motor skills which are divided into locomotor and object control subtests[9]. The locomotor subtest includes run, gallop, hop, leap, horizontal jump, and slide[9]. The object control subtest includes striking a stationary ball, stationary dribble, catch, kick, overhand throw, and underhand roll[9]. The items are the fundamental gross motor behaviors for the children with preschool and early elementary school years[9]. The complete test kit of the TGMD-2 includes the Examiner's Manual and 50 Examiner Record Forms[9]. The necessary materials for the TGMD-2 test are commonly found in schools, playgrounds, and available for cheaply purchase commercially[9]. The test takes 15-20 minutes to administer per child[9]. The directions for scoring items were clearly written in the examiner's manual and the professionals can administer the test with a minimum of training[9].

The activities and traditional games for the gross motor skills in the new KG curriculum are fundamental movement skills and related to the gross motor skill items of the TGMD-2, especially all six locomotor skill items and almost all object control skill items except "striking a stationary ball" for the children in the rural areas. However, that item was not too much difficult skill and could be performed after demonstration and practice. Thus, the TGMD-2 was the most suitable assessment tool for this study and the selection was considered according to the criteria that have been described in the section 1.1.5.2 and comparison of the TGMD-2 with other assessment tools in Table 1-2. It was the first time to use the TGMD-2 in Myanmar, and so it was necessary to investigate reliability of the TGMD-2 to find out the agreement on administering it among the researchers in Myanmar.

In this study, the original English version of the TGMD-2 examiner's record forms were used and the assessment procedures were done according to the standardized guidelines of the TGMD-2. As the TGMD-2 was a valid assessment tool, the validity of the TGMD-2 for this study was not considered.

1.3. Previous studies on the gross skill motor development or motor competence in preschool or KG children

The studies on the gross motor skill development or motor competence in the children and adolescents were conducted using different assessment tools and different outcomes in many countries around the world[51-152].

The age of the subjects in those previous studies recruited from preschool or KG aged children to adolescent age (the youngest 2-year-old to the oldest 16-year-old) [51-152].

The commonly recruited subjects were the preschool or KG aged children[51-115]. More than half of those previous studies used the TGMD-2 and other studies used different assessment tools like PDMS-2, BOT-2, MABC-2 and others[51-152].

The studies that used the TGMD-2 for the preschool or KG aged children assessed the gross motor skills, investigated correlates on the gross motor skills, and determined the efficacy of some exercise programs or others[51-87].

The previous studies that were conducted in Asia, not including South East Asia, using the TGMD-2 for the preschool or KG aged children were very few[51-57].

The studies that recruited only one age group among the preschoolers or KG children were very few[72, 73]. Those two studies in Canada recruited 5-year-old KG children and reported gender based differences on the gross motor skills.

LeGear et al. [72] investigated the differences on the locomotor raw scores, the object control raw scores, the combination of those two raw scores, and the perceptions of physical competence based on the gender and age in months.

Temple et al.[73] studied the differences on the locomotor raw scores and the object control raw scores based on the gender and recreational activities such as physical activities.

Thus, the gross motor skill development and the factors influencing on it only in 5-year-old KG children require further exploration, especially in different culture.

1.4. Hypotheses

1) The TGMD-2 is a reliable assessment tool to assess the gross motor skills of KG children in Myanmar.
2) The gross motor skill development of Myanmar KG children is influenced by biological (age and gender) and some environmental factors (types of schools, types of houses, types of playgrounds).

CHAPTER 2

AIM AND OBJECTIVES, ORIGINALITY, METHODOLOGY, ETHICAL CONSIDERATION AND OVERVIEW OF THE THESIS

2.1. Aim and objectives

2.1.1. Aim

To determine relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar.

2.1.2. Objectives

1) To investigate reliability of the TGMD-2 for KG children in Myanmar
2) To examine gross motor skill development of KG children from two geographical regions (urban and rural areas) of Myanmar
3) To compare gross motor skill development of KG children between two genders and two areas
4) To assess the socio-demographic factors of all participants
5) To compare the gross motor skill development of KG children among three types of school settings
6) To examine if there would be relationships between gross motor skill development and biological as well as environmental factors in Myanmar KG children

2.2. Originality of the thesis

The standardized assessment tool, the TGMD-2, is introduced in Myanmar very first time to assess the gross motor skill development of Myanmar KG children.

The normative data for the level of gross motor skill development only among 5-year-old KG children in Myanmar is to be established.

How different living environment such as urban or rural, different types of schools such as public or private, and with or without the access to facilities such as playground, different types of housing conditions such as a house with enough open space area or a flat (an apartment) without open space influence the gross motor skill development among 5-year-old KG children in Myanmar is to be clarified.

2.3. Methodology

2.3.1. Study design

Study 1 was reliability study to achieve the objective "1".

Study 2 was conducted to accomplish the objectives "2" and "3". Study 3 was done to complete the objectives "4" to "6". The subjects from the Study 2 and 3 were the same and those two studies were linked and the design was cross-sectional (Analytic) study (PECO).

2.3.2. Study area

The study areas were four schools in urban area and four schools in rural area of Myanmar.

2.3.3. Data collection period

The data collection period in Myanmar was from July to September 2016 (three months).

2.3.4. Sampling method

Samples were chosen using multi-stage random sampling involving several stages.

The first stage was choosing the sampling area (school location) in the cluster.

The second stage was determining the number of subjects based on the eligibility criteria and the number of all KG students in the sampling area (using proportional random sampling).

There are total 1,717 public schools (under the Department of basic Education of the MOE) and 160 private schools in Yangon region. In 2016-2017 academic year, the number of KG students from the public schools were 119,894 (62,327 (52%) boys and 57,567 (48%) girls) and those from the private schools were 3,464 (1,868 (53.9%) boys and 1,596 (46.1%) girls in Yangon region. There were 1,211 (612 boys and 599 girls) KG students in 18 schools of the sampling area of Yangon (1,149 from the public schools and 92 from the private school).

There are total 4,824 public schools (under the Department of basic Education of the MOE) in Bago region. In 2016-2017 academic year, the number of KG students from the public schools were 117,253 (61,263 (52.2%) boys and 55,990 (47.8%) girls). There are total 192 public schools in the township where this study was conducted in Bago region. The number of KG students from that township were 1,998 (1,040 (52.1%) boys and 958 (47.9%) girls) in 2016-2017 academic year. The number of KG students from 53 schools in the sampling area (one rural administrative unit in that township) were 485 (253 (52.2%) boys and 232 (47.8%) girls).

The third stage was selection of schools from the sampling areas which was decided by the township education officers of the respective sampling area and all KG students from the selected schools were invited to participate in this study.

2.3.5. Sample size determination

The minimum amount of sample size was calculated in G*Power software version 3.1.9.2 for Windows[153].

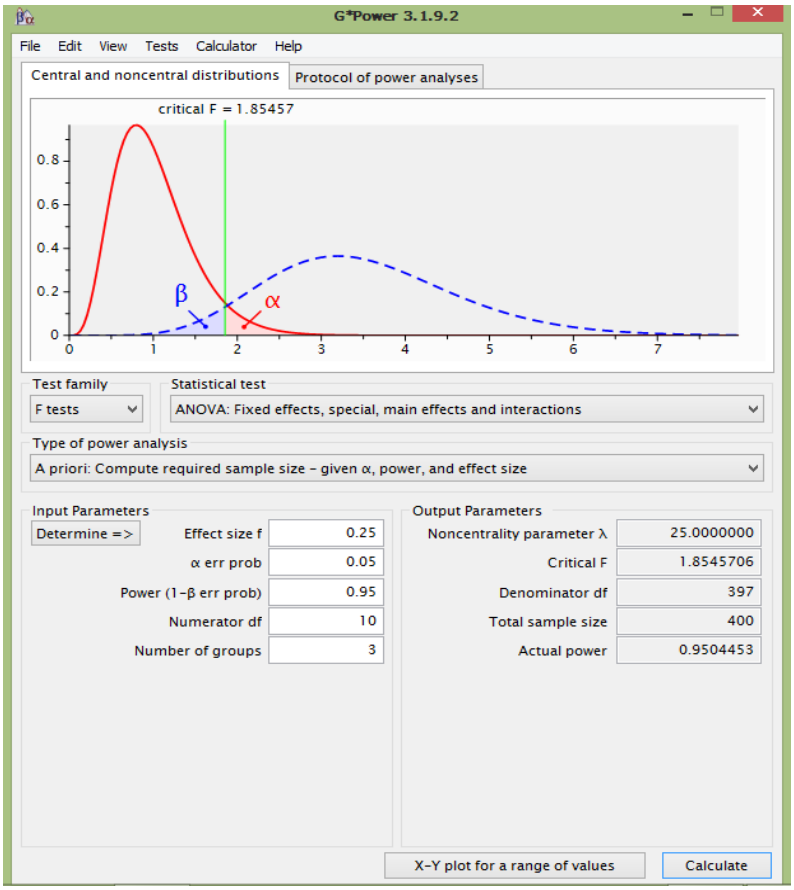

Figure 2-1 Sample size calculation in G*Power 3.1.9.2[153]

2.3.6. Operational definitions

2.3.6.1. Gross motor skill development

Gross motor skill development in this study means ability to perform six locomotor skills (run, gallop, horizontal jump, hop, leap and slide) and six object control skills (striking a stationary ball, stationary dribble, catch, kick, overhand throw and underhand roll) according to the TGMD-2[9].

2.3.6.2. Socio-demographic factors

Socio-demographic factor in this study means biological factors (gender and BMI or weight status) and environmental factors (types of school, types of playgrounds in schools, location of playgrounds, types of housing conditions, parental occupation and education status, monthly income of family).

2.3.6.3. Primary school children

Primary school children in this study means KG students of 2016-2017 academic year from the public and private schools in Myanmar. KG is the first year of primary education in Myanmar. KG in Myanmar is education that promotes holistic development using appropriate methods for 5-year-old children to ease their transition to first grade or Grade 1 and will be regarded as the base level of primary education[48]. In order to enroll as KG student in 2016-2017 academic year, the child must have reached 5-year-old by 1st June 2016.

2.3.6.4. Urban area

Urban area in this study means "areas classified by the Department of General Administration, Ministry of Home Affairs of the government of Myanmar, as wards, which have an increased density of building structures, population and better infrastructural development"[154]. The urban area in this study has the population density 716 persons per squared kilometer[154].

2.3.6.5. Rural area

Rural area in this study means "areas classified by the Department of General Administration, Ministry of Home Affairs of the government of Myanmar, as villages and village tracts, or remote areas where areas with low population density and a land use which is predominantly agriculture"[154]. The rural area in this study has the population density 124 persons per squared kilometer[154].

2.3.7. Materials

2.3.7.1. TGMD-2 examiner record forms

The main equipment used was the original English version of the TGMD-2 (Figure 2-2) and its examiner record forms (Appendix-1) [9].

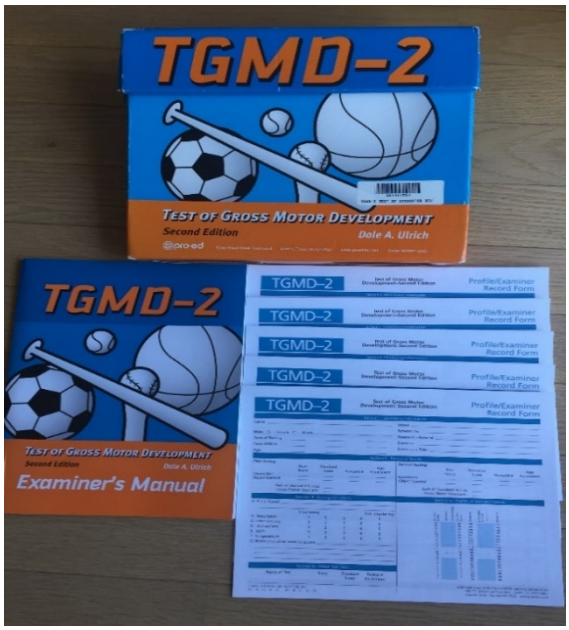

Figure 2-2 TGMD-2 complete set

2.3.7.2. Other materials

Other materials used were 8- to 10-inch playground ball, 4-inch light weight ball, tennis ball, soccer ball, softball, 4- to 5-inch square beanbag, color tapes, two traffic cones, plastic bat, batting tee and a video camera (Sony HD, HDR-PJ410).

Figure 2-3. Other Materials

2.3.8. Gross motor skills assessment procedures according to the TGMD-2

The necessary materials, the direction to assess the gross motor skills and the performance criteria for the gross skills are shown in the TGMD-2 examiner record form (Appendix 1).

2.3.8.1. Locomotor subtest

i. Run

There are four performance criteria for the skill “Run”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Run” are 0-8[9].

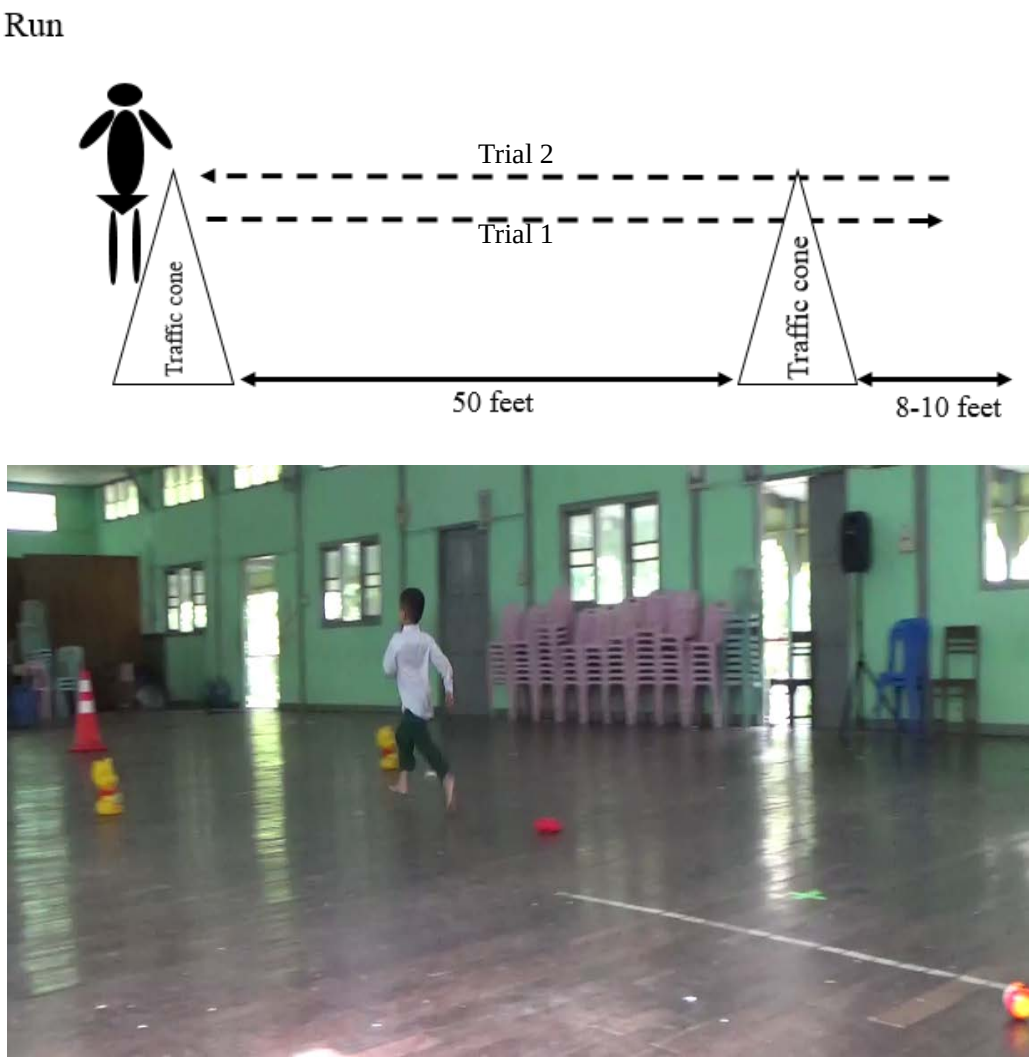

Figure 2-4. Run

ii. Gallop

There are four performance criteria for the skill “Gallop”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Gallop” are 0-8[9)].

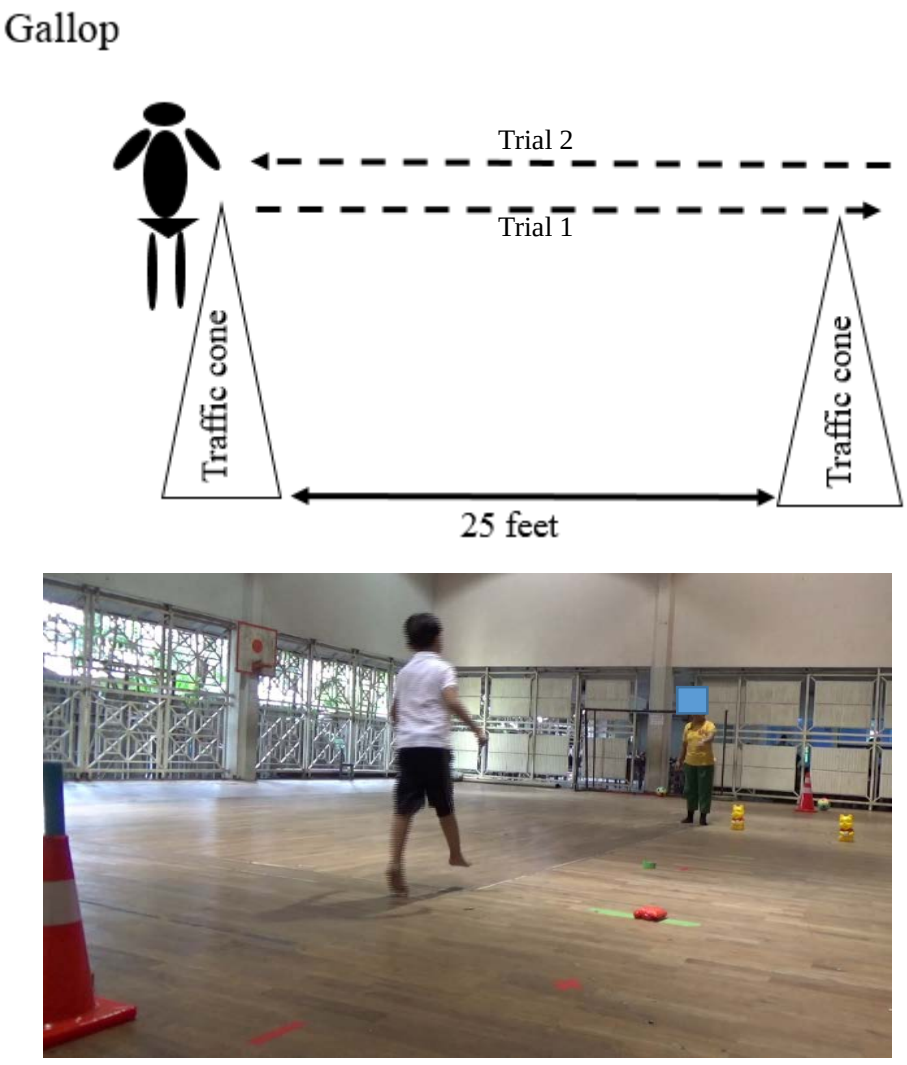

Figure 2-5. Gallop

iii. Hop

There are five performance criteria for the skill “Hop”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Hop” are 0-10[9)].

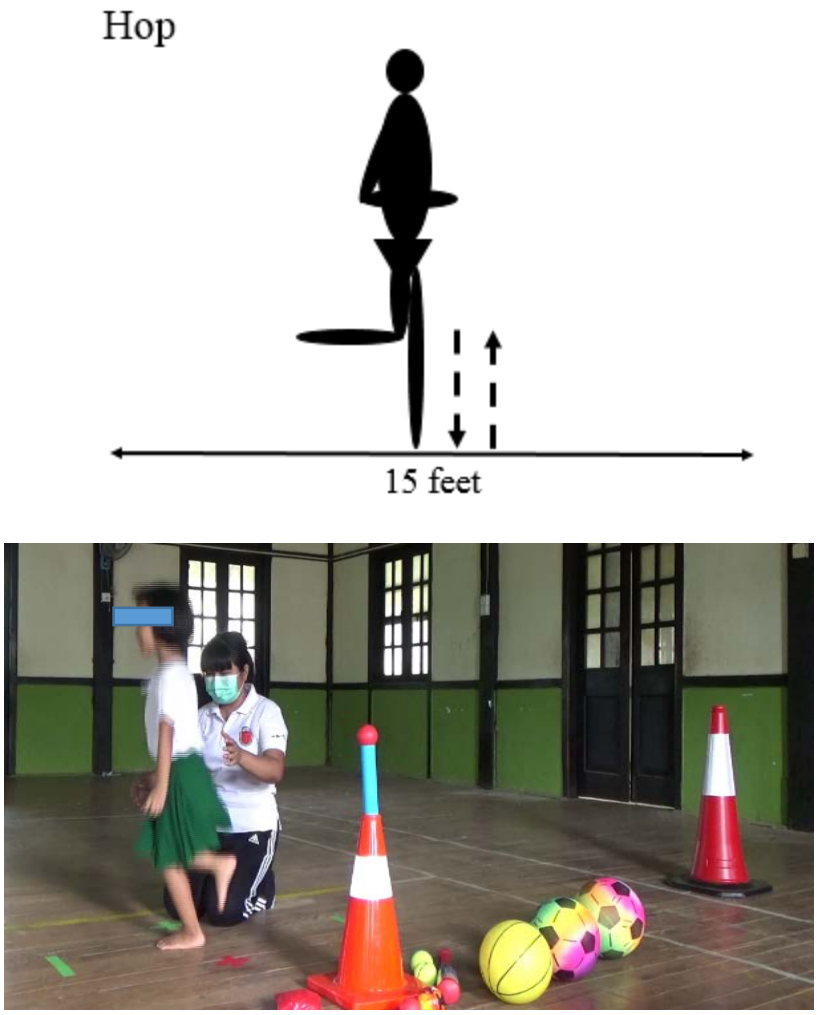

Figure 2-6. Hop

iv. Leap

There are three performance criteria for the skill “Leap”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Leap” are 0-6[9].

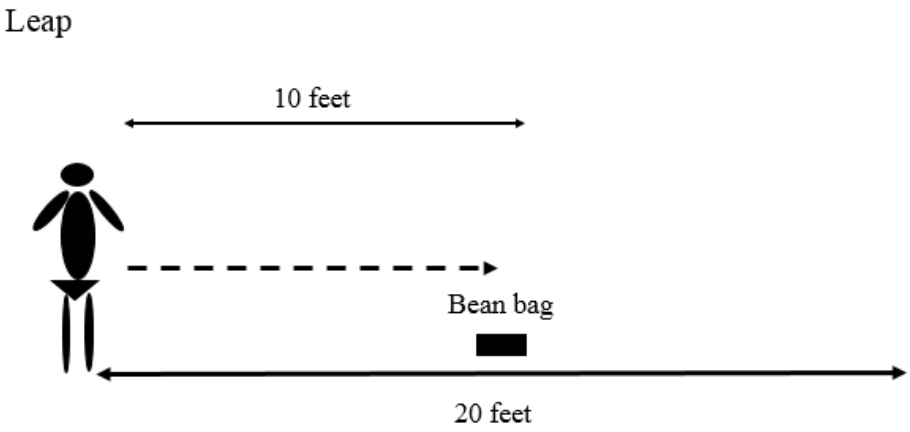

Figure 2-7. Leap

v. Horizontal jump

There are four performance criteria for the skill “Horizontal jump”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Horizontal jump” are 0-8[9)].

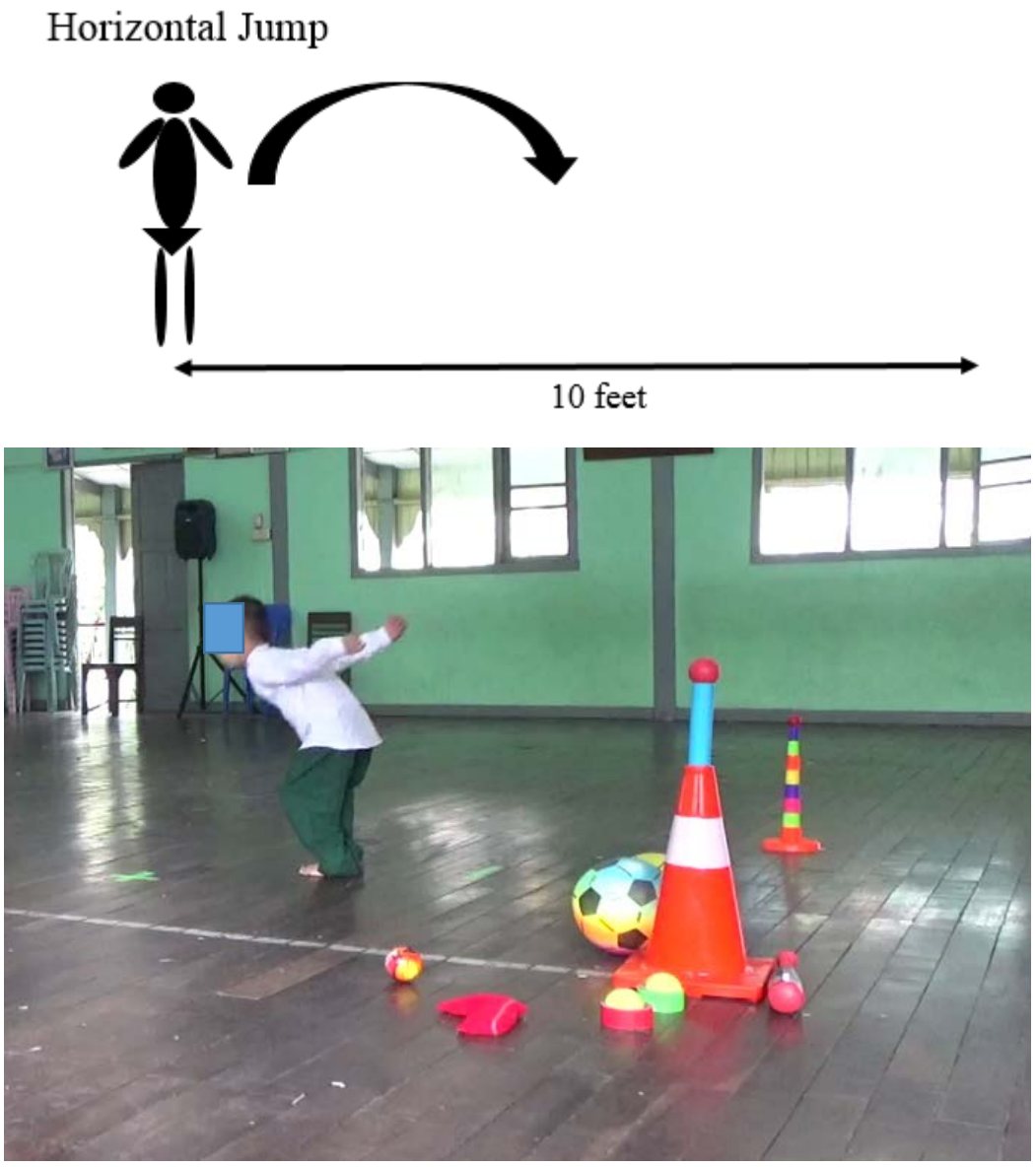

Figure 2-8. Horizontal jump

vi. Slide

There are four performance criteria for the skill “Slide”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Slide” are 0-8[9)].

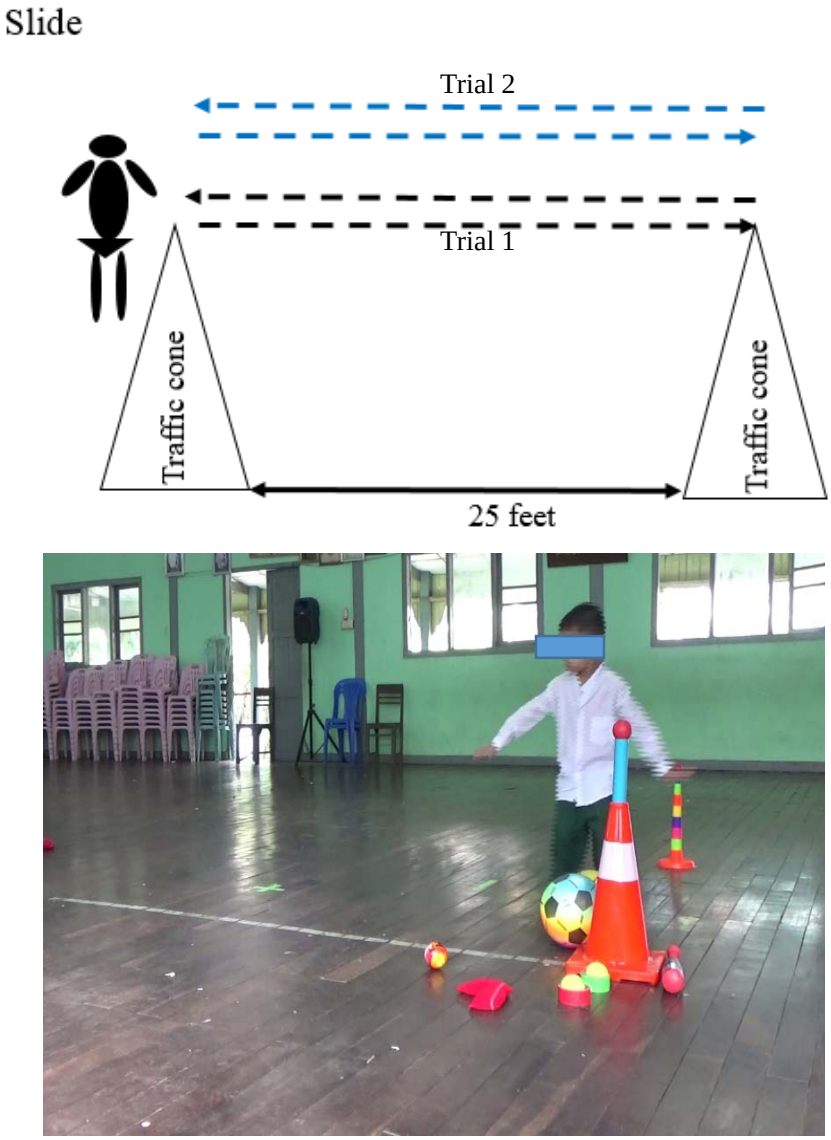

Figure 2-9. Slide

2.3.8.2. Objective control subtest

i. Striking a stationary ball

There are five performance criteria for the skill “Striking a stationary ball”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Striking a stationary ball” are 0-10[9)].

Figure 2-10. Striking a stationary ball

ii. Stationary dribble

There are four performance criteria for the skill “Stationary dribble”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Stationary dribble” are 0-8[9)].

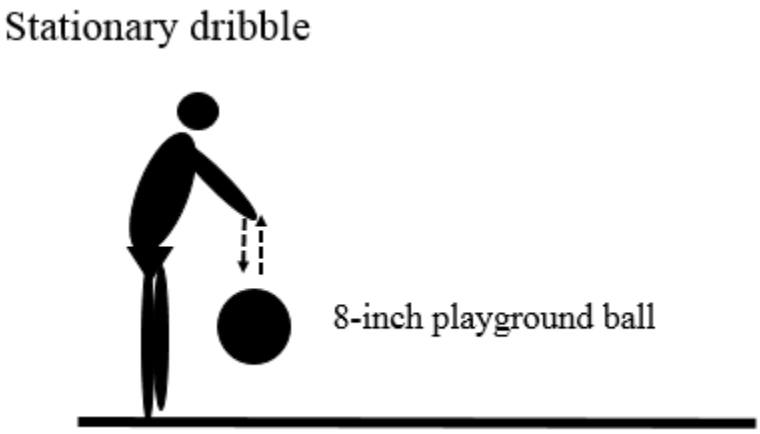

Figure 2-11. Stationary dribble

iii. Catch

There are three performance criteria for the skill “Catch”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Catch” are 0-6[9)].

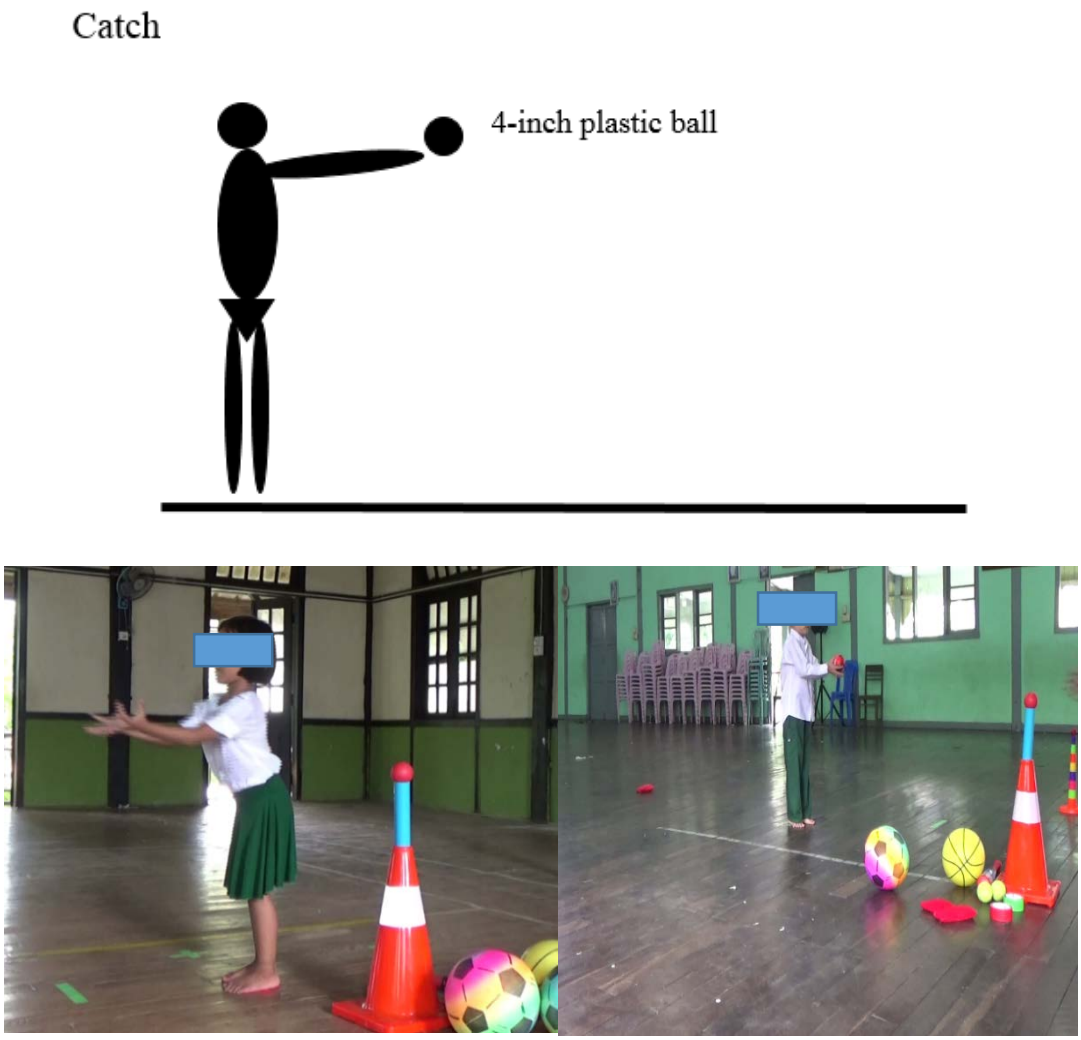

Figure 2-12. Catch

iv. Kick

There are four performance criteria for the skill “Kick”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Kick” are 0-8[9)].

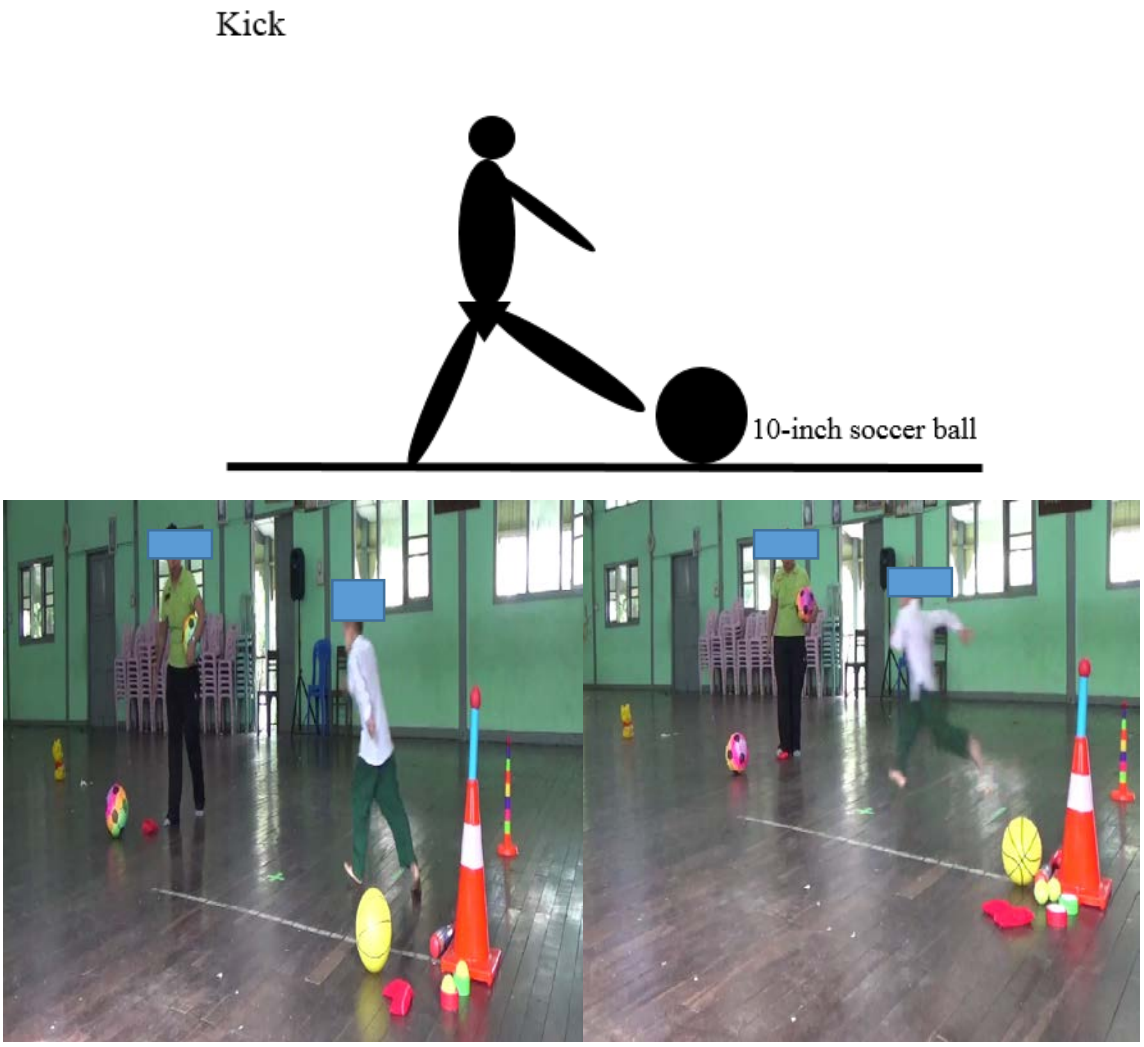

Figure 2-13. Kick

v. Overhand throw

There are four performance criteria for the skill “Overhand throw”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Overhand throw” are 0-8[9].

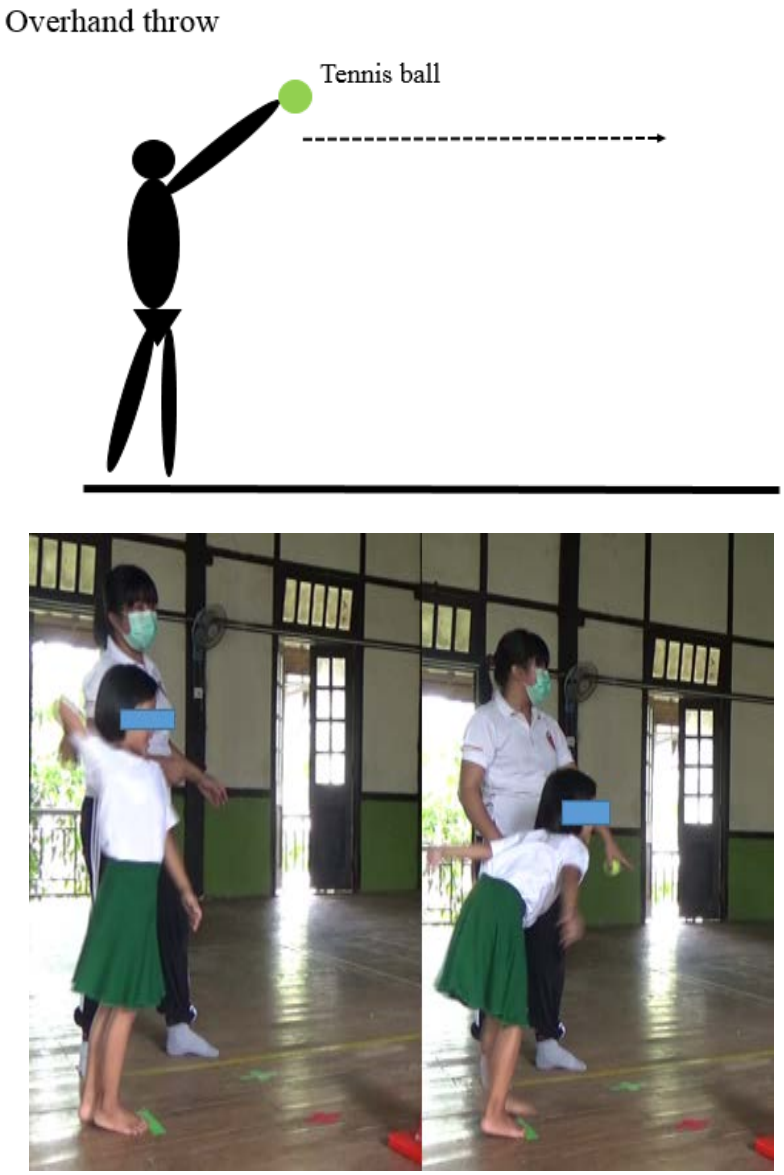

Figure 2-14. Overhand throw

vi. Underhand roll

There are four performance criteria for the skill “Underhand roll”. Each criterion is scored “1” when the child can correctly perform and scored “0” when he or she cannot. Therefore, the total skill scores for the test “Underhand roll” are 0-8[9)].

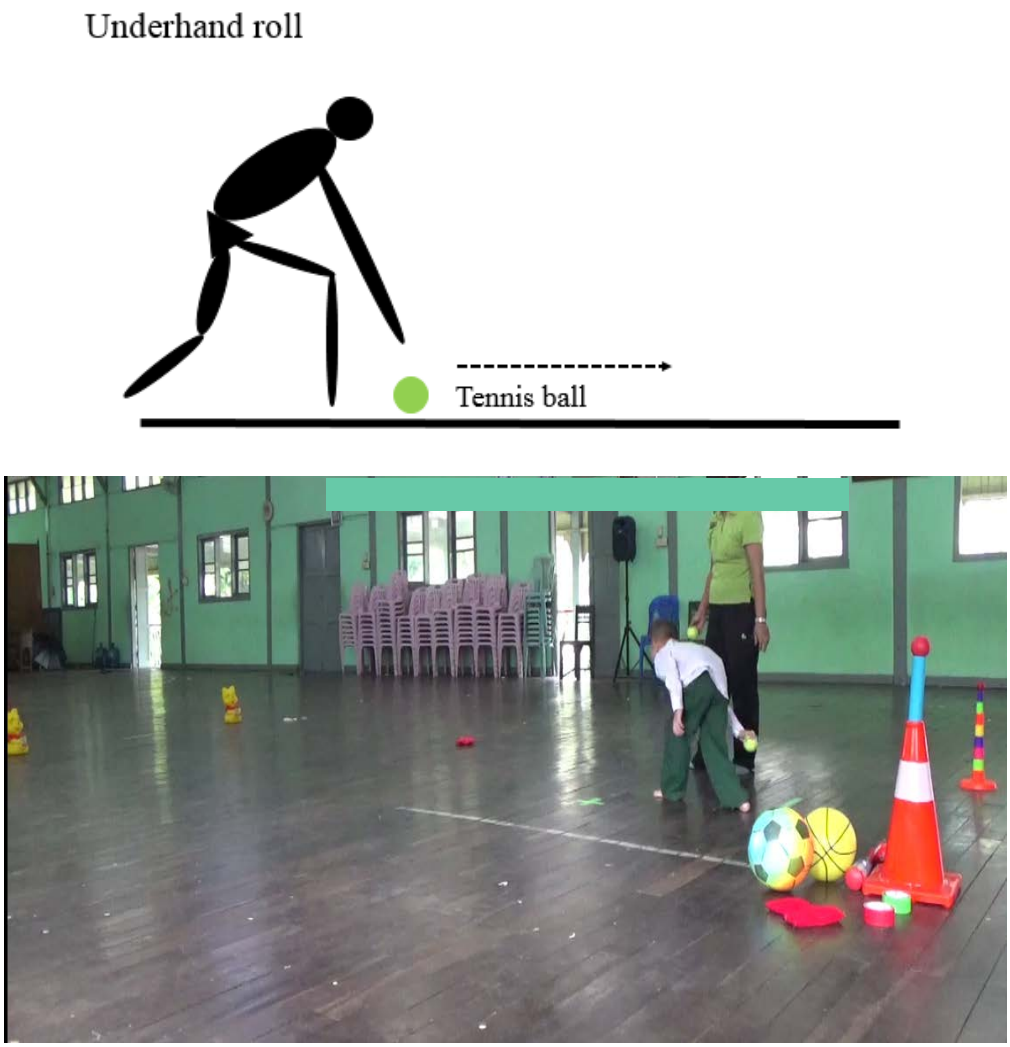

Figure 2-15. Underhand roll

Each skill is performed twice for assessment and each criterion is given a score of 1 or 0 for the pass and fail attempt respectively[9]. The scores of two trials are added up to get total criterion score, the total criterion scores for the performance criteria are added up to get skill score, the six-skill scores are added up to get subtest raw scores (0-48) [9]. The subtest raw scores are converted into standard scores (1-20) and percentiles (<1- >99) depending on age and gender according to the normed tables in the TGMD-2 manual (Appendix B of the TGMD-2 examiner's manual p. 53-56) [9]. The standard scores of the locomotor and object control subtests are added up and converted into Gross Motor Quotient (GMQ) (46-160) (Appendix C of the TGMD-2 examiner's manual p. 57-58) [9]. Finally, seven descriptive ratings: very poor, poor, below average, average, above average, superior, and very superior are given for the subtest standard scores and the GMQ for evaluation (Table 2-1) (p. 15 of the TGMD-2 examiner's manual)[9].

Table 2-1. Descriptive ratings for Subtest Standard Scores and Gross Motor Quotient[9]

Subtest Standard Scores	Gross Motor Quotient	Descriptive Ratings
17-20	>130	Very Superior
15-16	121-130	Superior
13-14	111-120	Above Average
8-12	90-110	Average
6-7	80-89	Below Average
4-5	70-79	Poor
1-3	<70	Very Poor

2.4. Ethical consideration

This study was performed with the following considerations for medical ethics.

a) The purposes of this study were thoroughly explained to all children, their parents, the principals and the teachers of the schools.
b) The written informed consent and verbal informed assent were taken.
c) The child and/or the parents were able to refuse to participate and they had the right to withdraw from the study at any time
d) There was neither charge nor incentive for participants.
e) The results of this study were confidential and the findings were used only for the health care and research purpose.

The certificate of Ethics from International University of Health and Welfare (IUHW), Ohtawara campus, Japan was received on 14th October 2015. This study was approved by the following organizations.

1) The ethical approval letter for this study from the Ethics Review Committee (ERC) of IUHW was received on 10th March 2016 with the approval number 15-Io-115 (Appendix 5).
2) The ethical approval letter for this study from the ERC of the University of Medical Technology, Yangon (UMTY), Myanmar was received on 11th July 2016 with the approval number 3/2016 (Appendix 6).
3) The study areas were officially approved by the Ministry of Health and Sports (MOHS) and the MOE of Myanmar.
4) The approvals of this study from the UMTY, the MOHS and the MOE were endorsed by the ERC of the Department of Medical Research, the MOHS, Myanmar on 9th September 2016.

2.4.1. Maintaining Confidentiality

The examiner record forms of the TGMD-2 includes name of child, but according to this research procedure the name of the child was not assessed and the code number was used instead of the name. All data from assessment sheets were transformed into electronic data and all electronic data including video recording of subjects were copied into the computer with password attenuation at the end of each of one day assessment. The assessment sheets have been kept in the locked locker of the department of Physiotherapy in the UMTY, Myanmar. All documents and electronic data are being kept confidentially for three years and will be deleted after three years.

The information about participants will not be shared to anyone outside of the research team. The information that collected from this research project are kept private. The information recorded is confidential, and no one else except the principal researcher has access to that information. Any information about all participants had number on it instead of their names. Only the principal researcher knows what their numbers are and the information will not be shared with or given to anyone.

2.5. Overview of the thesis

Chapter 1 contains the theoretical background for the research questions, rationale, brief introduction of previous studies and hypotheses.

Chapter 2 provides the aim and objectives, originality, methodology, ethical consideration, and a brief overview of the thesis.

Chapter 3 reports the Study 1 in its entirety. The Study 1 involved investigation of the inter-rater, intra-rater, and test-retest reliability on the TGMD-2. Three raters were responsible for the inter-rater agreement. The time intervals between the test and retest for the test-retest reliability and the intra-rater reliability were four weeks and six weeks respectively. The findings and limitations of the Study 1 are discussed.

Chapter 4 informs the Study 2 that used a cross-sectional assessment of the gross motor skill development of KG children and compared the mean values between boys and girls as well as between subjects from two different geographical regions of Myanmar. The findings and limitations of the Study 2 are also discussed.

Chapter 5 focuses on the Study 3 which used: 1) comparison of the mean values on the locomotor raw scores, locomotor standard scores, object control raw scores, object control standard scores, and the GMQ of the TGMD-2 among the subjects from three types of schools, 2) assessment of the socio-demographic factors of the subjects, and 3) investigation of relationship between the gross motor skill development of KG children and the socio-demographic factors. The findings and limitations of the Study 3 are also discussed.

Chapter 6 links the findings from the Study 1 to the Study 3 to present overall conclusions and recommendations for service provision and future research.

Flow diagram of the research

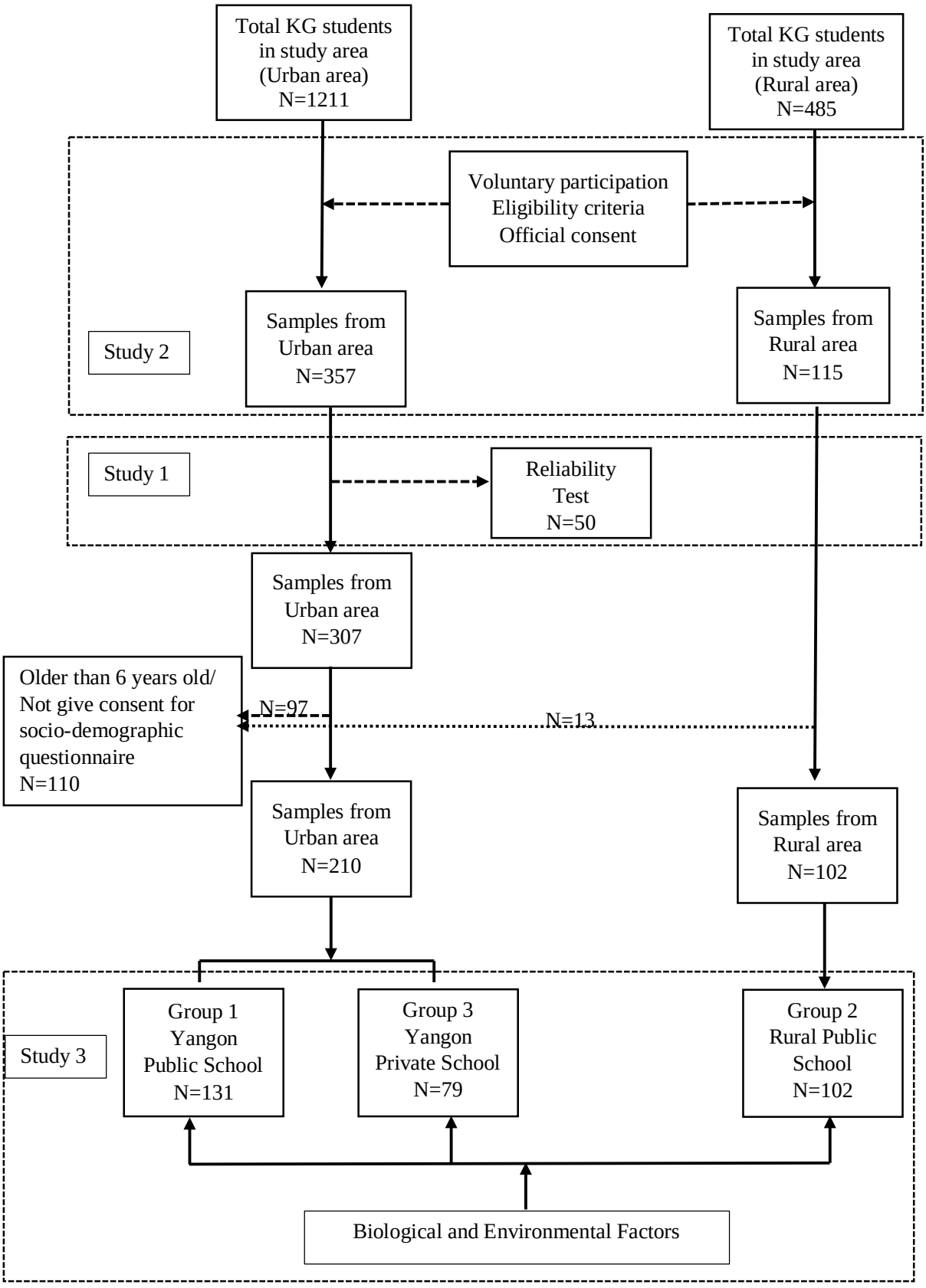

Figure 2-16. Flow diagram of this study

Flow diagram of assessment of the gross motor skill development and its predictors

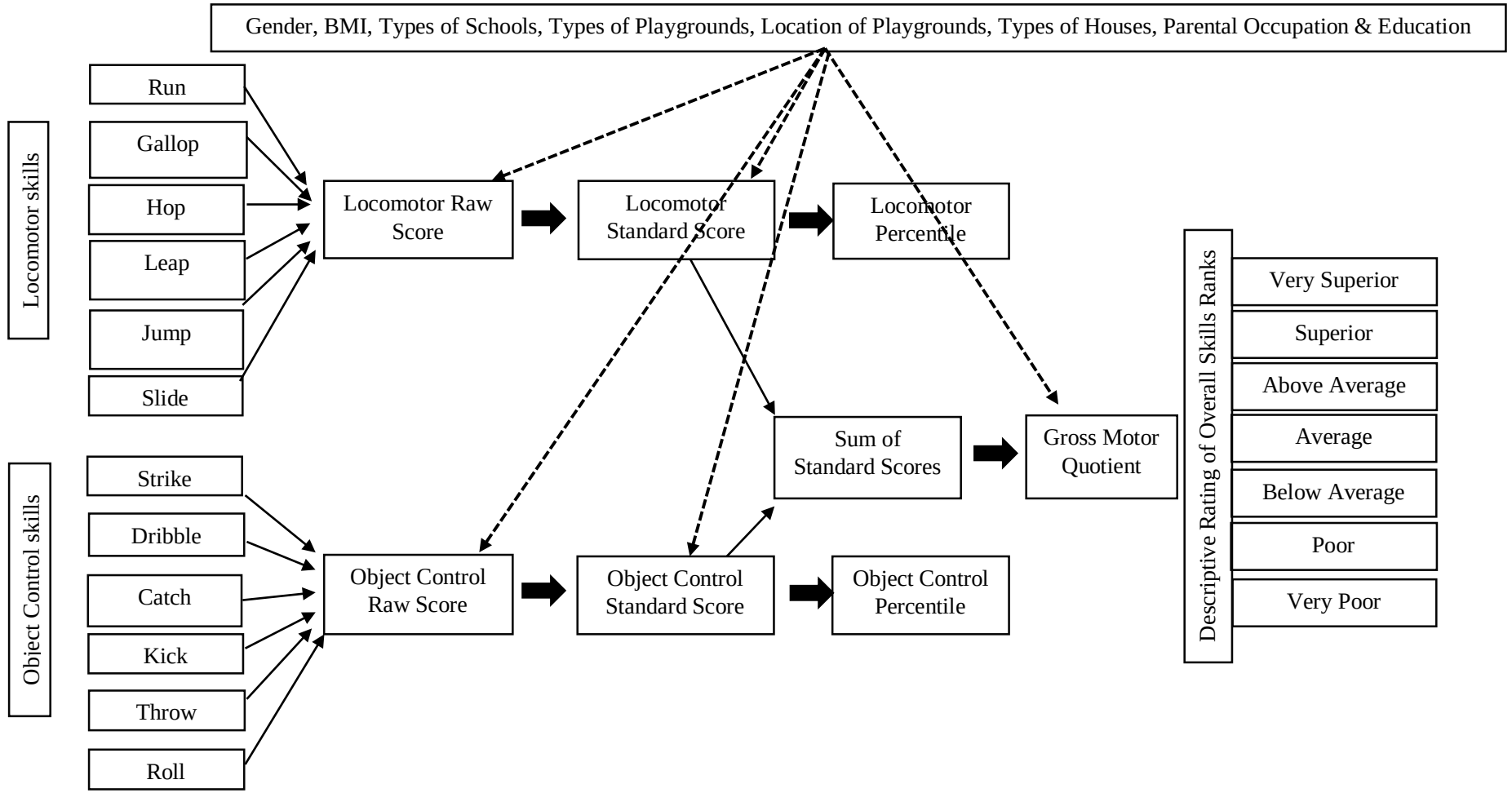

Figure 2-17. Flow diagram of assessment of the gross motor skill development and its predictors

CHAPTER 3

STUDY 1

RELIABILITY OF THE TEST OF GROSS MOTOR DEVELOPMENT SECOND EDITION (TGMD-2) FOR KINDERGARTEN CHILDREN IN MYANMAR

3.1. Background and purpose

3.1.1. Background

Connolly has described that the norm-referenced tests must meet minimal standards of reliability and validity before being widely accepted[37]. The TGMD-2 is a highly reliable and valid assessment tool using normative sample of 1,208 persons residing in 10 states of the USA and three sources of error variance, content sampling, time sampling, and inter-scorer differences, were analyzed in relation to TGMD-2 subtest and quotient scores[9]. The content sampling of the TGMD-2 was done to assess internal consistency and R values ranged from 0.76 to 0.94. The inter-rater reliability on the test was found to be very high with correlational values of r=0.98 found for the locomotor and object control subtests, and the gross motor quotient[9]. The test-retest reliability scores for a sample of 75 children ranged from 0.88 to 0.96[9].

There are several evidences for the reliability of the TGMD-2 as cross-cultural studies in Australia, Belgium, Brazil, Chile, China, Iran, Philippine, South Korea, and many other countries for typically developing children and children with special needs[155-168].

Valentini evaluated the test-retest reliability, the inter- and intra-rater reliability tests of the Brazilian version of the TGMD-2 in typically developing children from 3 to 10 years old in Brazil[156]. Two studies indicated that the TGMD-2 was reliable assessment tool for South Korean children[157, 158]. Barnett et al. reported that the valuable inter-rater reliability of the TGMD-2 for typically developing Australian children[159]. Farrokhi et al. had also found that the reliability of the TGMD-2 for typically developing children in Iran[162].

Although there are evidences of reliability of the TGMD-2 all over the world, it should be considered the sociocultural differences in children in Myanmar. Although several assessment tools are being used in clinical and school settings in Myanmar, the documented evidence of reliable assessment tools for gross motor skill development is limited.

3.1.2. Purpose

The purpose of this study (Study 1) was to investigate the reliability of the TGMD-2 for assessing the gross motor skill development of KG children in Myanmar.

3.2. Subjects and Methods

3.2.1. Subjects

This study was conducted with 50 healthy KG children (23 boys, 27 girls) who were attending at one public school for 2016-2017 academic year in Yangon city area of Myanmar. The characteristics of the subjects were age: 5.4 ± 0.3 years, height: 106.1 ± 7.0 cm, weight: 17.2 ± 2.5 kg, BMI: 15.3 ± 1.7 kg/m^2. The exclusion criteria were children with known developmental disability (e.g. Cerebral palsy, Down's syndrome, Autism Spectrum Disorder, Attention Deficit Hyperactive Disorder), obvious deformity (e.g. scoliosis, bow leg), and orthopedic injury in both upper and lower extremities within six months. Information on this study was provided to the principals, the teachers, the parents or guardians and the children themselves before their voluntary participation.

3.2.2. Materials

The main equipment used was the original English version of the TGMD-2 (Figure 2-2 in the Chapter 2), its examiner record forms (Appendix 1), and other materials (Figure 2-3 in the Chapter 2).

3.2.3. Procedures

Three raters were responsible for this study. Rater A is a Physical Therapist, Rater B and C are Physiatrists. The role of the Rater A is the principal researcher of the whole study. The roles of the Rater B and C are not only the raters for the reliability testing of the TGMD-2 but also associate supervisors of the Rater A in Myanmar. Their names and affiliations have been described in the acknowledgements and Appendix 4. All the three raters work in medical universities and university affiliated hospitals under the MOHS. They all have more than 15 years of experience teaching, observing and evaluating children's gross motor skill development. The Rater A and B were introduced the TGMD-2 two years earlier and more practice time than the Rater C. None of the three raters had any prior experience in administration of the TGMD-2 but they all finished training for the TGMD-2.

The test venue and equipment were set up according to the TGMD-2 requirements in the assembly hall of the school. The researcher thoroughly explained and demonstrated correct performance of all 12 gross motor skills of the TGMD-2 before the assessment. After that, each child started to perform each gross motor skill under the supervision of the researcher and the KG class teachers. The child was allowed at least one test trail for each gross motor skill. The child had to perform two trials for each of all 12 gross motor skills (rest period was provided between two consecutive gross motor skill tests). Total duration of the assessment of all 12 gross motor skills for each child lasted about 10-15 minutes (including rest periods). All children were assessed with their barefooted performance of all the skills. The assessment procedures were done according to the standardized guidelines of the TGMD-2 (Figure. 2-4 to 2-15 in the Chapter 2) and finished within three consecutive days for all 50 children.

The performance of every child was video-recorded. The video camera was fixed in the proper position and angle to record the whole performance of each motor skill, except recording of run, gallop and slide when the angle of the video camera was changed to record the whole performance. The video recordings were assessed and rated separately by the three raters. For test-retest reliability, out of 50 children already assessed a month before, 25 were randomly selected to be asked to perform all the required skills for the second occasion. The performance of each child in the second occasion was also video recorded and assessed. The assessment for the second occasion was finished within two consecutive days. For the intra-rater reliability, after six weeks of the first assessment, the Rater A watched the same video recordings of 12 out of 50 children once and assessed again.

The agreement on the individual and raw scores for both locomotor and object control skills, and the GMQ were calculated for the reliability testing. The inter-rater reliability was calculated by the use of Cronbach's alpha, intra-class correlation coefficients (ICC) (two-way random, average measures, absolute agreement), Pearson product-movement coefficients of correlation and Spearman rank correlation coefficients. The Spearman rank correlation coefficient was calculated only for the agreement on seven categories of descriptive ratings for overall gross motor skills converted from the GMQ by all the raters. The test-retest reliability and intra-rater reliability were also calculated by the use of Cronbach's alpha, ICC (two-way mixed, average measures, consistency) and Pearson product-movement coefficients of correlation. The significant level was set as $p<0.05$. The software used for data analysis was IBM SPSS statistic version 22.0 for Windows.

3.3. Results

3.3.1. Inter-rater reliability

The results of mean values for the individual and raw scores of the locomotor and object control skills and the GMQ by three raters, Cronbach's alpha, and ICC for the inter-rater reliability are shown in Table 3-1. All the values of Cronbach's alpha and ICC showed excellent for all the measures in the inter-rater reliability.

Table 3-1. Results of inter-rater reliability test (Cronbach's Alpha and ICC)

Gross Motor Skills	Rater A	Rater B	Rater C	Cronbach's Alpha	ICC	95% CI		
						Lower bound	Upper bound	
Run	5.58±2.16	6.02±1.88	6.40±1.51	0.94	0.93	0.86	0.96	***
Gallop	6.72±2.48	7.04±1.99	7.06±2.00	0.98	0.97	0.96	0.99	***
Hop	8.32±2.62	8.42±2.63	9.00±2.22	0.97	0.97	0.94	0.98	***
Leap	2.68±1.85	2.90±1.90	3.24±1.33	0.95	0.94	0.90	0.97	***
Jump	4.04±1.82	4.08±1.71	5.04±1.58	0.93	0.89	0.75	0.95	***
Slide	7.20±2.00	7.32±1.82	7.52±1.64	0.97	0.97	0.95	0.98	***
Striking a stationary ball	6.80±2.35	7.10±2.15	7.72±2.01	0.96	0.94	0.88	0.97	***
Stationary Dribble	1.52±2.64	1.68±2.72	1.86±2.60	0.99	0.99	0.98	0.99	***
Catch	1.00±0.97	0.97±1.00	0.68±0.65	0.89	0.74	0.18	0.89	***
Kick	7.42±1.25	7.54±0.99	7.92±0.40	0.79	0.77	0.62	0.86	***
Overhand Throw	3.52±2.51	4.26±1.90	4.94±2.00	0.93	0.89	0.75	0.95	***
Underhand Roll	4.58±1.83	4.86±1.67	5.28±1.80	0.95	0.94	0.88	0.96	***
LRS	34.5±7.95	35.8±7.37	38.3±6.12	0.98	0.95	0.83	0.98	***
OCRS	26.9±6.60	28.6±5.71	32.7±5.32	0.96	0.88	0.42	0.96	***
GMQ	98.9±13.5	101.9±11.9	110.3±11.1	0.96	0.89	0.46	0.96	***

Mean±SD, ICC: Intraclass correlation coefficient, CI: Confidence Interval, ***: $p<0.001$

LRS: Locomotor Raw Scores, OCRS: Object Control Raw Scores, GMQ: Gross Motor Quotient

Table 3-2 and Figure 3-1 to 3-9 show the values of Pearson product-movement coefficients of correlation for the inter-rater agreement. The results revealed strong positive to very strong positive degrees of correlation among all the three raters.

Table 3-2. Pearson product-movement coefficients of correlation for inter-rater reliability

Gross Motor Skills	Inter-rater		
	Rater A x B	Rater A x C	Rater B x C
Run	0.92***	0.85***	0.80***
Gallop	0.97***	0.96***	0.92***
Hop	0.98***	0.90***	0.92***
Leap	0.95***	0.85***	0.89***
Horizontal Jump	0.94***	0.75***	0.75***
Slide	0.95***	0.91***	0.92***
Striking a stationary ball	0.95***	0.85***	0.85***
Stationary Dribble	0.98***	0.96***	0.94***
Catch	0.97***	0.68***	0.65***
Kick	0.87***	0.48***	0.53***
Overhand Throw	0.94***	0.77***	0.78***
Underhand Roll	0.94***	0.84***	0.81***
Locomotor Raw Scores	0.97***	0.94***	0.93***
Object Control Raw Scores	0.96***	0.85***	0.96***
Gross Motor Quotient	0.97***	0.87***	0.88***

***: $p<0.001$

The Spearman rank correlation coefficients for inter-rater agreement on seven categories of descriptive ratings for overall skill ranks converted from the Gross Motor Quotient are shown in Table 3-3. The results also indicated strong positive to very strong positive degrees of correlation among all the three raters.

Table 3-3. Spearman rank correlation coefficients for inter-rater reliability

	Spearman Rank Correlation Coefficients		
TGMD-2 Scores	Rater A x Rater B	Rater A x Rater C	Rater B x Rater C
Descriptive Rating of Overall Skill	0.89***	0.67***	0.72***

***: $p<0.001$

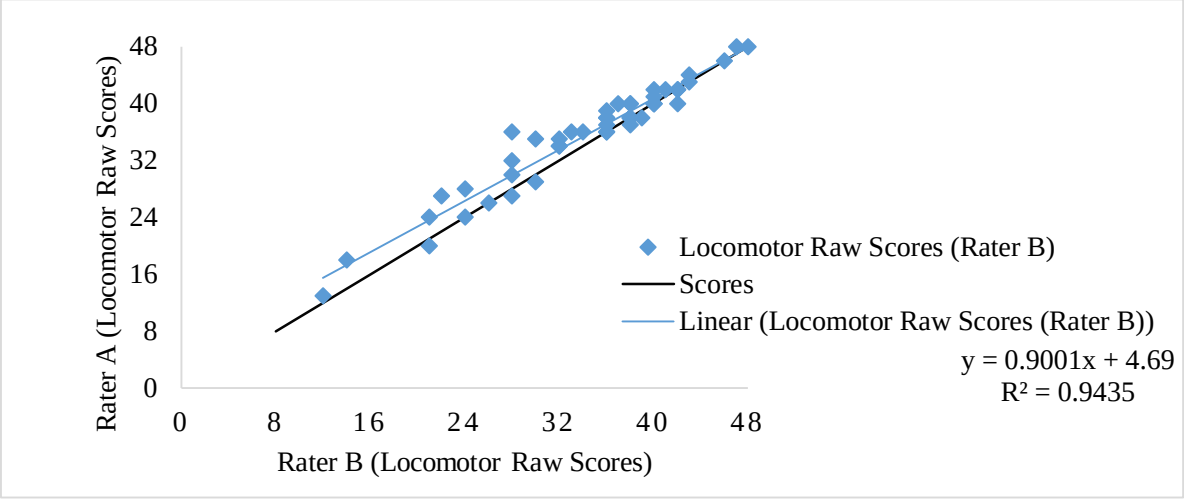

Figure 3-1. Locomotor Raw Scores between Rater A and Rater B

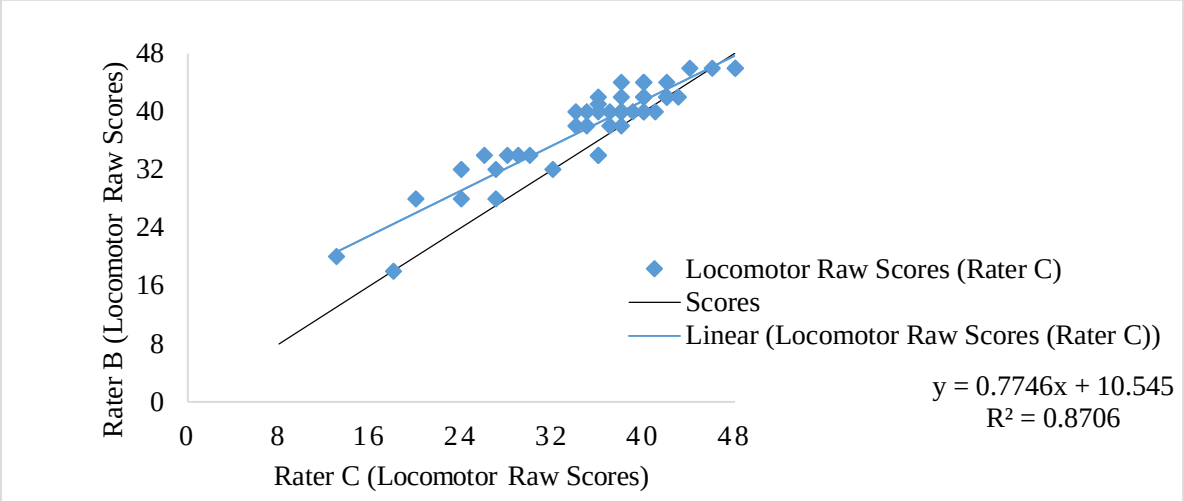

Figure 3-2. Locomotor Raw Scores between Rater B and Rater C

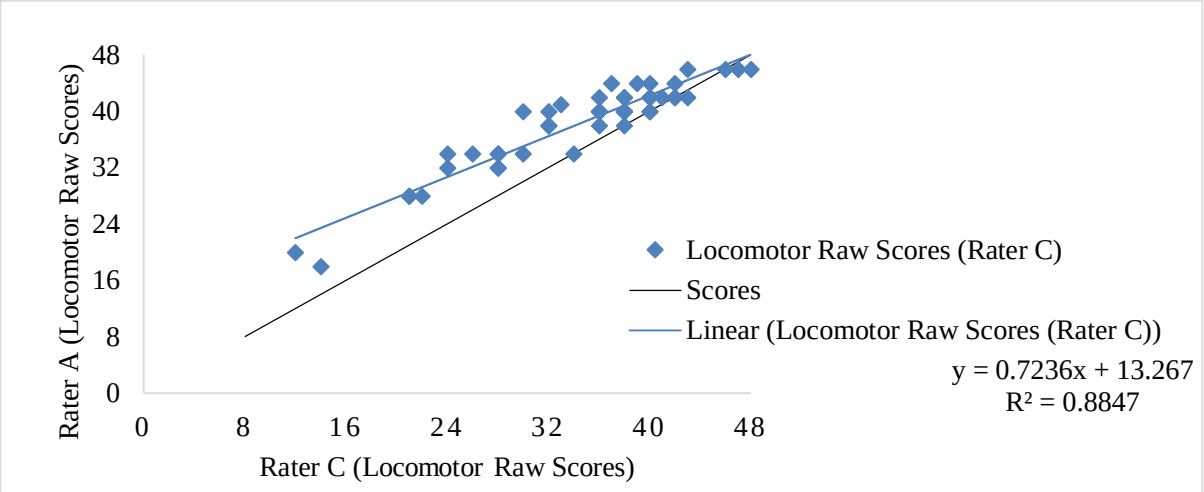

Figure 3-3. Locomotor Raw Scores between Rater A and Rater C

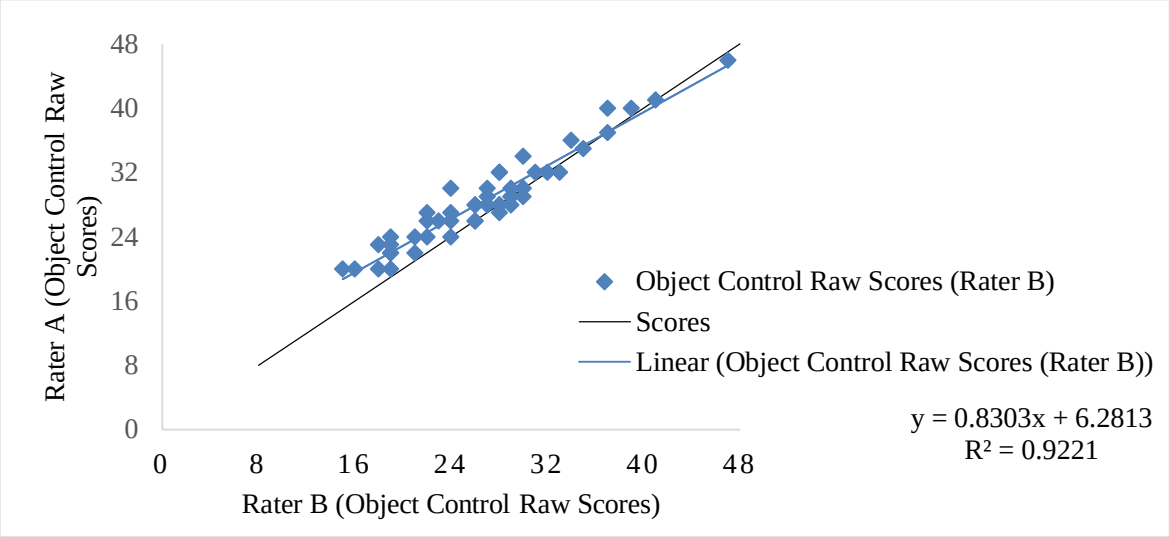

Figure 3-4. Object Control Raw Scores between Rater A and Rater B

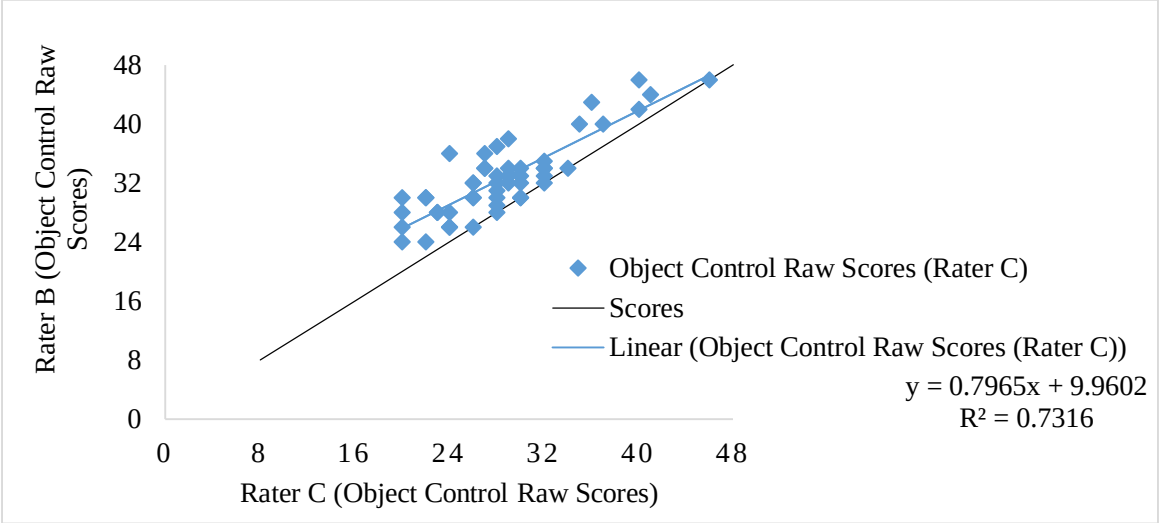

Figure 3-5. Object control Raw Scores between Rater B and Rater C

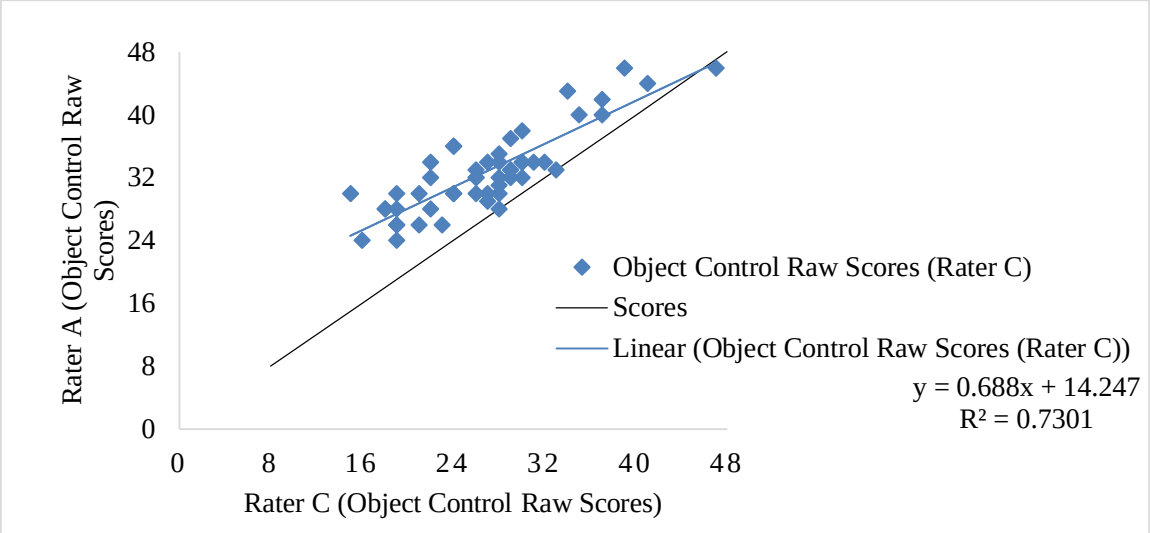

Figure 3-6. Object control Raw Scores between Rater A and Rater C

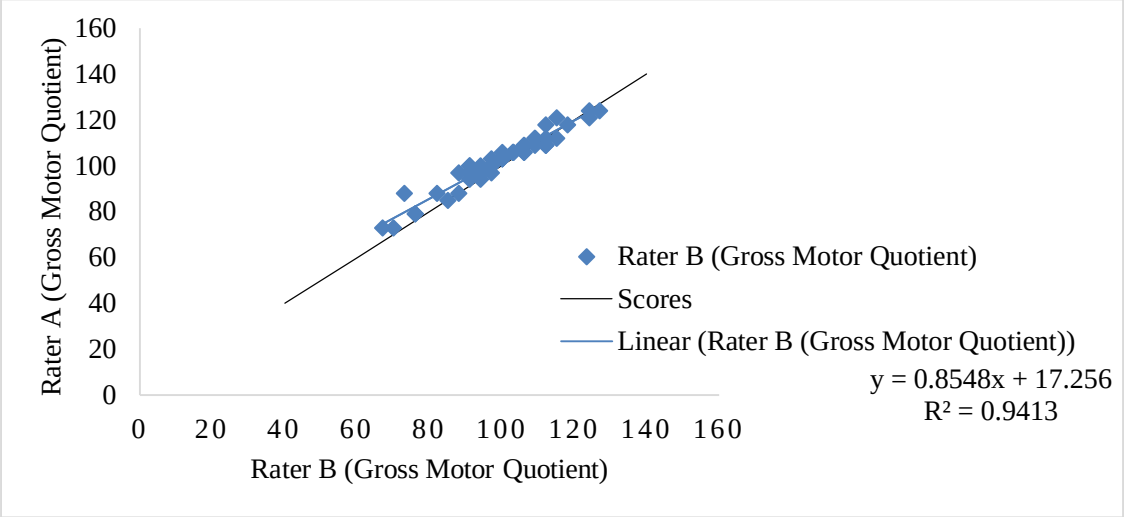

Figure 3-7. Gross Motor Quotient between Rater A and Rater B

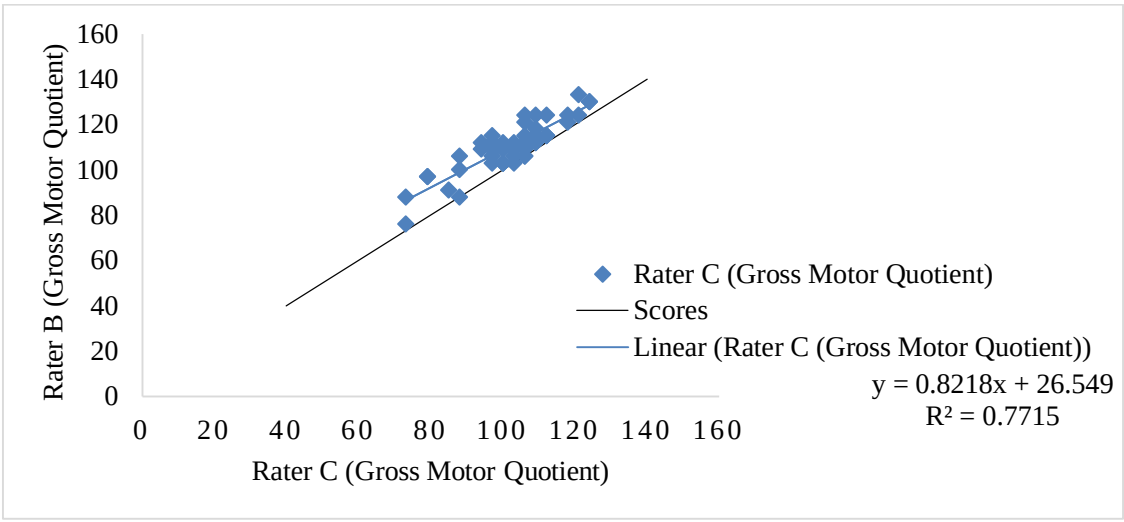

Figure 3-8. Gross Motor Quotient between Rater B and Rater C

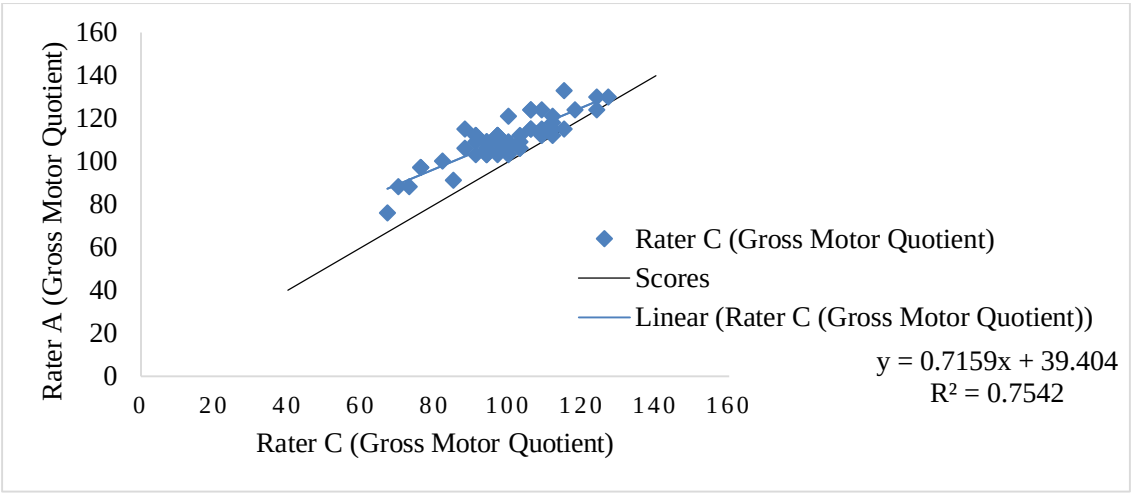

Figure 3-9. Gross Motor Quotient between Rater A and C

3.3.2. Test-retest reliability

The results of mean values for the individual and raw scores of the locomotor and object control skills and the GMQ, Cronbach's alpha, and ICC for the test-retest reliability are shown in Table 3-4. The results of the test-rest reliability presented acceptable to good alpha values for Cronbach's alpha and good to excellent agreement values for ICC between Day 1 and Day 2 assessments.

Table 3-4. Results of test-retest reliability (Cronbach's Alpha and ICC)

Gross Motor Skills	Day 1	Day 2	Cronbach's Alpha	ICC	95% CI		
					Lower bound	Upper bound	
Run	5.80±2.20	6.88±1.92	0.59	0.41	0.03	0.69	*
Gallop	7.44±1.69	7.84±0.55	0.41	0.26	-0.14	0.59	
Hop	8.52±2.54	8.8±2.58	0.86	0.75	0.51	0.88	***
Leap	2.84±1.95	4.32±1.25	0.65	0.49	0.12	0.74	**
Horizontal Jump	4.12±2.17	6.56±2.12	0.71	0.55	0.20	0.77	**
Slide	7.72±0.84	7.68±0.95	0.76	0.61	0.29	0.81	***
Striking a stationary ball	6.48±2.45	7.92±2.27	0.88	0.78	0.57	0.90	***
Stationary Dribble	1.28±2.57	1.60±3.00	0.91	0.84	0.66	0.92	***
Catch	3.04±1.65	3.60±2.00	0.87	0.78	0.55	0.89	***
Kick	7.40±1.29	7.04±1.65	0.75	0.60	0.28	0.80	***
Overhand Throw	3.44±2.62	6.56±1.87	0.76	0.61	0.29	0.81	***
Underhand Roll	4.60±1.83	5.76±2.03	0.68	0.51	0.15	0.75	**
LRS	36.4±7.49	42.1±6.84	0.82	0.69	0.42	0.85	***
OCRS	26.2±6.15	32.5±7.12	0.80	0.67	0.37	0.84	***
GMQ	102.3±13.2	118.9±16.2	0.76	0.61	0.29	0.81	***

Mean±SD, ICC: Intraclass correlation coefficient, CI: Confidence Interval

*: $p<0.05$, **: $p<0.01$, ***: $p<0.001$, NS: Not significant

LRS: Locomotor Raw Scores, OCRS: Object Control Raw Scores, GMQ: Gross Motor Quotient

Table 3-5 and Figure 3-10 to 3-12 show the values of Pearson product-movement coefficients of correlation for the test-retest reliability test. The results revealed strong positive to very strong positive degrees of correlation between Day 1 and Day 2 assessments.

Table 3-5. Pearson product-movement coefficients of correlation for test-retest reliability

Gross Motor Skills	Pearson product-movement coefficients of correlation
Run	0.42*
Gallop	0.44*
Hop	0.75***
Leap	0.54**
Horizontal Jump	0.55**
Slide	0.62***
Striking a stationary ball	0.79***
Stationary Dribble	0.85***
Catch	0.79***
Kick	0.62***
Overhand Throw	0.65***
Underhand Roll	0.51**
Locomotor Raw Scores	0.70***
Object Control Raw Scores	0.67***
Gross Motor Quotient	0.62***

*: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

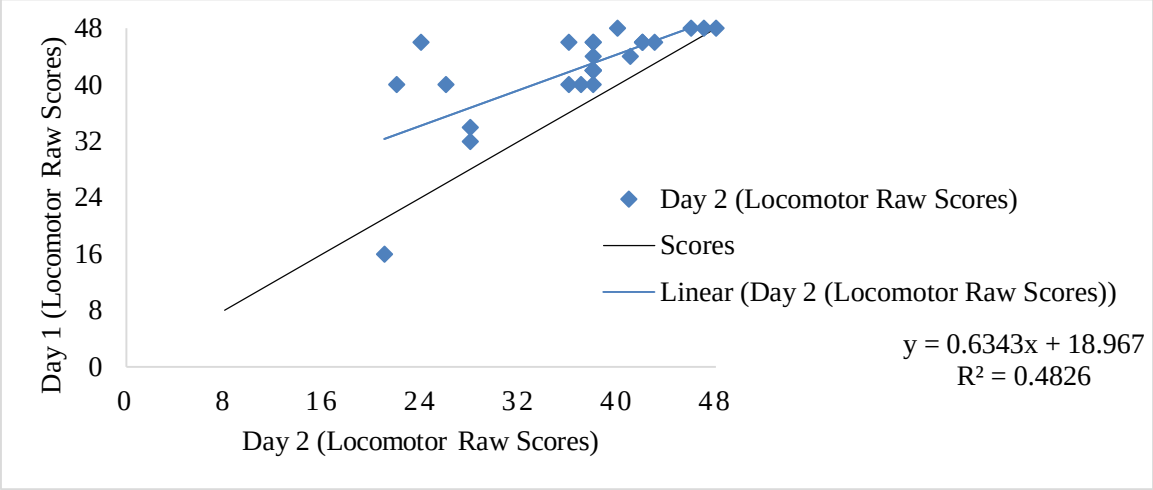

Figure 3-10. Locomotor Raw Scores between Day 1 and Day 2

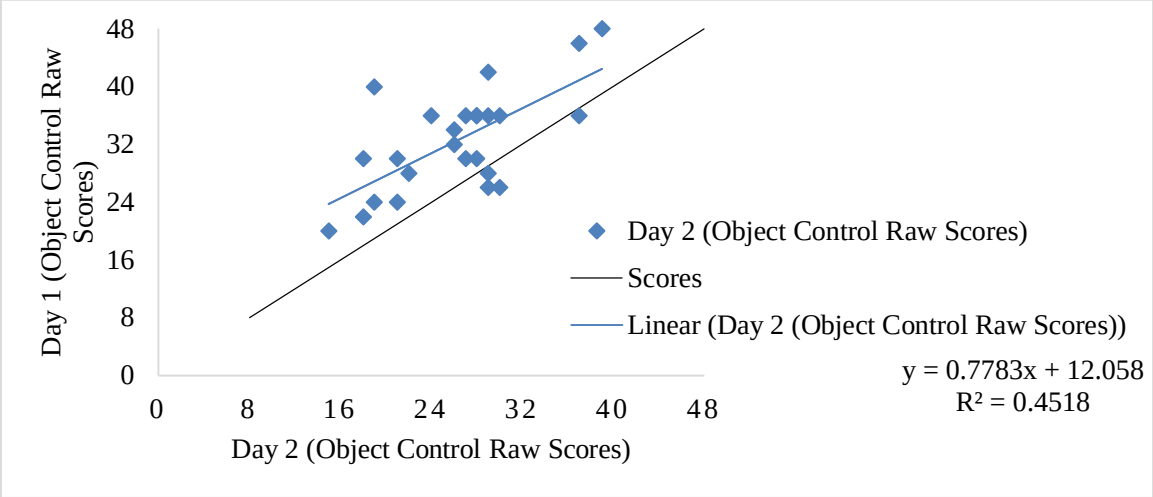

Figure 3-11. Object Control Raw Scores between Day 1 and Day 2

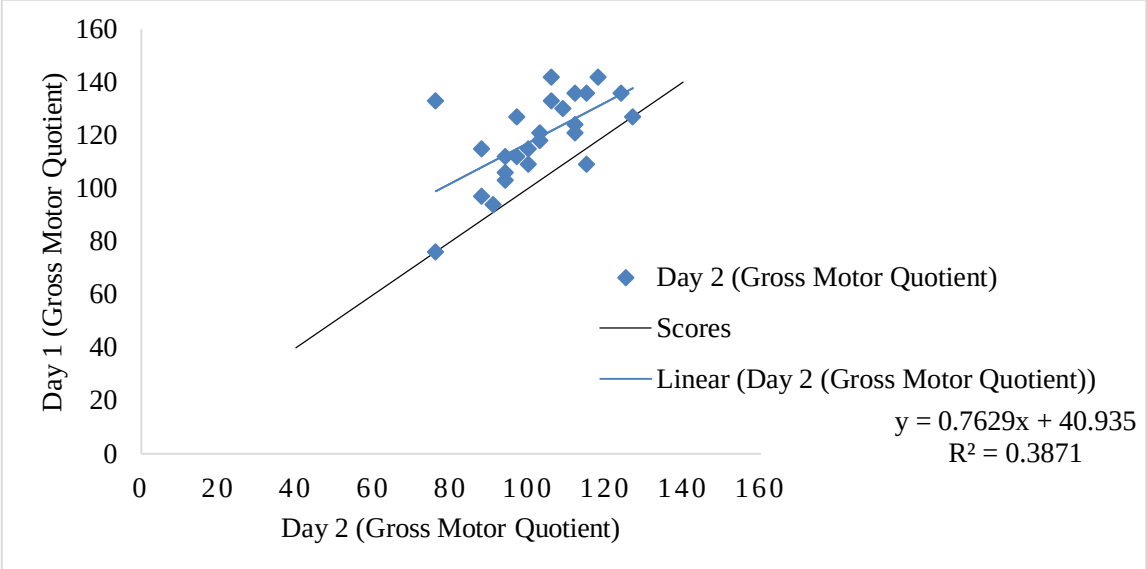

Figure 3-12. Gross Motor Quotient between Day 1 and Day 2

3.3.3. Intra-rater reliability

The results of mean values for the individual and raw scores of the locomotor and object control skills and the GMQ, Cronbach's alpha, and ICC for the intra-rater reliability test are shown in Table 3-6. The results of the intra-rater reliability revealed excellent values for all the measures between the first and second ratings (between Assessment 1 and 2).

Table 3-6. Results of intra-rater reliability (Cronbach's Alpha and ICC)

Gross Motor Skills	Assessment 1	Assessment 2	Cronbach's Alpha	ICC	95% CI		
					Lower bound	Upper bound	
Run	6.08±2.27	6.00±1.91	0.83	0.83	0.39	0.95	***
Gallop	7.83±0.58	7.83±0.58	1.00	1.00	1.00	1.00	***
Hop	7.83±3.13	7.83±3.24	0.98	0.98	0.94	0.99	***
Leap	2.83±2.17	3.50±1.51	0.86	0.86	0.52	0.96	***
Horizontal Jump	4.58±2.35	5.50±1.93	0.94	0.94	0.80	0.98	***
Slide	7.75±0.87	7.67±1.15	0.98	0.98	0.93	0.99	***
Striking a stationary ball	6.83±2.76	7.58±1.93	0.89	0.89	0.63	0.97	***
Stationary Dribble	2.33±3.28	2.50±3.53	0.99	0.99	0.97	1.00	***
Catch	2.67±1.30	2.50±1.24	0.95	0.95	0.81	0.98	***
Kick	7.25±1.42	7.00±1.81	0.96	0.96	0.87	0.99	***
Overhand Throw	3.5±2.58	4.50±1.93	0.90	0.90	0.67	0.97	***
Underhand Roll	5.25±2.05	4.67±1.56	0.66	0.66	-0.18	0.90	*
LRS	36.9±8.72	38.3±7.76	0.98	0.98	0.92	0.99	***
OCRS	27.8±6.62	28.8±7.36	0.95	0.95	0.83	0.99	***
GMQ	105.3±17.1	108.0±17.2	0.97	0.97	0.88	0.99	***

Mean±SD, ICC: Intraclass correlation coefficient, CI: Confidence Interval

*: $p<0.05$, ***: $p<0.001$

LRS: Locomotor Raw Scores, OCRS: Object Control Raw Scores, GMQ: Gross Motor Quotient

Table 3-7 and Figure 3-13 to 3-15 show the values of Pearson product-movement coefficients of correlation for the intra-rater agreement. The results of the intra-rater reliability revealed excellent values for all the measures except the “underhand roll” between the first and second ratings.

Table 3-7. Pearson product-movement coefficients of correlation for intra-rater reliability

Gross Motor Skills	Pearson product-movement coefficients of correlation
Run	0.71**
Gallop	1.00***
Hop	0.97***
Leap	0.81**
Horizontal Jump	0.91***
Slide	1.00***
Striking a stationary ball	0.86***
Stationary Dribble	0.99***
Catch	0.90***
Kick	0.95***
Overhand Throw	0.86***
Underhand Roll	0.51
Locomotor Raw Scores	0.96***
Object Control Raw Scores	0.91***
Gross Motor Quotient	0.94***

**: $p<0.01$, ***: $p<0.001$

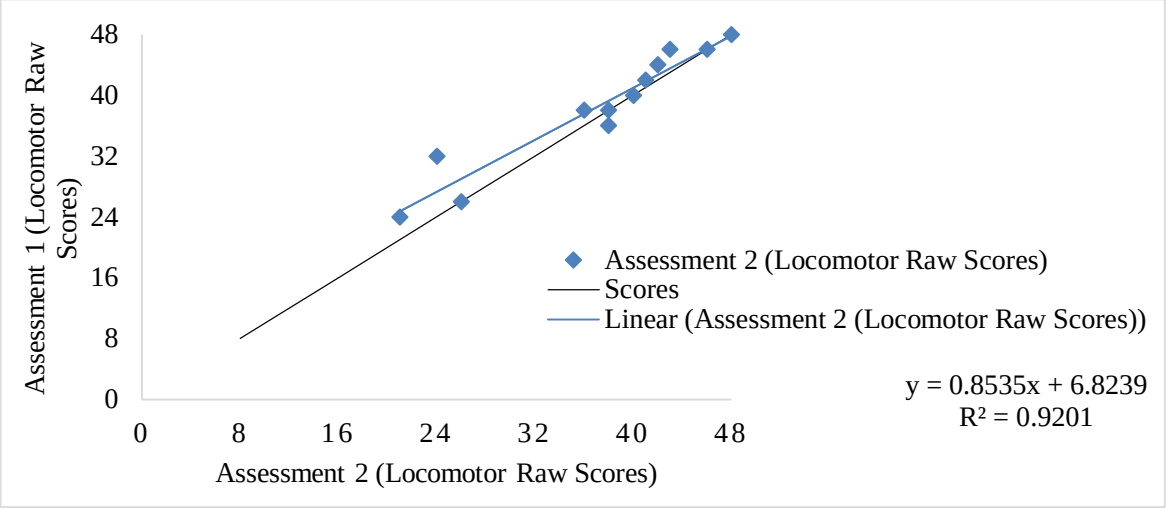

Figure 3-13. Locomotor raw scores between Assessment 1 and Assessment 2

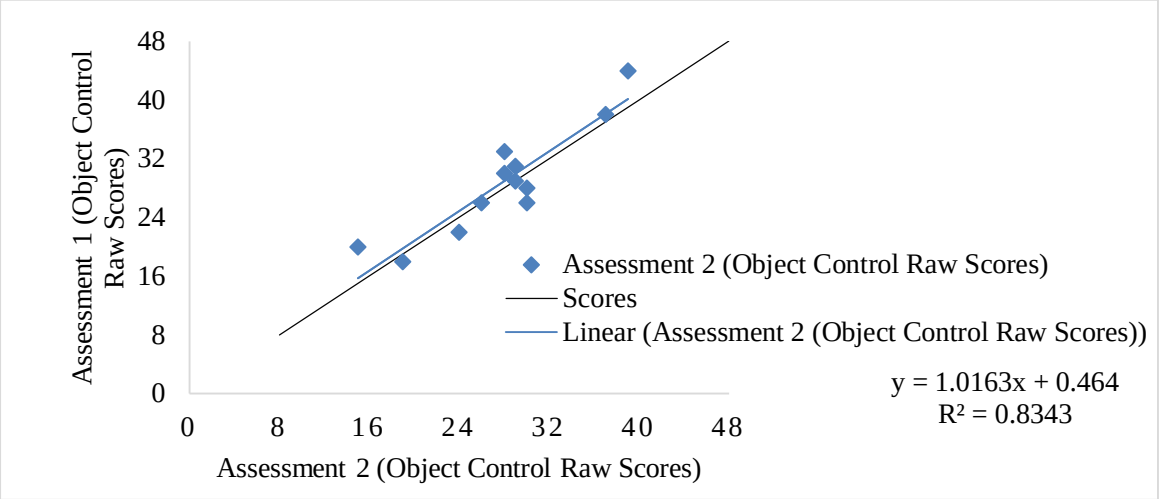

Figure 3-14. Object Control Raw Scores between Assessment 1 and Assessment 2

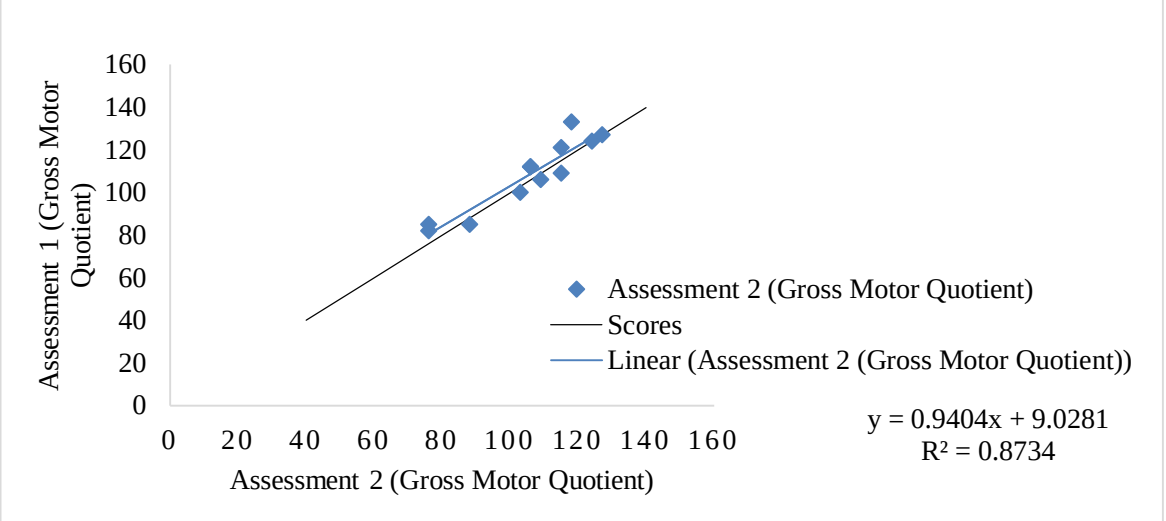

Figure 3-15. Gross Motor Quotient between Assessment 1 and Assessment 2

3.3.4. Cross-cultural results of reliability of TGMD-2

Table 3-8 shows the results of ICC of the current study and the other previous studies in other countries.

Table 3-8. Cross-cultural results of reliability (ICC)

	Current study			Kim et al[158], 2014	Farrokhi et al[162], 2014	
Country	Myanmar			South Korea	Iran	
Age	only 5 years			3-10 years	3-10 years	
Number of subjects	n = 50	n = 25	n = 12	n = 40	n = 63	n = 32
ICC	Inter-rater	Test-retest (four weeks)	Intra-rater	Inter-rater	Test-retest (two weeks)	Intra-rater
Locomotor Raw Scores	0.95	0.82	0.98	0.94	0.65	0.95
Object Control Raw Scores	0.88	0.79	0.95	-	0.85	0.99
Sum of Standard Scores	0.89	0.76	0.97	0.96	-	-
Gross Motor Quotient	0.89	0.76	0.97	-	0.81	0.97

n: Number, ICC: Intraclass correlation coefficient

Table 3-9 shows the results of other reliability coefficients of the current study in Myanmar, the original TGMD-2 study in the USA, and the other previous study in other country.

Table 3-9. Cross-cultural results of reliability (other reliability coefficients)

	Current study			Ulrich[9], 2000			Valentini[156], 2012	
Country	Myanmar			USA			Brazil	
Age	only 5 years			3-10 years			3-10 years	
Number of subjects	n = 50	n = 25	n = 12	n = 30	n = 75	-	-	n = 648
Reliability Tests	Inter-rater	Test-retest (4 weeks)	Intra-rater	Inter-rater	Test-retest (2 weeks)	Content sampling	Inter-rater	Test-retest (7-10 Days)
Reliability Coefficients	Alpha	Pearson	Pearson	ND	Pearson	ND	Alpha	Pearson
Locomotor Raw Scores	0.98	0.69	0.96	0.98	0.88	0.85	0.88	0.83
Object Control Raw Scores	0.96	0.67	0.91	0.98	0.93	0.88	0.89	0.91
Gross Motor Quotient	0.96	0.62	0.94	0.98	0.96	0.91	-	-

n: Number, ND: Not defined

3.4. Discussion

The findings of all reliability coefficients for the locomotor subtest, the object control subtest and the GMQ are interpreted as good and excellent[169-172].

Portney & Watkin reported that the reliability coefficients ICC below 0.50 represent poor reliability, from 0.50 to 0.75 suggest moderate reliability, and values above 0.75 indicate high reliability[169]. Cicchetti indicated that the reliability coefficients ICC below 0.40 represent poor reliability, coefficients from 0.40 to 0.59 suggest fair reliability, from 0.60 to 0.74 represent good reliability and values above 0.75 indicate excellent reliability[170]. The inter-rater reliability ICC for the locomotor subtest, the object control subtest, and the GMQ were higher than 0.80. This value can be interpreted as excellent agreement among all the raters. Kim et al. reported that inter-rater reliability ICC for the locomotor raw scores was 0.94 and the sum of standard scores was 0.96 in 40 South Korean children who were assessed by three raters[158]. The test-retest reliability ICC for all the gross motor tests in this study were more than 0.75 which indicated high reliability. Farrokhi et al. reported that ICC for the locomotor subtest was 0.65, the object control subtest was 0.85 and the GMQ was 0.81 in the test-retest reliability testing of 63 children in Iran[162]. The test-retest ICC for the locomotor subtest of this study was higher but the object control subtest and the GMQ were lower than their study. It would be attributed to time interval differences between the first and second assessments and age differences of participants between two studies. The time interval between the test and retest in Farrokhi et al. was two weeks and the subjects were 3-10 years of age[162]. The intra-rater ICC for all the gross motor tests in this study were higher than 0.95 which represented high or excellent reliability. The similar findings for the intra-rater ICC were reported by Farrokhi et al. in Iran[162]. The subjects in the present study and the previous studies by Kim et al. and Farrokhi et al. were typically developing children[158, 162]. The similar findings were also found when the results of this study were compared to the study by Houwen et al. for children with visual impairments in the Netherlands[163]. They had found that the inter-rater ICC for the locomotor subtest, the object control subtest and the GMQ were 0.82, 0.93 and 0.89 respectively, the intra-rater ICC for the locomotor subtest was 0.85, the object control subtest was 0.93 and the GMQ was 0.95, and the test-retest ICC for the locomotor subtest, the object control subtest and the GMQ were 0.86, 0.87 and 0.92 respectively. The time interval between the test and retest in Houwen et al. was also two weeks and the subjects were 6-12 years of age[163].

DeVellis reported that the alpha coefficients from 0.70 to 0.80 suggest acceptable, from 0.80 to 0.90 indicate good and above 0.90 represent excellent[171]. The alpha coefficient values of the inter-rater reliability for the locomotor raw scores, the object control raw scores, and the GMQ were higher than 0.90. The values were not different from the original TGMD-2 which showed 0.98 of alpha coefficient values for the locomotor raw scores, the object control raw scores and the GMQ in a set of 30 completed protocols, scored by two raters, among 1,208 typically developing American children[9]. Valentini also informed that the alpha coefficient values of inter-rater reliability for the locomotor raw scores and the object control raw scores were 0.88 and 0.89 respectively in typically developing Brazilian children[156]. Simons et al. reported that the

internal consistency Cronbach's alpha for the locomotor scale was 0.82, the object control scale was 0.86 and the GMQ was 0.90 in 7- to 10-year-old Flemish children with intellectual disability[155].

Chowdhuru et al. reported that Pearson and Spearman correlation coefficients values from 0.60 to 0.79 represent strong positive and more than 0.80 indicate very strong positive correlations[172]. The Pearson and Spearman correlation coefficients for the inter-rater reliability in this study showed higher than 0.75. Most of correlation coefficients between Rater A and B is higher when compared to the correlation coefficients between Rater A and C as well as between Rater B and C. It might be ascribed to the different duration of familiarity with the TGMD-2 among three raters. The Pearson test-retest reliability results showed more than 0.60 for locomotor raw scores, object control raw scores and the GMQ. The original TGMD-2 manual stated that the Pearson test-retest reliability results for locomotor raw scores, object control raw scores and the GMQ were 0.88, 0.93 and 0.96 respectively[9]. Valentini also indicated that the Pearson test-retest reliability results for locomotor raw scores was 0.83 and object control raw scores was 0.91[156]. The values in this study were lower than that of Ulrich and Valentini[9, 156]. It might also be attributed to time interval differences between the first and second assessments of three studies and cultural differences of Myanmar, USA and Brazil. The time interval between the test and retest was four weeks in this study which was not similar to the previous studies. The time interval of most of the previous studies was from 7-10 days to two weeks. The subjects were one month older at the second assessment and their performances on all gross motor skills were better than the first assessment. The TGMD-2 was first developed in the USA and the skill for "Striking a stationary ball" was considered an important motor skill for American children. It is quite different for Myanmar children that the motor skills not only "Striking a stationary ball" but also some of the object control skills are not widely used in games and daily play activities. It was their first experience to play with a bat and batting tee for the majority of subjects in this study.

The limitations of this study were that the subjects were only KG students, which meant only one age group, and the subjects were only from Yangon city (urban) area. Further studies are still needed to find out reliability of the TGMD-2 using larger sample of Myanmar children, with age range from 3-10 years, from different regions, and states.

3.5. Conclusion

In conclusion, the results in this study revealed high or excellent reliability of the tests. Thus, the TGMD-2 was a highly reliable and appropriate assessment tool for assessing gross motor skill development of KG children in Myanmar.

CHAPTER 4

STUDY 2

GROSS MOTOR SKILL DEVELOPMENT OF KINDERGARTEN CHILDREN IN MYANMAR

4.1. Background and Purposes

4.1.1. Background

The activities and traditional games for the gross motor skills in the new KG curriculum are fundamental movement skills and related to the items of the TGMD-2, especially the locomotor items. The studies on the gross motor skill development of children from preschools and elementary schools with the TGMD-2 have been conducted in many countries[51-87, 116-144]. Most of the previous studies were conducted with typically developing children while some were conducted with children with special needs[51-87, 116-144]. Some of the existing studies reported assessment of gross motor skill development but the others examined the efficacy of gross motor skill interventions[51-87, 116-144]. Some studies had found that no significant differences between the locomotor skills of boys and girls[73, 76, 123, 126]. The other studies had found the girls to be superior in the locomotor skills[64, 72, 116]. A number of studies had found that the object control skills were significantly better in the boys[55, 60, 64, 72, 73, 76, 78, 116, 123].

There was currently limited information on assessment of the gross motor skill development of KG children using the TGMD-2 in Myanmar.

4.1.2. Purposes

The purposes of this study (Study 2) were to examine the gross motor skill development of 5-year-old KG children in Myanmar, to compare the gross motor skill development of KG children between the boys and girls and also between two geographical regions (urban and rural areas).

4.2. Subjects and Methods

4.2.1. Subjects and Ethical Consideration

This study was a cross-sectional study and a sample of 472 healthy KG children (237 boys, 235 girls) who were attending for 2016-2017 academic year at four schools in urban area (three public and one private schools in Yangon city area) and four public schools in rural area (one township in Bago Region West, about 300km to the North from Yangon) of Myanmar. The selection of the schools was decided by the township education officers from the MOE. The characteristics of the subjects were age: 5.41 ± 0.34 years, height: 105.9 ± 7.17 cm, weight: 17.3 ± 2.99 kg, BMI: 15.4 ± 1.93 kg/m^2.

The exclusion criteria and the ethical consideration were the same as the Study 1 in the Chapter 3.

4.2.2. Materials

The main equipment (Figure 2-2 in Chapter 2) and other materials (Figure 2-3 in Chapter 2) used were also the same as the Study 1 in the Chapter 3.

4.2.3. Procedures

The test venue and equipment were set up according to TGMD-2 requirements in the indoor assembly halls or the outdoor playgrounds of the public schools and the indoor gymnasium of the private school. The subjects were assessed with their barefooted performance of all skills because the majority of the subjects were not accustomed to wear rubber-soled shoes. The assessment procedures for the gross motor skills were done as same as the Study 1 in the Chapter 3 and finished within three consecutive months for all 472 children. The video recordings were assessed and rated with TGMD-2 examiner's record forms by three raters (inter-rater reliability determined by the intra-class correlation coefficients from 0.88-0.95). The raters, except the main researcher, were blinded so that they did not know the subjects and their schools (for all public schools).

The descriptive statistics and one-way ANOVA with effect size and observed power were used to analyze the data to compare the mean values. The significant level was set as $p<0.05$. The software used for data analysis was IBM SPSS statistic version 22.0 for Windows.

4.3. Results

Table 4-1 and Figure 4-1 (a) and (b) show the results of one-way ANOVA between the boys and the girls. The significant differences were found on the run and gallop but there were no significant differences on the rest of the locomotor skills between the boys and the girls. The significant differences were also found on most of the object control skills except the catch, the object control standard and the percentile scores between two genders.

Table 4-1. Comparison of gross motor skills between boys and girls

Demographic characteristics and gross motor skills	Boys	Girls	Total		Partial Eta Squared	Observed Power
Number (%)	237 (50.2)	235 (49.8)	472 (100)			
Age (years)	5.43 ± 0.35	5.39 ± 0.33	5.41 ± 0.34		0.00	0.25
Height (cm)	105.5 ± 7.16	106.3 ± 7.16	105.9 ± 7.17		0.00	0.25
Weight (kg)	17.3 ± 3.11	17.3 ± 2.87	17. 3± 2.99		0.00	0.05
BMI (kg/m^2)	15.6 ± 2.02	15.3 ± 1.82	15.4 ± 1.93		0.01	0.34
Run	7.08 ± 1.54	6.66 ± 1.89	6.87 ± 1.74	*	0.01	0.72
Gallop	6.52 ± 2.34	7.15 ± 1.86	6.83 ± 2.13	**	0.02	0.90
Hop	8.81 ± 2.20	8.63 ± 2.55	8.72 ± 2.38		0.00	0.13
Leap	4.00 ± 1.82	3.88 ± 1.63	3.94 ± 1.73		0.00	0.13
Horizontal Jump	5.18 ± 2.28	5.12 ± 1.96	5.15 ± 2.13		0.00	0.06
Slide	7.18 ± 1.84	7.18 ± 1.57	7.18 ± 1.72		0.00	0.05
LRS	38.8 ± 7.66	38.6 ± 7.07	38.7 ± 7.36		0.00	0.05
LSS	12.9 ± 3.74	12.6 ± 3.48	12.8 ± 3.61		0.00	0.13
Locomotor Percentiles	71.7 ± 29.0	71.3 ± 27.4	71.5 ± 28.2		0.00	0.05
Striking a stationary ball	7.53 ± 2.18	6.59 ± 2.22	7.06 ± 2.25	***	0.04	1.00
Stationary Dribble	2.37 ± 3.15	1.79 ± 2.81	2.08 ± 2.99	*	0.01	0.53
Catch	3.58 ± 1.77	3.39 ± 1.81	3.49 ± 1.79		0.00	0.20
Kick	7.47 ± 1.27	6.79 ± 1.79	7.13 ± 1.59	***	0.05	1.00
Overhand Throw	5.68 ± 2.23	4.73 ± 2.41	5.21 ± 2.37	***	0.04	0.99
Underhand Roll	5.16 ± 1.98	4.56 ± 1.52	4.86 ± 1.79	***	0.03	0.95
OCRS	31.8 ± 7.53	27.8 ± 7.30	29.8 ± 7.67	***	0.06	1.00
OCSS	10.0 ± 2.65	10.2 ± 2.95	10.1 ± 2.81		0.00	0.10
Object Control Percentiles	49.2 ± 26.9	50.5 ± 29.1	49.8 ± 28.0		0.00	0.08
Sum of Standard Scores	22.9 ± 5.02	22.8 ± 5.27	22.9 ± 5.14		0.00	0.06
Gross Motor Quotient	108.3 ± 16.3	108.4 ± 15.8	108.3 ± 16.0		0.00	0.05

Mean ± SD, Significant differences between boys and girls *: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

LRS: Locomotor Raw Scores, LSS: Locomotor Standard Scores, OCRS: Object Control Raw Scores, OCSS: Object Control Standard Scores

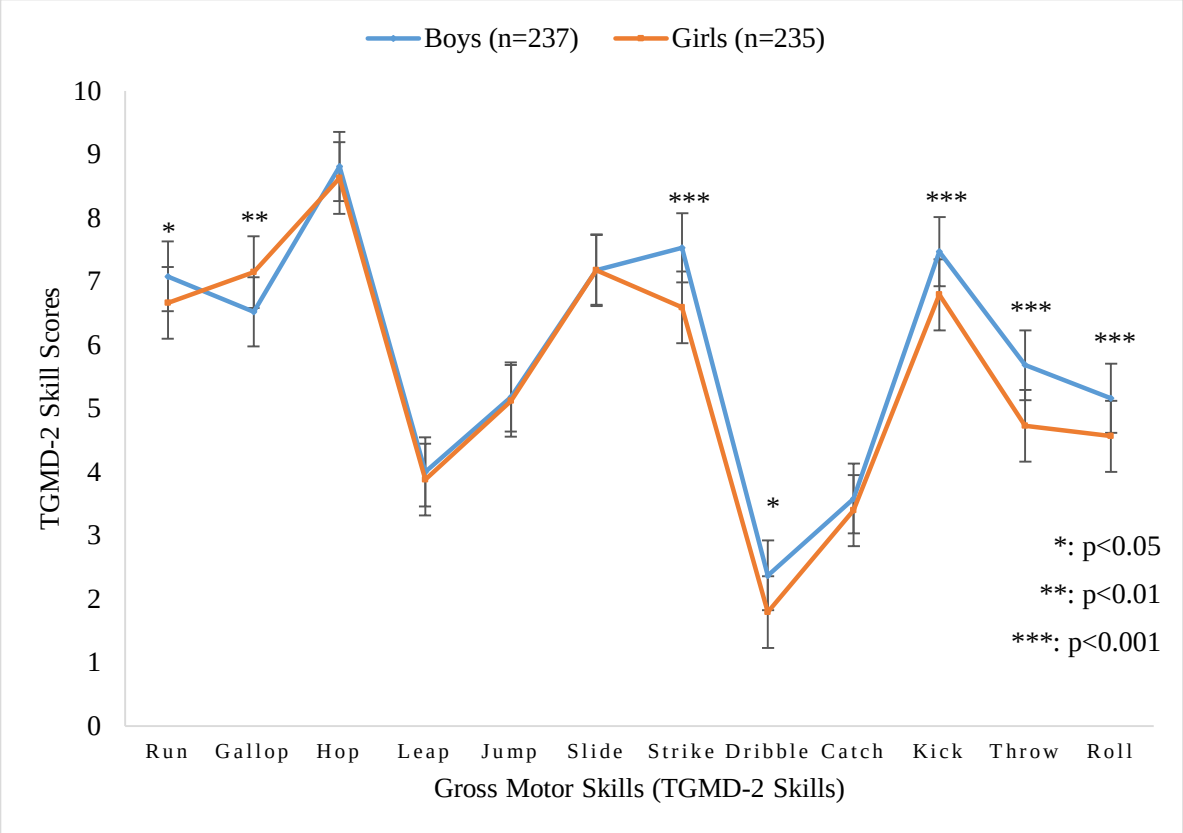

Figure 4-1 (a). Comparison of gross motor skills (TGMD-2 individual skills) between boys and girls

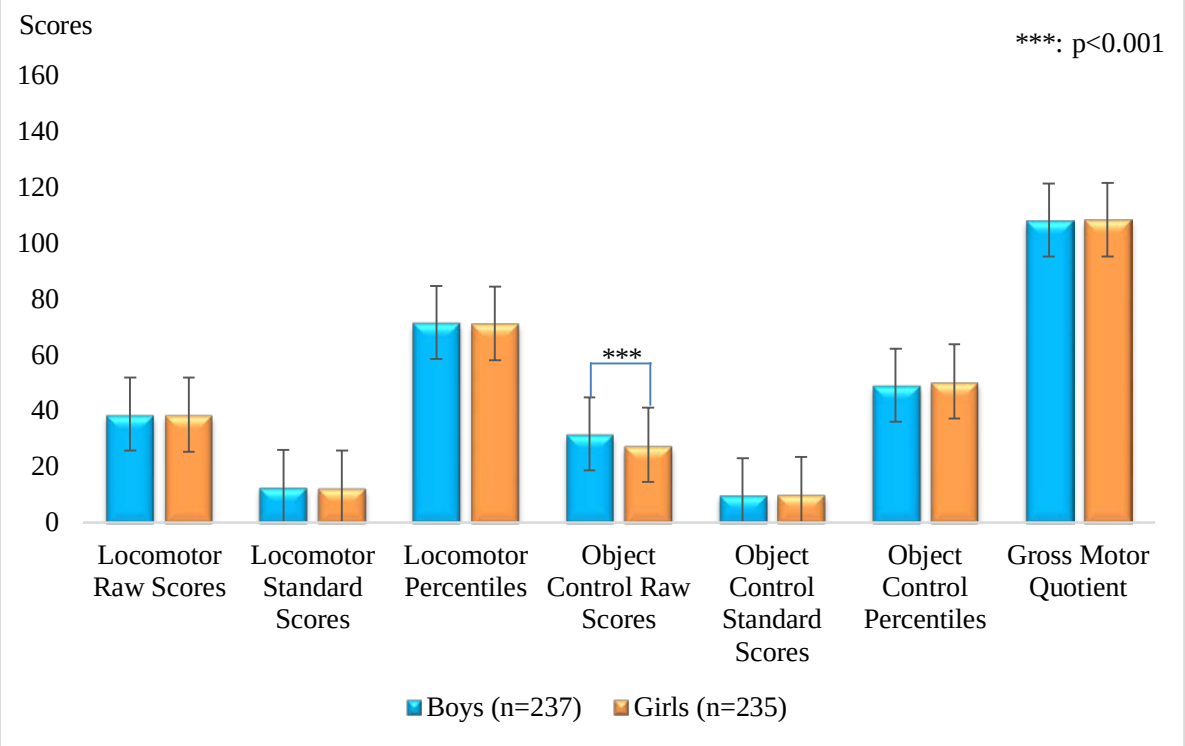

Figure 4-1 (b). Comparison of gross motor skills between boys and girls

The overall gross motor skill ranks by the seven levels of descriptive rating according to the GMQ for all the subjects are shown in Table 4-2 and Figure 4-2. The majority of subjects (46.2%, n=218) had the "average" level of gross motor skill rank. The minority (0.6%, n=3) had the "very poor" level of gross motor skill rank.

Table 4-2. Overall gross motor skill ranks

Overall gross motor skill ranks	Frequency	Percent	Cumulative Percent
Average	218	46.2%	46.2%
Above Average	95	20.1%	66.3%
Superior	83	17.6%	83.9%
Very Superior	32	6.8%	90.7%
Below Average	29	6.1%	96.8%
Poor	12	2.5%	99.4%
Very Poor	3	0.6%	100.0%
Total	472	100.0%	

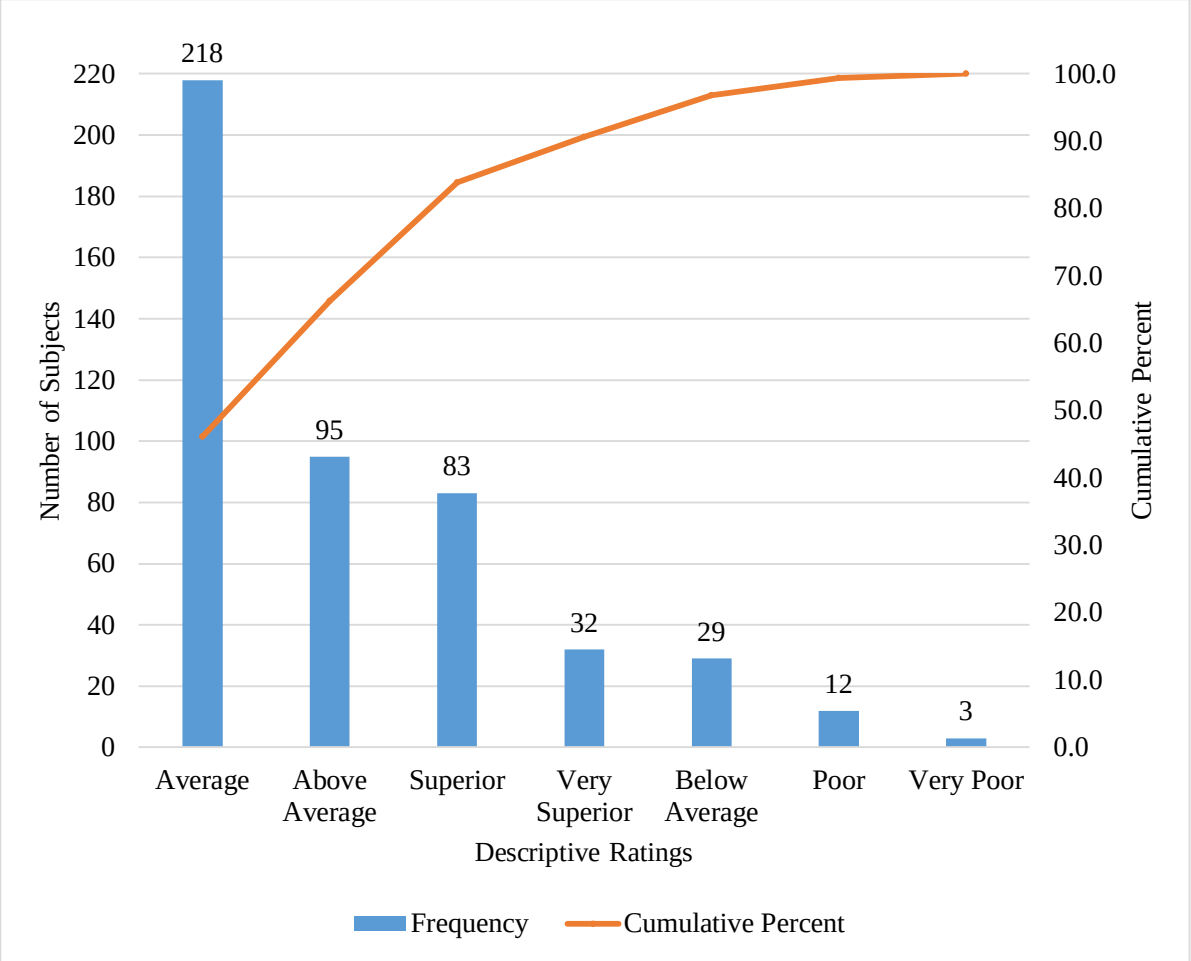

Figure 4-2. Overall gross motor skill ranks of the subjects in all three groups

Table 4-3 and Figure 4-3 (a) and (b) show the comparison of the subjects between urban and rural areas. The significant differences were found between the two groups.

Table 4-3. Comparison of subjects between urban and rural areas

Demographic characteristics and gross motor skills	Urban	Rural	Total		Partial Eta Squared	Observed Power
Number (%)	357 (75.6)	115 (24.4)	472 (100)			
Age (years)	5.36 ± 0.31	5.56 ± 0.39	5.41 ± 0.34	***	0.06	1.00
Height (cm)	107.2 ± 7.18	102.0 ± 5.57	105.9 ± 7.17	***	0.10	1.00
Weight (kg)	17.6 ± 3.10	16.3 ± 2.36	17.3 ± 2.99	***	0.03	0.98
BMI (kg/m^2)	15.3 ± 2.02	15.7 ± 1.56	15.4 ± 1.93		0.01	0.35
Run	6.59 ± 1.85	7.76 ± 0.84	6.87 ± 1.74	***	0.08	1.00
Gallop	6.70 ± 2.23	7.23 ± 1.75	6.83 ± 2.13	*	0.01	0.65
Hop	8.57 ± 2.46	9.18 ± 2.05	8.72 ± 2.38	*	0.01	0.68
Leap	3.62 ± 1.79	4.92 ± 1.00	3.94 ± 1.73	***	0.10	1.00
Horizontal Jump	5.01 ± 2.12	5.59 ± 2.08	5.14 ± 2.13	**	0.01	0.74
Slide	7.01 ± 1.77	7.49 ± 1.49	7.18 ± 1.72	*	0.01	0.63
LRS	37.6 ± 7.35	42.1 ± 6.25	38.7 ± 7.36	***	0.07	1.00
LSS	12.2 ± 3.46	14.6 ± 3.43	12.8 ± 3.61	***	0.09	1.00
Locomotor Percentiles	67.5 ± 28.4	84.1 ± 23.5	71.5 ± 28.2	***	0.06	1.00
Striking a stationary ball	7.29 ± 2.22	6.36 ± 2.19	7.06 ± 2.25	***	0.03	0.97
Stationary Dribble	2.33 ± 3.08	1.30 ± 2.56	2.08 ± 2.99	***	0.02	0.89
Catch	3.46 ± 1.75	3.56 ± 1.90	3.48 ± 1.79		0.00	0.09
Kick	7.09 ± 1.60	7.23 ± 1.56	7.13 ± 1.59		0.00	0.13
Overhand Throw	4.99 ± 2.47	5.86 ± 1.89	5.21 ± 2.37	***	0.02	0.93
Underhand Roll	4.99 ± 1.90	4.47 ± 1.31	4.86 ± 1.79	**	0.02	0.77
OCRS	30.1± 7.81	28.8 ± 7.12	29.8 ± 7.67		0.01	0.36
OCSS	10.3 ± 2.84	9.51 ± 2.61	10.1 ± 2.81	**	0.01	0.72
Object Control Percentiles	51.8 ± 28.2	43.6 ± 26.8	49.8 ± 28.0	**	0.02	0.79
Sum of Standard Scores	22.4 ± 5.29	24.1 ± 4.43	22.9 ± 5.14	**	0.02	0.88
Gross Motor Quotient	107.0 ± 16.6	112.4 ± 13.3	108.3 ± 16.0	**	0.02	0.89

Mean ± SD, Significant differences between urban and rural areas *: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

LRS: Locomotor Raw Scores, LSS: Locomotor Standard Scores, OCRS: Object Control Raw Scores, OCSS: Object Control Standard Scores

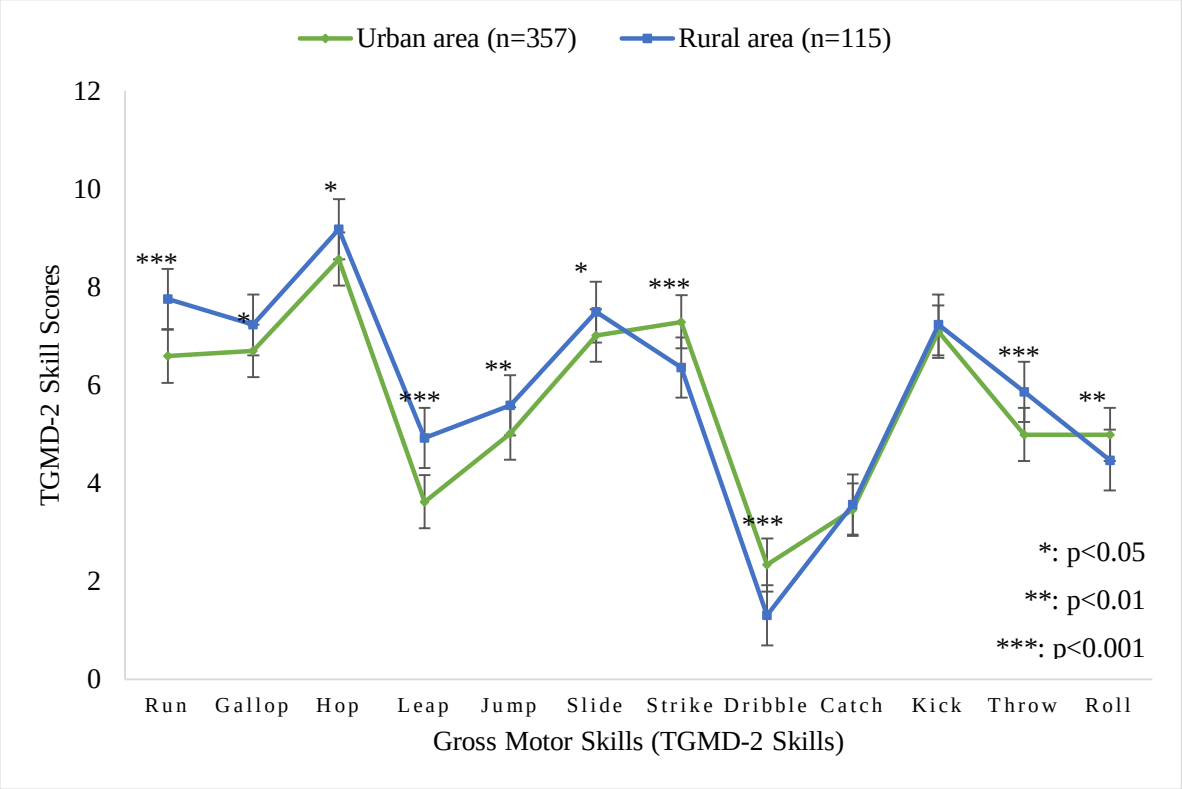

Figure 4-3. (a) Comparison of gross motor skills (TGMD-2 individual skills) between urban and rural areas

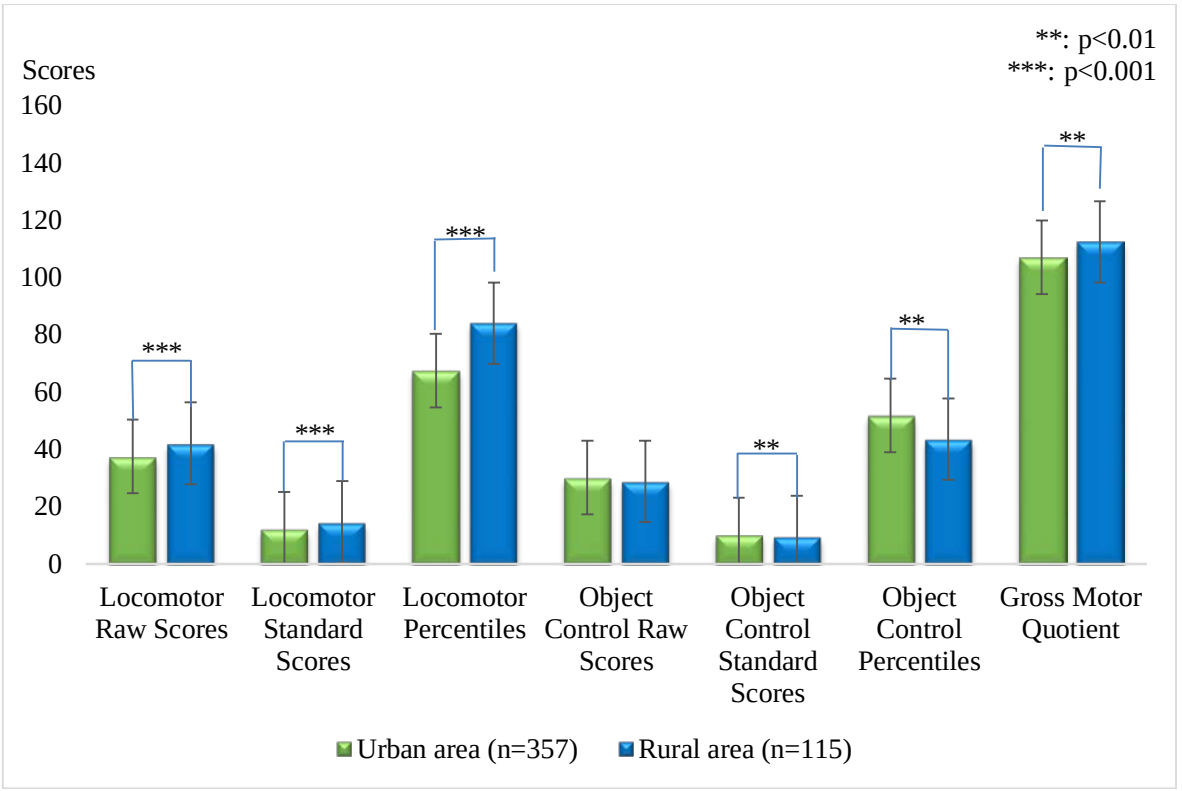

Figure 4-3. (b) Comparison of gross motor skills between urban and rural areas

4.4. Discussion

The findings of this study showed that the gross motor skill development of KG children in Myanmar had a different tendency across gender and geographical region. The majority of the subjects demonstrated average level of overall skill rank.

The mean standard score for the locomotor subtest was better than the US normative samples while the mean standard score for the object control subtest was matched with the US normative samples. The standard scores for both locomotor and object control subtests had a mean of 10 and standard deviation of 3 for the US normative samples [9]. This finding was in line with the study of Pang and Fong in which Hong Kong Chinese children performed better than the US normative samples [120].

The boys performed significantly better in run than girls, while the girls did in gallop than boys. There were no significant differences on all the rest of locomotor skills between the boys and girls. The findings of this study were similar to the previous studies[72, 73, 76, 123, 126]. Legear et al. also reported that the girls had superior locomotor proficiency in KG children in Canada[72]. Temple et al. had found that there were no significant differences on the locomotor skills between the boys and girls[73]. Goodway et al. reported that no significant differences were found between boys and girls for locomotor skills in the preschoolers from two geographical regions in the US[76]. It was found that boys and girls aged between six and nine in Taiwan had roughly equal locomotor skills in the study of Lin and Yang[123]. Bakhtiar also stated the similar findings for 6-year-old children in Indonesia[126].

The gender-based differences on locomotor skills of this study were differed from Hardy et al in which the girls of preschool children in Australia tended to have higher mastery of locomotor skills[64].

In this study, the boys performed significantly better in five out of six individual object control skills and total raw skill. The findings were concurred with the previous studies[60, 64, 72, 73, 76, 78, 116, 123, 126]. Bardid et al. reported that the boys had better performance on object control skills in Belgian children[60]. The findings of this study agreed with Hardy et al. in which the boys had higher total and individual object control skills except the catch[64]. The better object control skills among boys had also found in the study of Legear et al.[72]. Temple et al. had found that the boys had significant better object control[73]. There were significant differences on object control skills in the boys among preschoolers from the US in the study of Goodway et al.[76]. Butterfield et al. had found that the boys had better performance on the strike and the throw of the object control skills[78]. Cohen et al. had also found that the object control skills were higher in the boys[116]. Lin and Yang had also reported that the significant differences were found in object control skills except the catch and the kick between the two genders[123]. Bakhtiar had found that the boys were slightly higher in object control skills than the girls[126].

The number of subjects from urban and rural area were significantly different because of demography of the population in those two study areas. The population who live in urban area is the highest (70.1%) in

Yangon[154, 173]. In this study, 75.6% of the subjects were from urban area. This result was similar to the original TGMD-2 manual where 77% of the US normative samples were from urban area[9].

The significant differences on most of the gross motor skills except the catch, the kick and the raw object control scores were found between urban and rural areas. All locomotor skills of the subjects from rural area were significantly better than those from urban area. This differences may be due to plenty of open spaces for play around schools and home environments in rural area. Another possible reason may be due to the circumstance in rural area where most of children used to walk to schools because of lack of accessible transportation to schools.

Conversely, the subjects from urban area had better performances on most of object control skills. This may be due to the subjects from one private schools in this study where well facilitated indoor gymnasium and outdoor playground are situated.

The findings from this study have implications for Physical Therapists, physical education teachers, and other professionals who are working for early childhood care and development programs.

The strength of this study was that it was conducted with a large sample of KG children attending at the public and private schools in Myanmar. The sample could represent 5-year-old KG aged children of two different areas. The first limitation of this study was that the subjects were only from two regions out of total 15 regions (seven regions, seven states and one union territory) of Myanmar. The second limitation was that the schools were selected based on the different geographical regions and this study could not differentiate the two areas based on socioeconomic status (SES). The objective assessment of SES of the families of all the subjects should have been done for accurate differentiation between two study areas. The third limitation was that the subjects were not assessed their nutrition, culture, and ethnicity, although the majority of residents in the two study areas were Bamar (more than 80%) which was one out of the eight major national ethnic races of Myanmar. Further studies are still needed to examine KG children from all the 15 regions of Myanmar and whether the differences of the gross motor skill development depending on the families' SES and the nutrition, culture, and ethnicity of children.

4.5. Conclusion

In conclusion, the development of gross motor skills in KG children in Myanmar had gender-based and region-based differences on both the locomotor and the object control skills. The findings of this study gave a valuable information to the establishment of a normative reference of KG aged children for future studies.

CHAPTER 5

STUDY 3

RELATION BETWEEN GROSS MOTOR SKILL DEVELOPMENT AND BIOLOGICAL FACTORS AS WELL AS ENVIRONMENTAL FACTORS IN KINDERGARTEN CHILDREN FROM THREE TYPES OF SCHOOLS

5.1. Background and Purposes

5.1.1. Background

Effgen stated that the development of a child is fascinating and complex process involving the interaction between inborn genetic influences and vast environmental influences and experiences[6]. The most examined correlates in the previous related studies were biological and demographic factors in which the most commonly investigated were gender, age/grade and BMI or weight status[50].

Many previous studies in other countries investigated and reported the influence of biological and demographic factors, especially gender and weight status, and the environmental factors including home environment, school environment, and other family context[51-152]. Those previous studies used different assessment tools to assess different motor functions in children with different age groups. The most commonly used assessment tool was the TGMD-2 and the most investigated age group was KG aged children[51-152].

The majority of the previous studies reported that the gender influenced the development of gross motor skills[55, 60, 64, 72, 73, 76, 78, 116, 123]. Some studies stated that the girls had higher scores on the locomotor skills while the other studies did there was no gender difference on the locomotor skills[64, 72, 73, 76, 116, 123, 126]. A number of studies had found that the boys had better scores on the object control skills[60, 64, 72, 73, 76, 78, 116, 123].

Some studies reported that there were not significant correlations between motor competences including gross motor skills and the BMI or weight status[55, 67, 70, 71, 106, 112, 122, 125, 146]. The other studies informed that there was relation between the gross motor skills and the weight status, which meant, positive association or inverse association or negative correlation between the gross motor skills and the BMI or weight status[53, 54, 91, 92, 97, 98, 107, 109, 110, 117, 121, 124, 134, 152].

A systematic review on motor competence and health related physical fitness in youth by Cattuzzo et al. in 2016 reported that there is strong scientific evidence supporting an inverse association between motor competence and body weight status[174]. However, a recent systematic review on fundamental movement skills and weight status in children by Slotte et al., 2017 reported that the relation between the fundamental movement skills and weight status was still unclear for children from three to 12 years of age[175].

Chow and Louie, 2013 had found that the performance of locomotor skills by the children was affected by their schools' physical environment. They had found out presence or absence of outdoor play area might be a key factor affecting the motor performance of the children[52]. Giagazoglou et al., 2008 also reported that the school environment had influenced on the gross motor development the children[95]. Moreover, True et al., 2017 reported that the outdoor playground might promote motor competence on the children[103]. Tsapakidou et al., 2014 also stated that the significant differences of the gross motor skills were found based on the different types of schools[118].

The development of gross motor skills might be different based on the home environment and family context[6]. Duarte et al. also stated their findings of the relationship between motor development, socio-demographic and the child's home environment conditions in the children between 36 and 42 months of age[66]. Draper et al. had found that the different scores of gross motor skills based on different settings of school environments in South African children[74]. Lee at el. reported to consider differences in individual and environmental factors influencing on the development of children[100]. Hua et al., 2016 studied effects of home and education environments on children's motor performance in China and they reported that both home and educational environments had significant influences on poor motor performance[104]. The study on influence of affordances in the home environment on motor development of young children in Japan by Mori et al. reported that the physical and social-psychological environments of the home influenced children's motor development[115]. Gadžić et al., 2015 reported that residential status and father's education had a significant influence on the motor and cognitive abilities[151]. In the review study of Golding et al. indicated that the findings of the existing studies focusing on relationship between childhood motor skills and different socio-demographic factors including education and occupation status of parents[176].

The Union level population density of Myanmar in March 2014 was 76 persons per square kilometer[154]. The population density of Yangon Region was 716 persons per squared kilometer, that is about nine times higher than the Union level, and Bago Region was 123.5 persons per squared kilometer[154, 173, 177]. At the Union level of Myanmar, 70 percent (%) of the total population live in rural areas while 30% live in urban areas[154].

The proportion of urban population in Yangon Region is the highest, which is 70.1%, at the Union level[173]. There are four main districts in Yangon region named as East, West, North and South Yangon (Figure 5-1), and 98.9% in the East Yangon, 100.0% in the West Yangon, 54.8% in the North Yangon, and 29.8% in the South Yangon are urban populations[173]. In the West Yangon, 56.6% of the people live in apartments. There are 13 townships in the West Yangon and 75.1% of the people in Kamayut Township, which has been chosen as the study area of this study, live in apartments[173].

There are also four main districts in Bago region named as Bago, Toungoo, Pyay, and Thayawady (Figure 5-2), and 26.2% in the Bago, 20.6% in the Toungoo, 24.8% in the Pyay, and 14.2% in the Thayawady are urban populations[177]. Thegon Township, which has also been chosen as the study area of this study, is one of the six townships in the Pyay district and 88.0% is rural population in it[177]. The people in Thegon Township usually live in large brick or wooden houses or others, and only 0.02% live in apartments[177].

In the study area of Yangon region, some public schools have no playground nor open spaces for free play for their children. Some other public schools have indoor and/or outdoor limited spaces for free play. Very few public high schools in the study area of Yangon have outdoor playground or outdoor open spaces for free play. The private schools in Yangon region have both indoor and outdoor playgrounds for free play. Some private high schools have large indoor gymnasia. In contrast to the public schools in urban area, those are located in large compounds and usually surrounded by rich lands. There are plenty of outdoor open

spaces in all the public schools in the study area of Bago region. The sufficient space and furnishings in KG was a protective factor for poor motor performance Hua et al., 2016[104)].

5.1.2. Purposes

The purposes of this study (Study 3) were to assess the socio-demographic factors of all participants, to compare the gross motor skill development of KG children among three types of school settings, and to examine if there would be relationships between gross motor skill development and biological as well as environmental factors in Myanmar KG children.

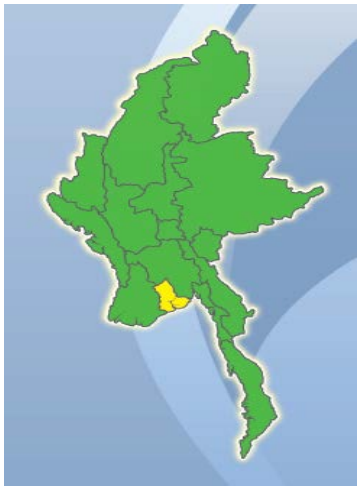

Figure (5-1) Map of Yangon Region[173)]

Figure (5-2) Map of Bago Region[177)]

5.2. Subjects and Methods

5.2.1. Subjects

The subjects from the previous study in the chapter 4 were recruited. The exclusion criteria were the same as the previous two studies. The subjects who involved in the reliability study, who were older than 6-year-old and whose parents did not give written answers for socio-demographic factors were also excluded. Finally, 312 subjects were recruited in three groups. Group 1 consists of 131 (65 boys and 66 girls) subjects from three public schools in Yangon City (urban) area which represents that the schools and/or home environments have limited spaces for playing gross motor activities (Figure 5-3). The characteristics of the subjects in the Group 1 were age: 5.33 ± 0.31 years, height: 105.9 ± 6.88 cm, weight: 16.9 ± 2.55 kg, BMI: 15.0 ± 1.93 kg/m^2. Group 2 consists of 102 (58 boys and 44 girls) subjects from four public schools in rural area which represents that the schools and home environments have enough spaces but not well facilitated places for playing gross motor activities (Figure 5-4). The characteristics of the subjects in the Group 2 were age: 5.46 ± 0.27 years, height: 101.8 ± 5.12 cm, weight: 16.2 ± 2.37 kg, BMI: 15.6 ± 1.55 kg/m^2. Groups 3 consists of 79 (45 boys and 34 girls) subjects from one private school in Yangon City area which represents that the school has enough spaces such as well facilitated playground and gymnasium although home environments might have limited spaces for playing gross motor activities (Figure 5-5). The characteristics of the subjects in the Group 3 were age: 5.39 ± 0.32 years, height: 110.3 ± 6.97 cm, weight: 19.5 ± 4.19 kg, BMI: 16.0 ± 2.64 kg/m^2.

There was minimum duration of 30 minutes a day for free play time for every child in all three groups. However, the private school in the Group 3 has structured physical education class including different ball skills for 45 minutes once a week.

5.2.2. Materials

A simple questionnaire including questions regarding biological factors and environmental factors was used (Appendix 2).

5.2.3. Procedures

The above questionnaire was distributed to the parents or guardians of all subjects. The parents or guardians filled out the questionnaire and returned back to the researcher.

The height and weight of all the subjects were measured before assessing gross motor skills and BMI was calculated in the BMI percentile calculator for child and teen metric version online from the Centers for Disease Control and Prevention (CDC)[178] (Appendix 3). The gender and the BMI or the weight status categories according to the CDC[177] were considered as the biological factors. The environmental factors were type of schools (Figure 5-3 to 5-5), type of houses, types of playgrounds, occupational and educational status of parents. The type of houses was classified into four categories (Figure 5-10 (a) to (f)), the type of

playgrounds was also classified into four categories, the occupation and education levels were classified into two categories (Appendix 2). The questionnaire included a question for monthly income but nobody answered that question and it could not be analyzed. Location of playgrounds at the schools which was classified into three categories was also calculated as one of the environmental factors.

The descriptive statistics and one-way ANOVA (Scheffe Post Hoc test) was used to compare means among the three groups. Multiple linear regression analysis and multivariate multiple regression analysis was used to determine the relationship between the gross motor skill development and biological factors as well as environmental factors. Effect size (Partial Eta Squared) and Observed Power (Statistical Power) were also calculated. The significant level was set as $p<0.05$. The software used for data analysis was IBM SPSS statistic version 22.0 for Windows.

Figure 5-3. Environment of the public schools in Group 1 (Yangon Public Schools)

Figure 5-4. Environment of the public schools in Group 2 (Rural Public Schools)

Figure 5-5. Environment of the private school Group 3 (Yangon Private School)

Figure 5-6. Test venue in the assembly hall of one public school in urban area

Figure 5-7. Test venue in the indoor gymnasium of the private school

Figure 5-8 (a). Test venue in the assembly hall of one public school in rural area

Figure 5-8 (b). Test venue in the outdoor playground of one public school in rural area

Figure 5-9 (a). TGMD- assessment

Figure 5-9 (b). TGMD- assessment

Figure 5-9 (c). TGMD- assessment

Figure 5-9 (d). TGMD- assessment

Figure 5-9 (e). TGMD- assessment

Figure 5-9 (f). TGMD- assessment

Figure 5-10 (a)-(f) show the examples of different types of houses from the study areas in the current study.

Figure 5-10. Big house in large compound (a)(Urban) (b) (Rural)

Figure 5-10 (c). Condominium Figure 5-10 (d) Flat

Figure 5-10 (e). Other Figure 5-10 (f). Other

5.3. Results

5.3.1. Comparison of Gross Motor Skills in all subjects (boys and girls) among three groups

Table 5-1 and Figure 5-11 to 5-19 show the one-way ANOVA results of all the subjects in all three groups. The significant differences were found on the demographic characteristics, almost all the gross motor skills among the groups.

Table 5-1. Comparison of gross motor skills in all subjects (boys and girls) among three groups

Demographic characteristics and gross motor skills	Group 1 Yangon Public	Group 2 Rural Public	Group3 Yangon Private		Partial Eta Squared	Observed Power
Number (%)	131 (42.0)	102 (32.7)	79 (25.3)			
Age (years)	5.33 ± 0.31	5.46 ± 0.27	5.39 ± 0.32			
Height (cm)	105.9 ± 6.88	101.8 ± 5.12	110.3 ± 6.97	***	0.21	1.00
Weight (kg)	16.9 ± 2.55	16.2 ± 2.37	19.5 ± 4.19	***	0.15	1.00
BMI (kg/m^2)	15.0 ± 1.93	15.6 ± 1.55	16. 0 ± 2.64	**	0.03	0.90
Run	6.53 ± 1.89	7.80 ± 0.72	6.84 ± 1.71	***	0.11	1.00
Gallop	6.53 ± 2.37	7.25 ± 1.69	6.58 ± 2.56	*	0.02	0.65
Hop	8.59 ± 2.49	9.16 ± 2.04	8.79 ±2.51		0.01	0.35
Leap	3.19 ± 1.69	4.90 ± 1.00	3.54 ± 1.63	***	0.21	1.00
Horizontal Jump	4.63 ± 2.10	5.69 ± 2.09	4.82 ± 2.17	***	0.05	0.95
Slide	7.11 ± 1.88	7.45 ± 1.57	6.99 ± 1.89		0.01	0.36
LRS	36.6 ± 7.68	42.3 ± 6.25	37.6 ± 7.06	***	0.11	1.00
LSS	11.7 ± 3.39	14.7 ± 3.43	12.2 ± 3.63	***	0.13	1.00
Locomotor Percentiles	64.8 ± 28.7	84.7 ± 22.8	64.8 ± 28.9	***	0.11	1.00
Striking a stationary ball	6.68 ± 2.24	6.25 ± 2.25	7.39 ± 2.15	**	0.04	0.87
Stationary Dribble	1.15 ± 2.34	1.24 ± 2.58	4.44 ± 3.54	***	0.21	1.00
Catch	3.34 ± 1.81	3.45 ± 1.89	3.16 ± 1.74		0.00	0.14
Kick	7.24 ± 1.48	7.18 ± 1.60	6.46 ± 2.12	**	0.04	0.87
Overhand Throw	4.47 ± 2.43	5.84 ± 1.90	5.08 ± 2.23	***	0.07	0.99
Underhand Roll	4.63 ± 1.80	4.45 ± 1.29	4.56 ± 1.78		0.00	0.10
OCRS	27.5 ± 6.88	28.4 ± 7.29	31.0 ± 8.71	**	0.03	0.84
OCSS	9.29 ± 2.32	9.45 ± 2.69	10.5 ± 3.22	**	0.03	0.82
Object Control Percentiles	42.4 ± 24.5	42.9 ± 27.5	52.2 ± 30.7	*	0.02	0.68
Sum of Standard Scores	21.0 ± 4.67	24.2 ± 4.45	22.7 ± 5.57	***	0.07	1.00
Gross Motor Quotient	103.0 ± 13.9	112.5 ± 13.4	108.0 ± 16.7	***	0.07	1.00

Mean ± SD,

Significant differences among the groups *: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

LRS: Locomotor Raw Scores, LSS: Locomotor Standard Scores, OCRS: Object Control Raw Scores, OCSS: Object Control Standard Scores

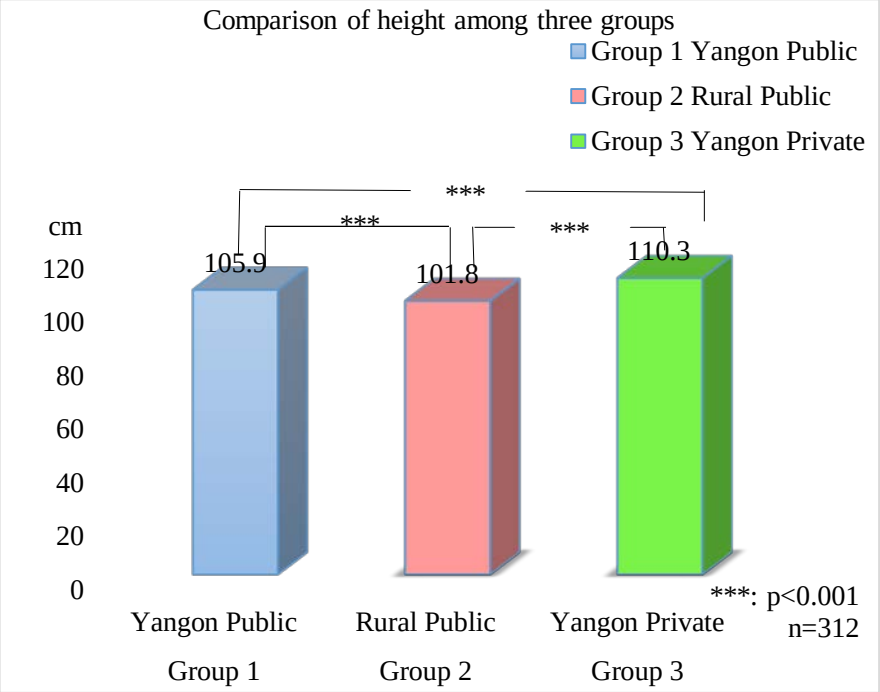

Figure 5-11. Comparison of height in all subjects (boys and girls) among three groups

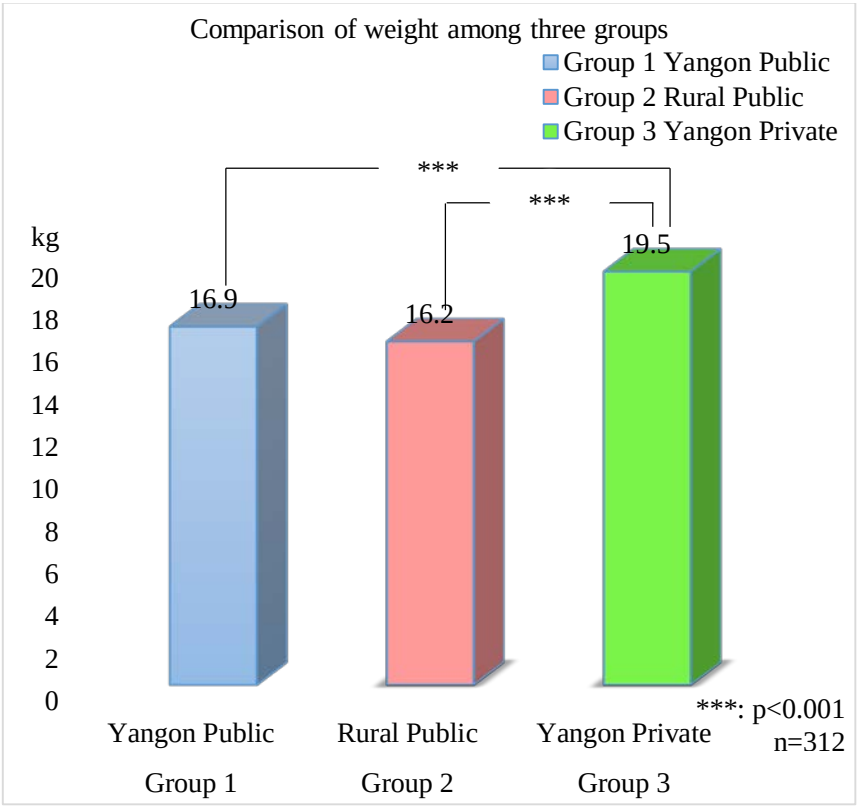

Figure 5-12. Comparison of weight in all subjects (boys and girls) among three groups

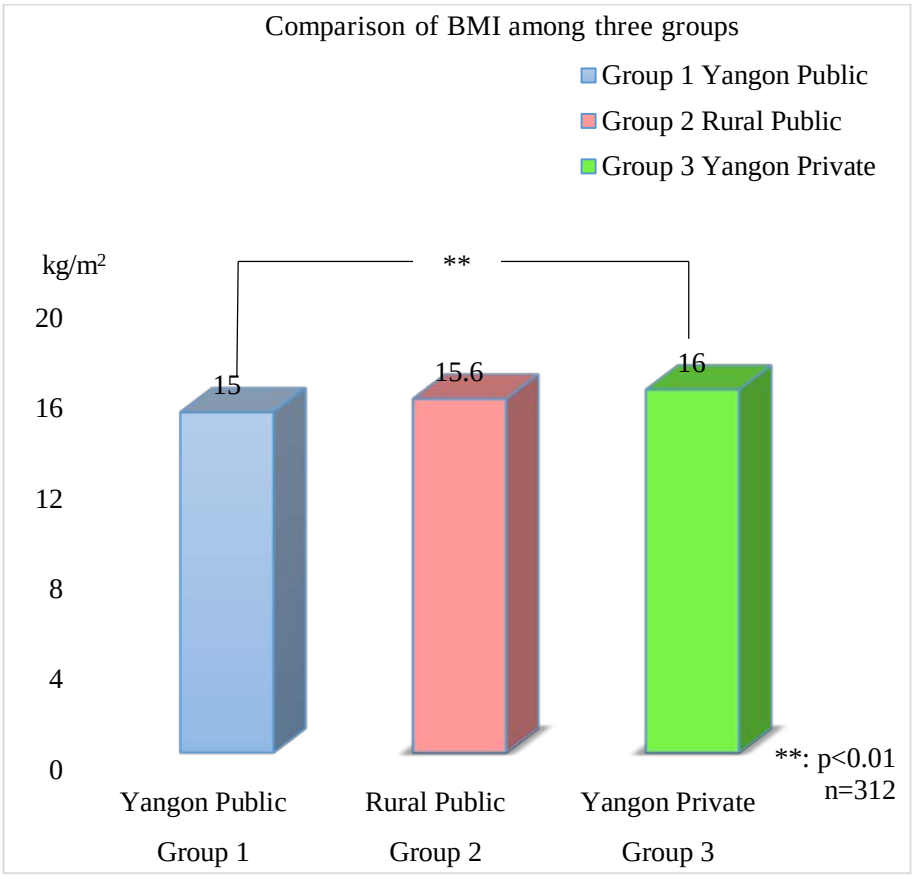

Figure 5-13. Comparison of BMI in all subjects (boys and girls) among three groups

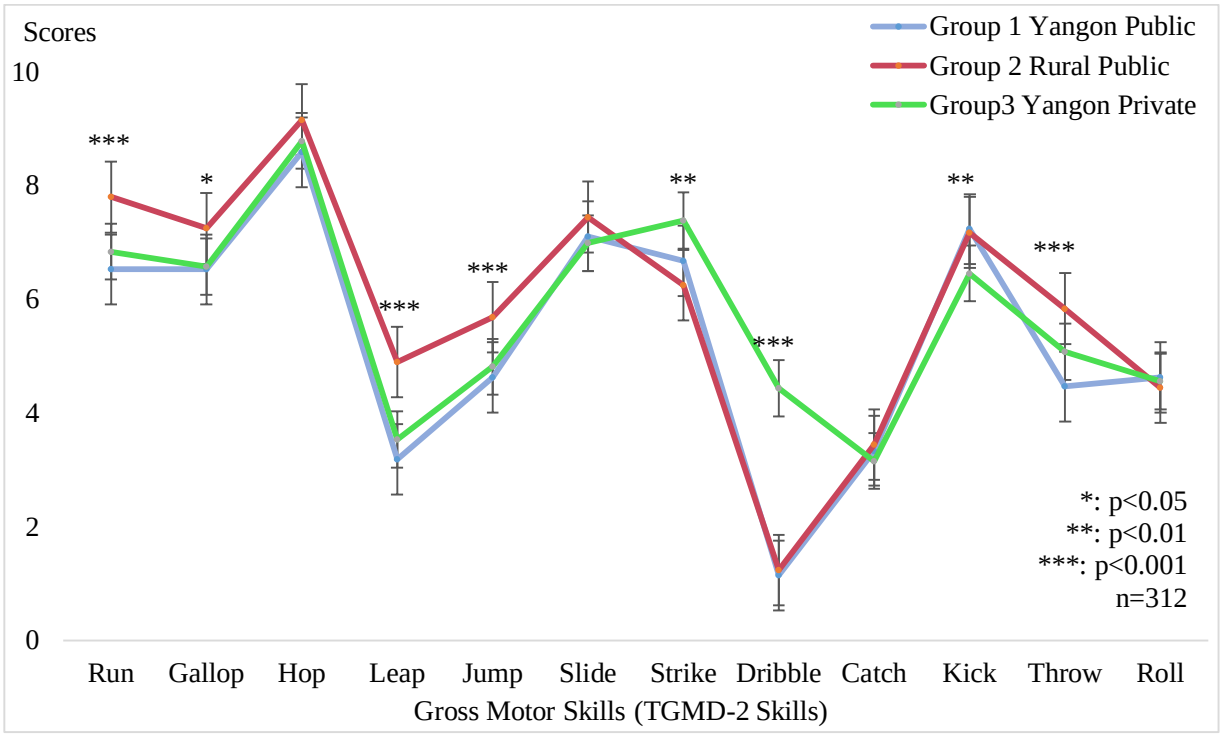

Figure 5-14. Comparison of gross motor skills in all subjects (boys and girls) among three groups

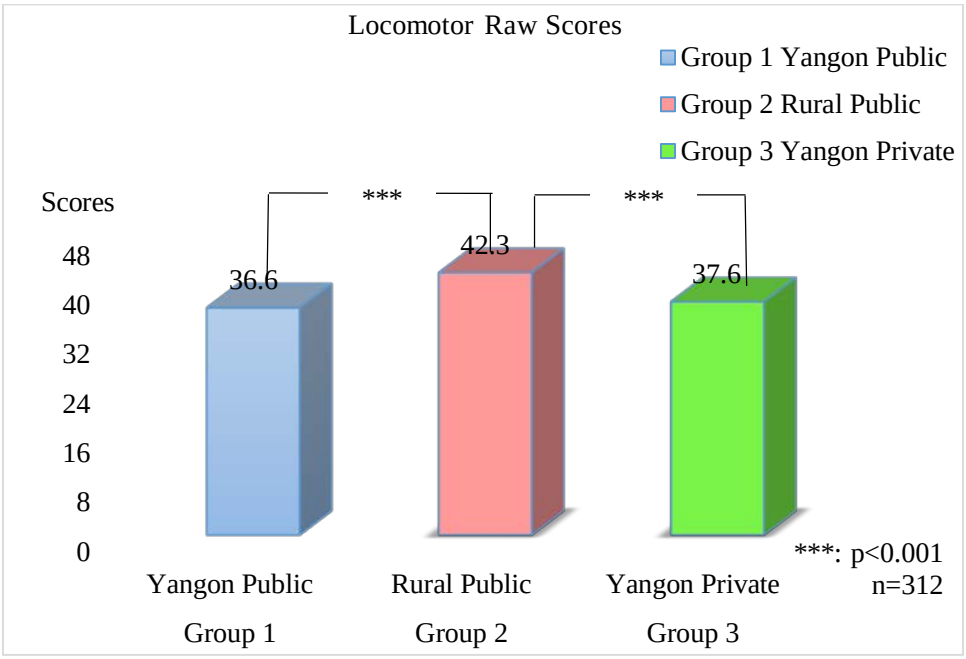

Figure 5-15. Comparison of Locomotor Raw Scores in all subjects (boys and girls) among three groups

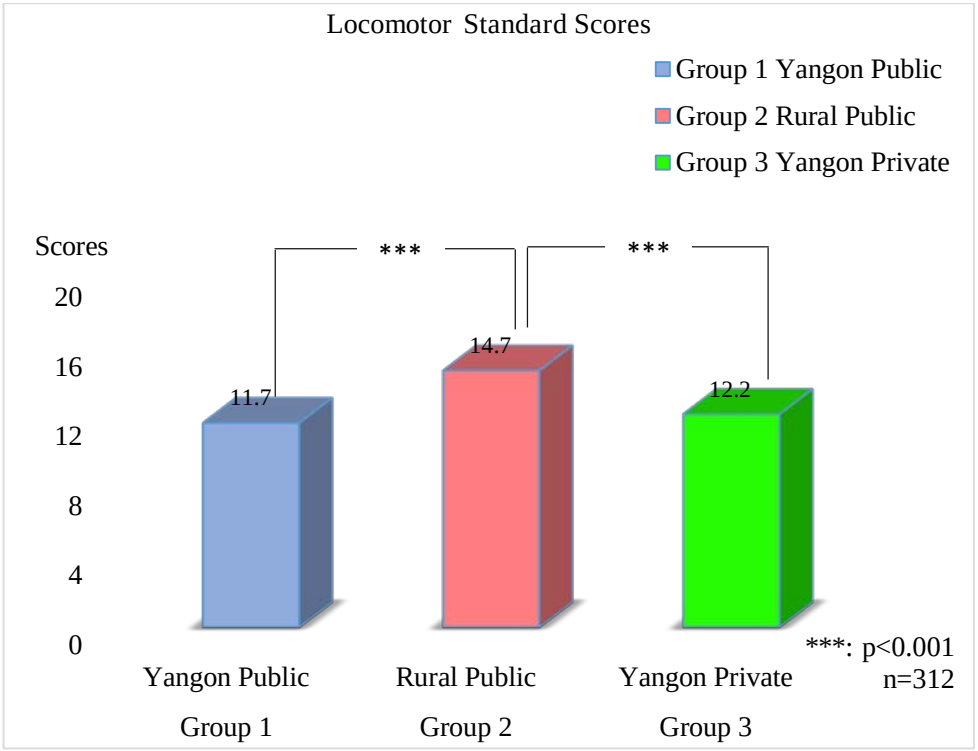

Figure 5-16. Comparison of Locomotor Standard Scores in all subjects (boys and girls) among three groups

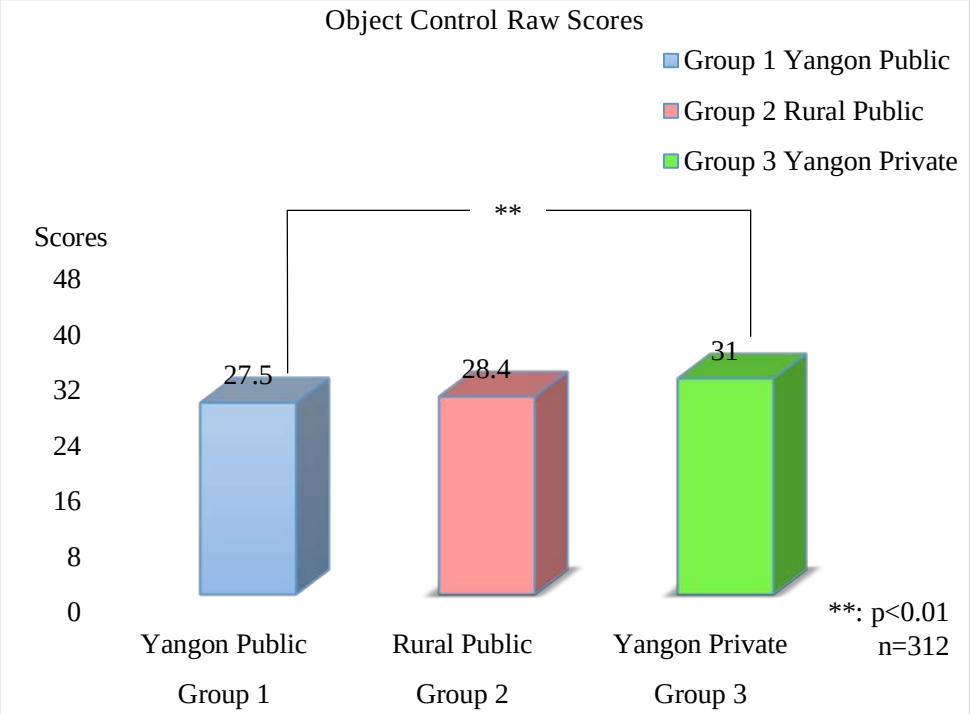

Figure 5-17. Comparison of Object Control Raw Scores in all subjects (boys and girls) among three groups

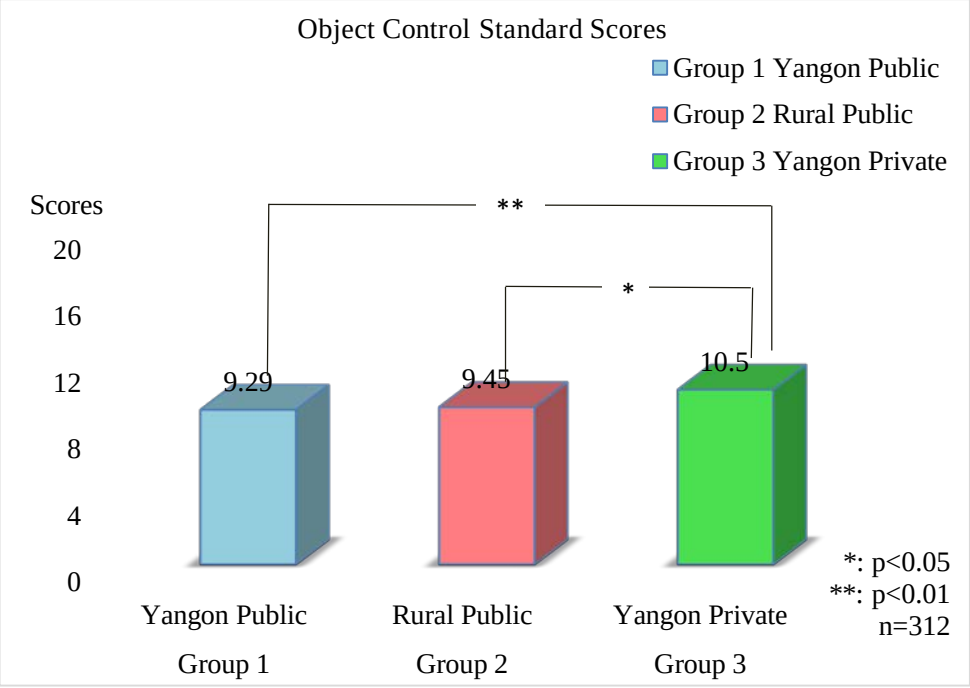

Figure 5-18. Comparison of Object Control Standard Scores in all subjects (boys and girls) among three groups

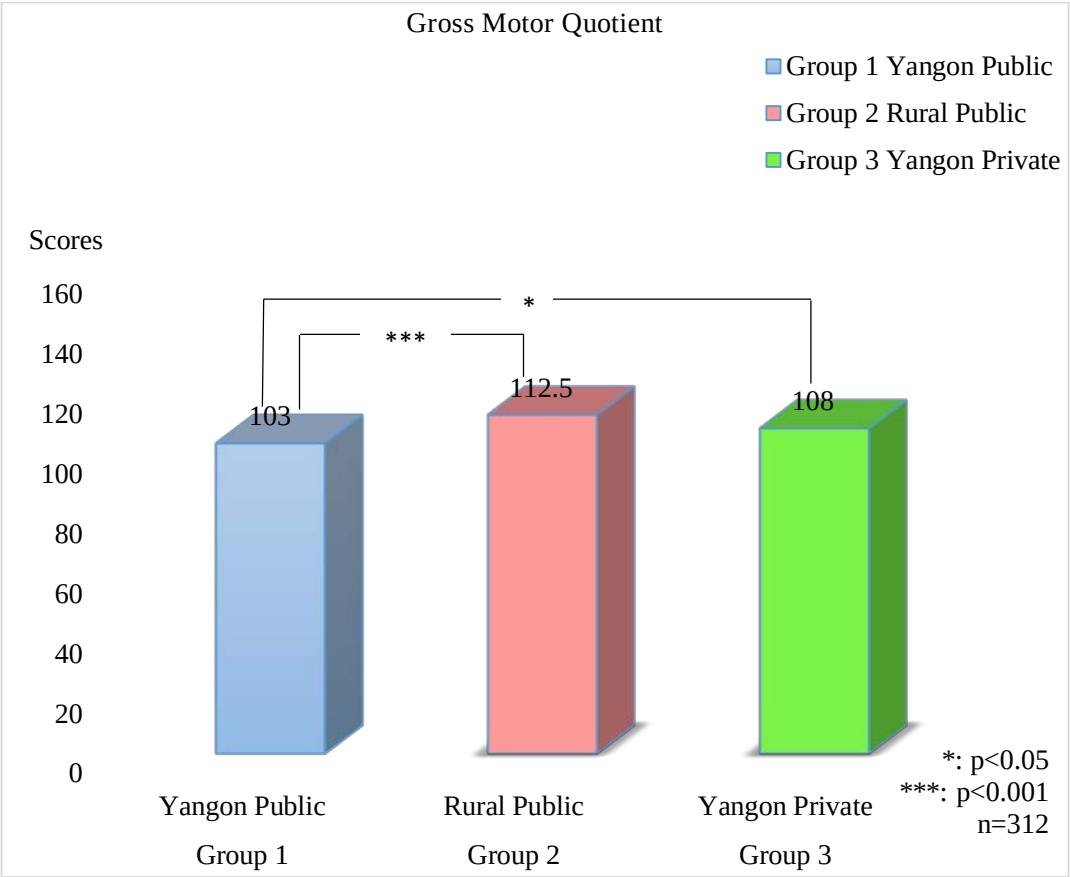

Figure 5-19. Comparison of Gross Motor Quotient in all subjects (boys and girls) among three groups

Table 5-2 and Figure 5-20 show the overall gross motor skill ranks in descriptive rating of all the subjects in all three groups.

Table 5-2. Comparison of overall gross motor skill ranks among three groups (boys and girls)

Overall Skill Ranks	Group 1 Yangon Public Percent	Group 2 Rural Public Percent	Group 3 Yangon Private Percent
Average	62.6	41.2	46.8
Above Average	15.3	24.5	10.1
Superior	8.4	23.5	19.0
Below Average	5.3	2.0	15.2
Poor	3.8	2.0	0.0
Very Superior	3.1	6.9	8.9
Very Poor	1.5	0.0	0.0
Total	100.0	100.0	100.0

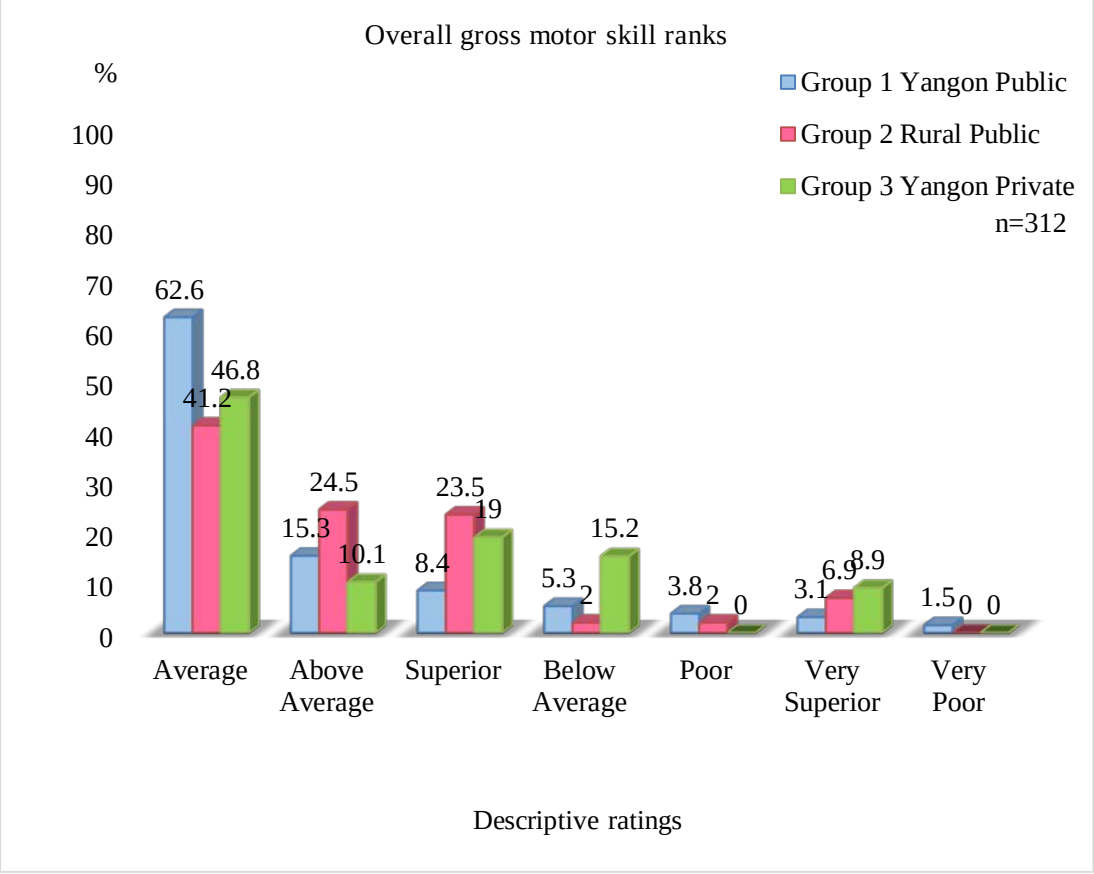

Figure 5-20. Comparison of Overall gross motor skill ranks among three groups (boys and girls)

Table 5-3 and Figure 5-21 show the results of the overall gross motor skill ranks in the Group 1 (Yangon Public Schools). The majority of the subjects had the “average” level and the minority had the “very poor” level in the Group 1.

Table 5-3. Overall gross motor skill ranks in the Group 1

Overall Skill Ranks	Frequency	Percent	Cumulative Percent
Average	82	62.6	62.6
Above Average	20	15.3	77.9
Superior	11	8.4	86.3
Below Average	7	5.3	91.6
Poor	5	3.8	95.4
Very Superior	4	3.1	98.5
Very Poor	2	1.5	100.0
Total	131	100.0	

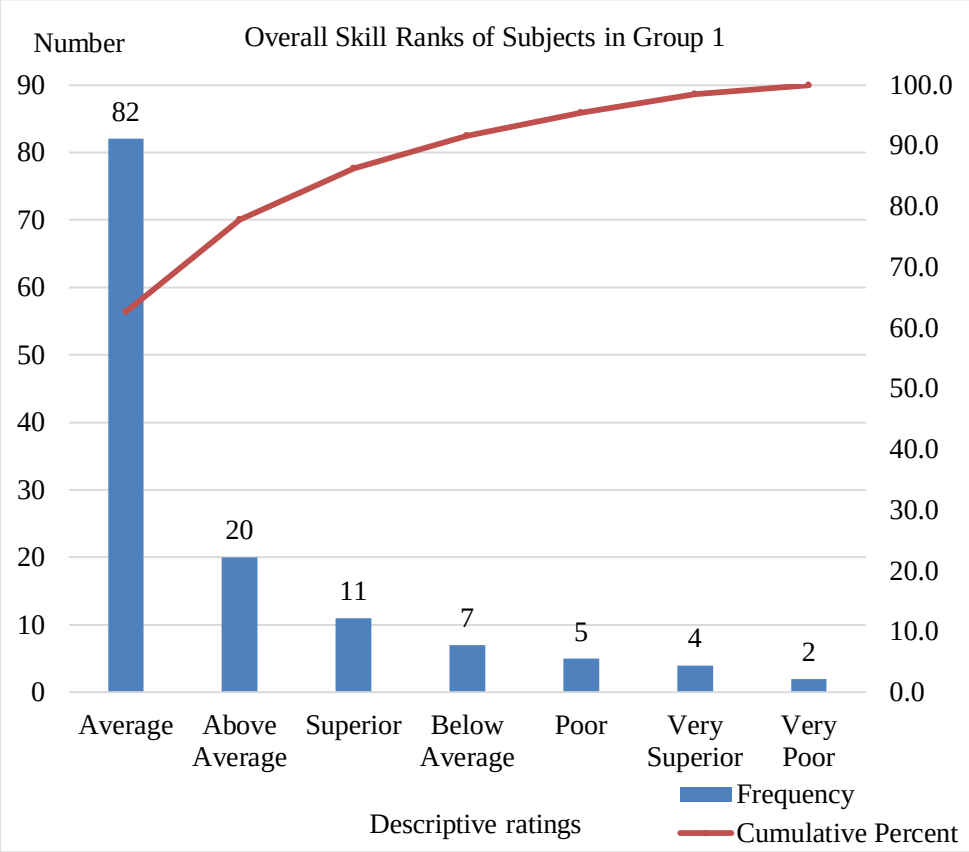

Figure 5-21. Overall gross motor skill ranks in the Group 1

Table 5-4 and Figure 5-22 show the results of the overall gross motor skill ranks in the Group 2 (Rural Public Schools). The majority of the subjects in the Group 2 also had the “average” level and the minority had the “poor” level. There was no subject with the “very poor” level.

Table 5-4. Overall gross motor skill ranks in the Group 2

Overall Skill Ranks	Frequency	Percent	Cumulative Percent
Average	42	41.2	41.2
Above Average	25	24.5	65.7
Superior	24	23.5	89.2
Very Superior	9	6.9	96.1
Below Average	2	2.0	98.0
Poor	2	2.0	100.0
Total	102	100.0	

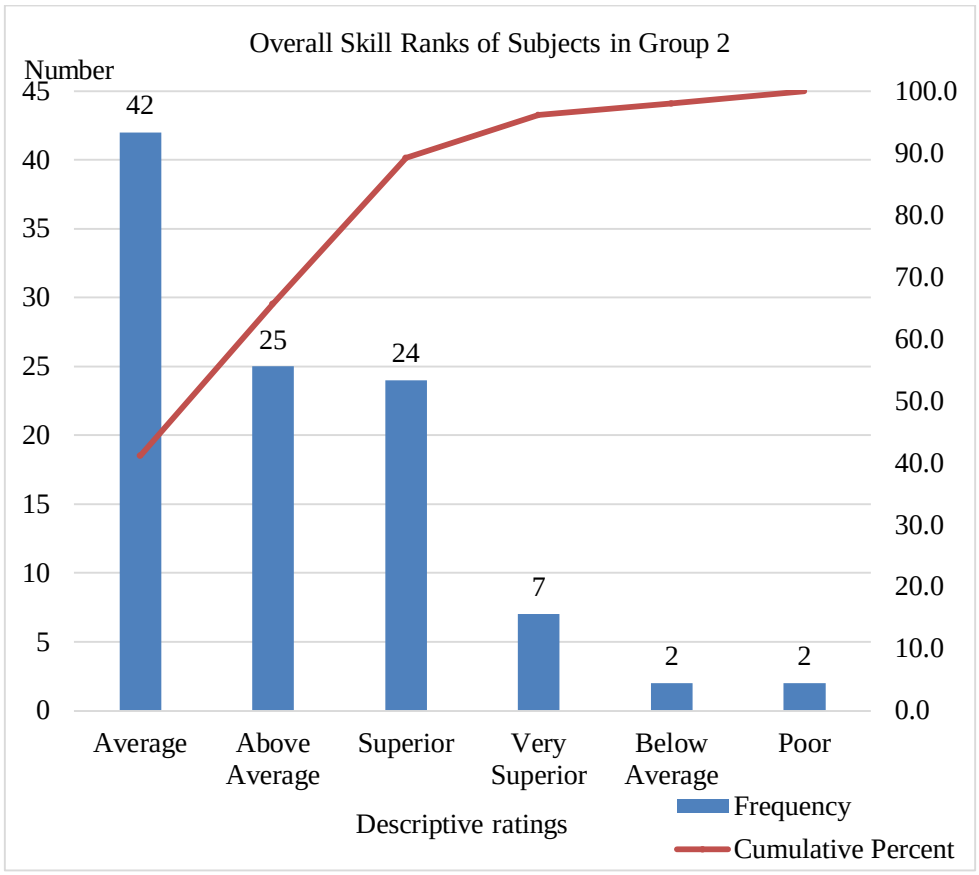

Figure 5-22. Overall gross motor skill ranks in the Group 2

Table 5-5 and Figure 5-23 show the results of the overall gross motor skill ranks in the Group 3 (Yangon Private School). The majority of the subjects in the Group 3 also had the “average” level and the minority had the “poor” level. There was no subject with the “poor” nor “very poor” level.

Table 5-5. Overall gross motor skill ranks in the Group 3

Overall Skill Ranks	Frequency	Percent	Cumulative Percent
Average	37	46.8	46.8
Superior	15	19.0	65.8
Below Average	12	15.2	81.0
Above Average	8	10.1	91.1
Very Superior	7	8.9	100.0
Total	79	100.0	

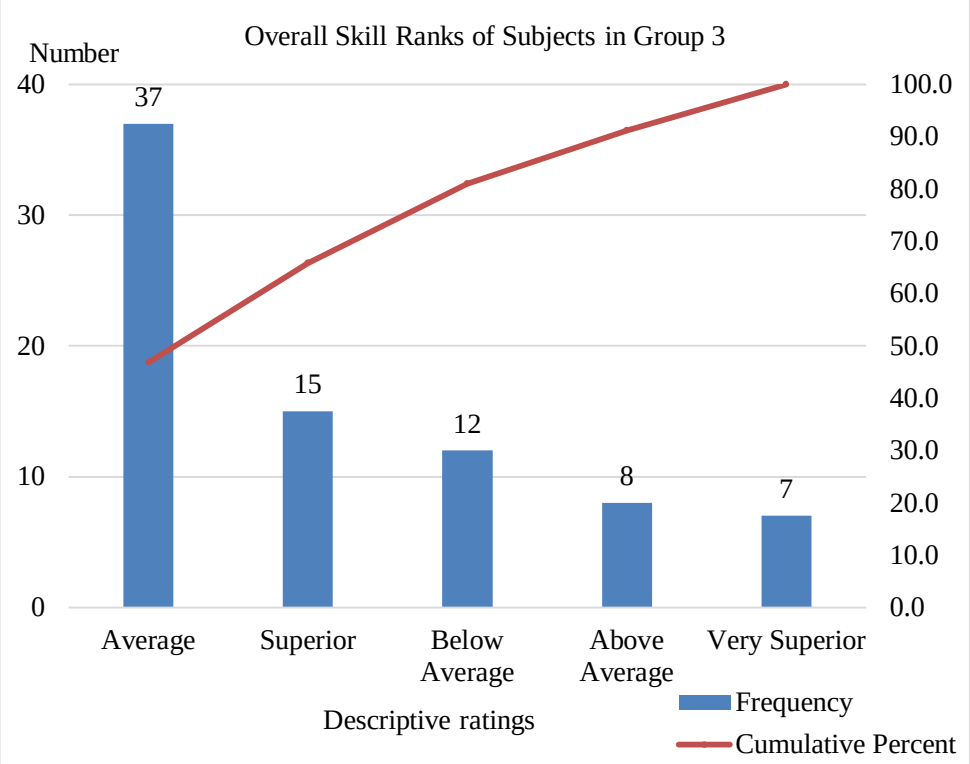

Figure 5-23. Overall gross motor skill ranks in the Group 3

Table 5-6 and Figure 5-24 (a) and (b) show the results of the comparison of the gross motor skills between the boys and the girls in the Group 1(Yangon Public Schools).

Table 5-6. Comparison of gross motor skills between boys and girls in Group 1 (Yangon Public Schools)

Demographic characteristics and gross motor skills	Boys	Girls		Partial Eta Squared	Observed Power
Number (%)	65 (49.6)	66 (50.4)			
Age (years)	5.31 ± 0.29	5.36 ± 0.32			
Height (cm)	105.6 ± 6.27	106.4 ± 7.45		0.00	0.10
Weight (kg)	16.9 ± 2.36	16.9 ± 2.74		0.00	0.05
BMI (kg/m^2)	15.2 ± 1.83	14.9 ± 2.04		0.00	0.11
Run	6.71 ± 1.81	6.36 ± 1.98		0.01	0.18
Gallop	6.23 ± 2.42	6.82 ± 2.29		0.02	0.29
Hop	8.39 ± 2.59	8.80 ± 2.37		0.01	0.16
Leap	3.25 ± 1.81	3.15 ± 1.57		0.00	0.06
Horizontal Jump	4.49 ± 2.29	4.76 ± 1.91		0.00	0.11
Slide	7.02 ± 2.24	7.21 ± 1.46		0.00	0.09
Locomotor Raw Scores	36.1 ± 8.45	37.1 ± 6.87		0.00	0.12
Locomotor Standard Scores	11.8 ± 3.72	11.7 ± 3.07		0.00	0.05
Locomotor Percentiles	63.7 ± 30.4	65.9 ± 27.1		0.00	0.07
Striking a stationary ball	7.42 ± 1.99	5.96 ± 2.25	***	0.11	0.97
Stationary Dribble	1.45 ± 2.61	0.85 ± 2.02		0.02	0.31
Catch	3.57 ± 1.85	3.11 ± 1.76		0.02	0.31
Kick	7.79 ± 0.80	6.71 ± 1.79	***	0.13	0.99
Overhand Throw	5.11 ± 2.42	3.85 ± 2.28	**	0.07	0.86
Underhand Roll	5.08 ± 2.03	4.18 ± 1.42	**	0.06	0.83
Object Control Raw Scores	30.4 ± 6.68	24.7 ±5.84	***	0.18	1.00
Object Control Standard Scores	9.65 ± 2.27	8.96 ± 2.34		0.02	0.40
Object Control Percentiles	46.0 ± 24.1	38.8 ± 24.6		0.02	0.39
Sum of Standard Scores	21.4 ± 5.05	20.6 ± 4.26		0.01	0.15
Gross Motor Quotient	104.2 ± 15.2	101.9 ± 12.8		0.01	0.15

Mean ± SD

Significant differences among the groups **: $p<0.01$, ***: $p<0.001$

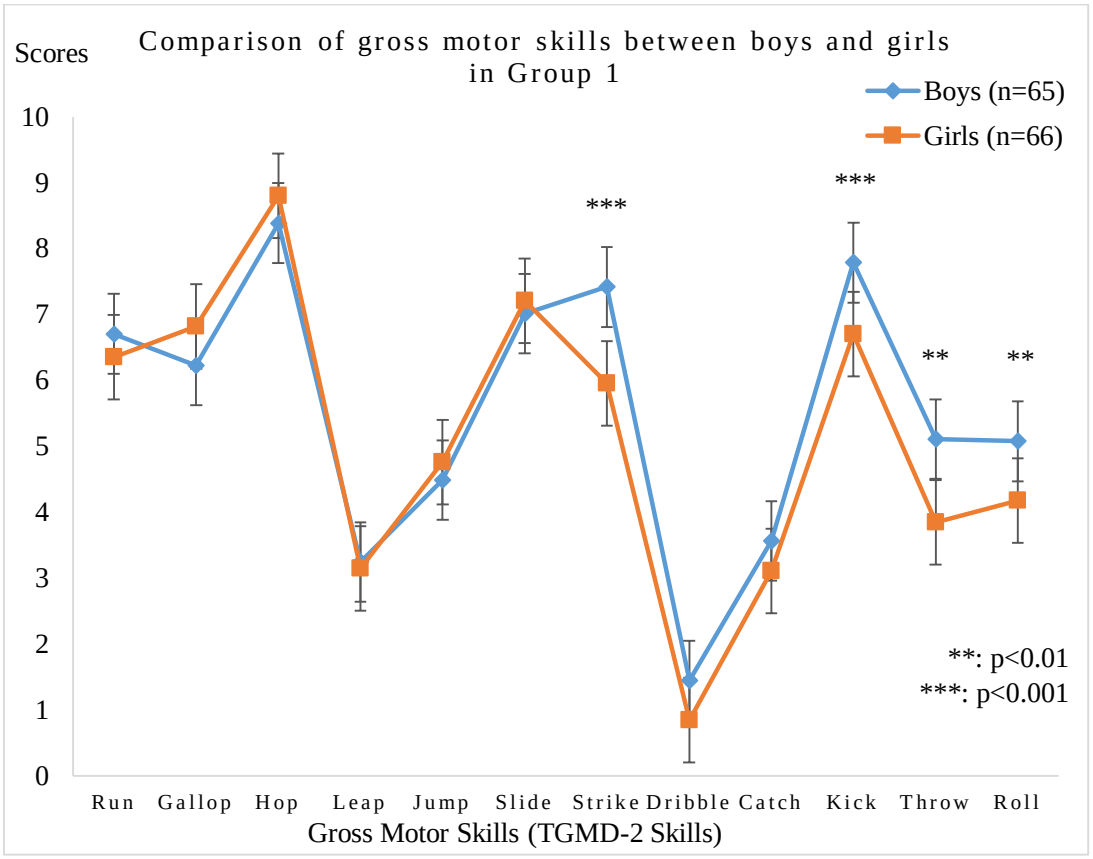

Figure 5-24 (a). Comparison of gross motor skills (individual skills) between boys and girls in Group 1 (Yangon Public Schools)

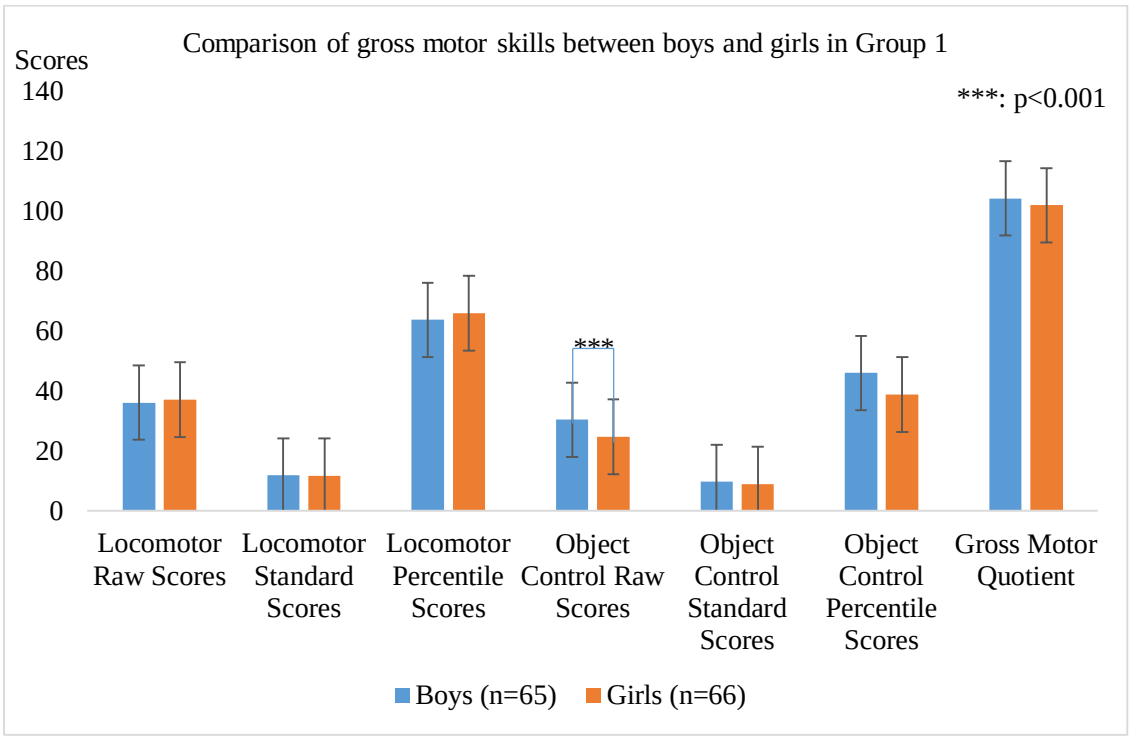

Figure 5-24 (b). Comparison of gross motor skills between boys and girls in Group 1 (Yangon Public Schools)

Table 5-7 and Figure 5-25 (a) and (b) show the results of the comparison of the gross motor skills between the boys and the girls in the Group 2 (Rural Public Schools).

Table 5-7. Comparison of gross motor skills between boys and girls in Group 2 (Rural Public Schools)

Demographic characteristics and gross motor skills	Boys	Girls		Partial Eta Squared	Observed Power
Number (%)	58 (56.9)	44 (43.1)			
Age (years)	5.45 ± 0.26	5.47 ± 0.29			
Height (cm)	101.7 ± 5.01	101.8 ± 5.33		0.00	0.05
Weight (kg)	16.4 ± 2.55	15.9 ± 2.11		0.01	0.19
BMI (kg/m^2)	15.9 ± 1.71	15.3 ± 1.27		0.03	0.40
Run	7.72 ± 0.87	7.91 ± 0.42		0.02	0.25
Gallop	7.31 ± 1.66	7.18 ± 1.74		0.00	0.07
Hop	9.41 ± 1.63	8.82 ± 2.45		0.02	0.31
Leap	4.97 ± 1.01	4.82 ± 0.99		0.01	0.11
Horizontal Jump	6.05 ± 2.07	5.23 ± 2.03	*	0.04	0.51
Slide	7.59 ± 1.53	7.27 ± 1.62		0.01	0.17
Locomotor Raw Scores	43.1 ± 5.81	41.2 ± 6.71		0.02	0.31
Locomotor Standard Scores	15.2 ± 3.27	14.0 ± 3.54		0.03	0.44
Locomotor Percentiles	87.9 ± 20.7	80.3 ± 24.9		0.03	0.39
Striking a stationary ball	6.38 ± 2.44	6.09 ± 1.97		0.00	0.10
Stationary Dribble	1.48 ± 2.74	0.91 ± 2.34		0.01	0.20
Catch	3.41 ± 1.86	3.50 ± 1.94		0.00	0.06
Kick	7.24 ± 1.54	7.09 ± 1.69		0.00	0.07
Overhand Throw	5.89 ± 1.85	5.77 ± 1.98		0.00	0.06
Underhand Roll	4.52 ± 1.38	4.36 ± 1.16		0.00	0.09
Object Control Raw Scores	28.9 ± 7.28	27.7 ± 7.31		0.01	0.13
Object Control Standard Scores	9.00 ± 2.45	10.0 ± 2.92	*	0.04	0.50
Object Control Percentiles	38.7 ± 25.2	48.4 ± 29.6		0.03	0.42
Sum of Standard Scores	24.2 ± 4.41	24.0 ± 4.55		0.00	0.06
Gross Motor Quotient	112.7 ± 13.2	112.1 ± 13.7		0.00	0.06

Mean ± SD

Significant differences among the groups *: $p<0.05$

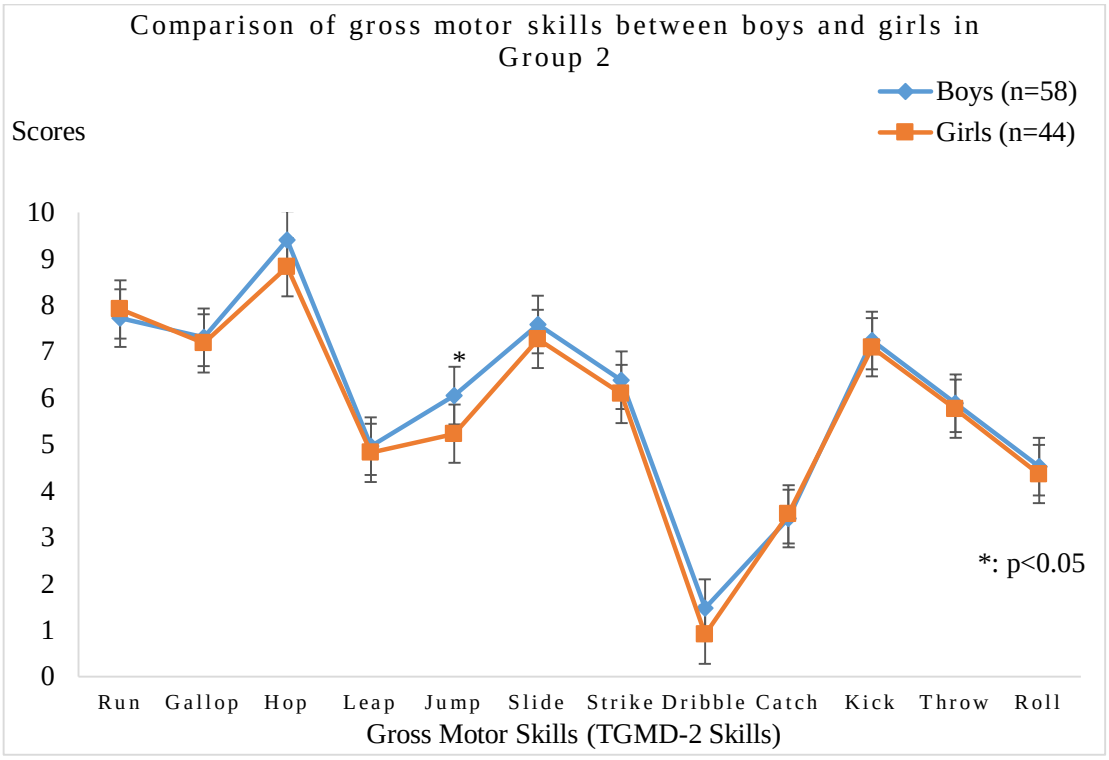

Figure 5-25 (a). Comparison of gross motor skills (individual skills) between boys and girls in Group 2 (Rural Public Schools)

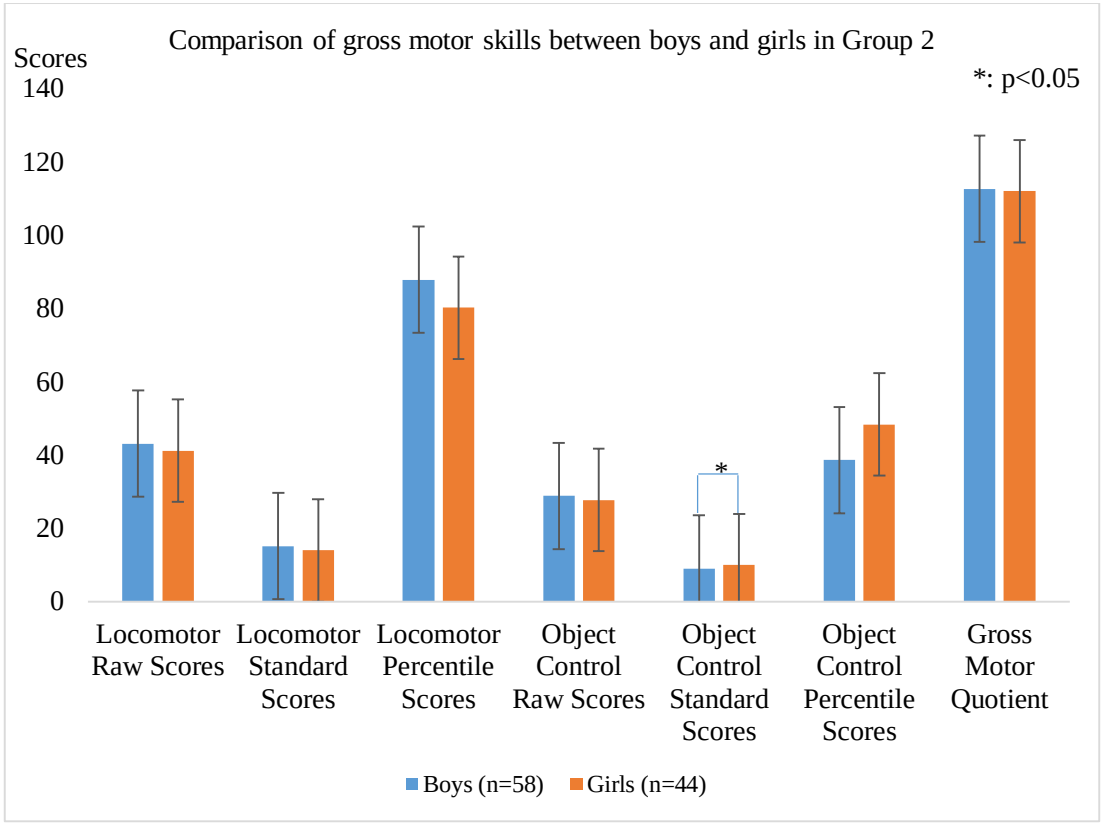

Figure 5-25 (b). Comparison of gross motor skills between boys and girls in Group 2 (Rural Public Schools)

Table 5-8 and Figure 5-26 (a) and (b) show the results of the comparison of the gross motor skills between the boys and the girls in the Group 3 (Yangon Private School).

Table 5-8. Comparison of gross motor skills between boys and girls in Group 3 (Yangon Private School)

Demographic characteristics and gross motor skills	Boys	Girls		Partial Eta Squared	Observed Power
Number (%)	45 (57.0)	34 (43.0)			
Age (years)	5.39 ± 0.32	5.39 ± 0.32			
Height (cm)	111.2 ± 6.79	109.2 ± 7.15		0.02	0.22
Weight (kg)	20.0 ± 4.38	18.7 ± 3.84		0.03	0.30
BMI (kg/m^2)	16.2 ± 2.83	15.6 ± 2.36		0.01	0.15
Run	6.89 ± 1.63	6.77 ± 1.84		0.00	0.06
Gallop	6.16 ± 2.78	7.15 ± 2.15		0.04	0.40
Hop	8.71 ± 2.53	8.91 ± 2.52		0.00	0.06
Leap	3.42 ± 1.84	3.71 ± 1.31		0.01	0.12
Horizontal Jump	4.82 ± 2.17	4.82 ± 2.21		0.00	0.05
Slide	6.98 ± 1.63	7.00 ± 2.22		0.00	0.05
Locomotor Raw Scores	37.0 ± 6.97	38.4 ± 7.21		0.01	0.13
Locomotor Standard Scores	11.9 ± 3.59	12.6 ± 3.68		0.01	0.15
Locomotor Percentiles	61.5 ± 29.2	69.2 ± 28.5		0.02	0.21
Striking a stationary ball	8.09 ± 1.94	6.47 ± 2.09	***	0.14	0.94
Stationary Dribble	4.93 ± 3.37	3.79 ± 3.69		0.03	0.29
Catch	3.38 ± 1.80	2.88 ± 1.63		0.02	0.24
Kick	6.84 ± 1.78	5.94 ± 2.44		0.04	0.47
Overhand Throw	5.82 ± 2.12	4.09 ± 2.01	***	0.15	0.95
Underhand Roll	4.80 ± 2.02	4.24 ± 1.37		0.02	0.28
Object Control Raw Scores	33.8 ± 8.23	27.3 ± 8.02	***	0.14	0.93
Object Control Standard Scores	11.0 ± 3.19	9.77 ± 3.17		0.04	0.39
Object Control Percentiles	57.2 ± 30.2	45.5 ± 30.5		0.04	0.39
Sum of Standard Scores	22.9 ± 5.58	22.4 ± 5.63		0.00	0.06
Gross Motor Quotient	108.6 ± 16.7	107.2 ± 16.9		0.00	0.06

Mean ± SD

Significant differences among the groups ***: $p<0.001$

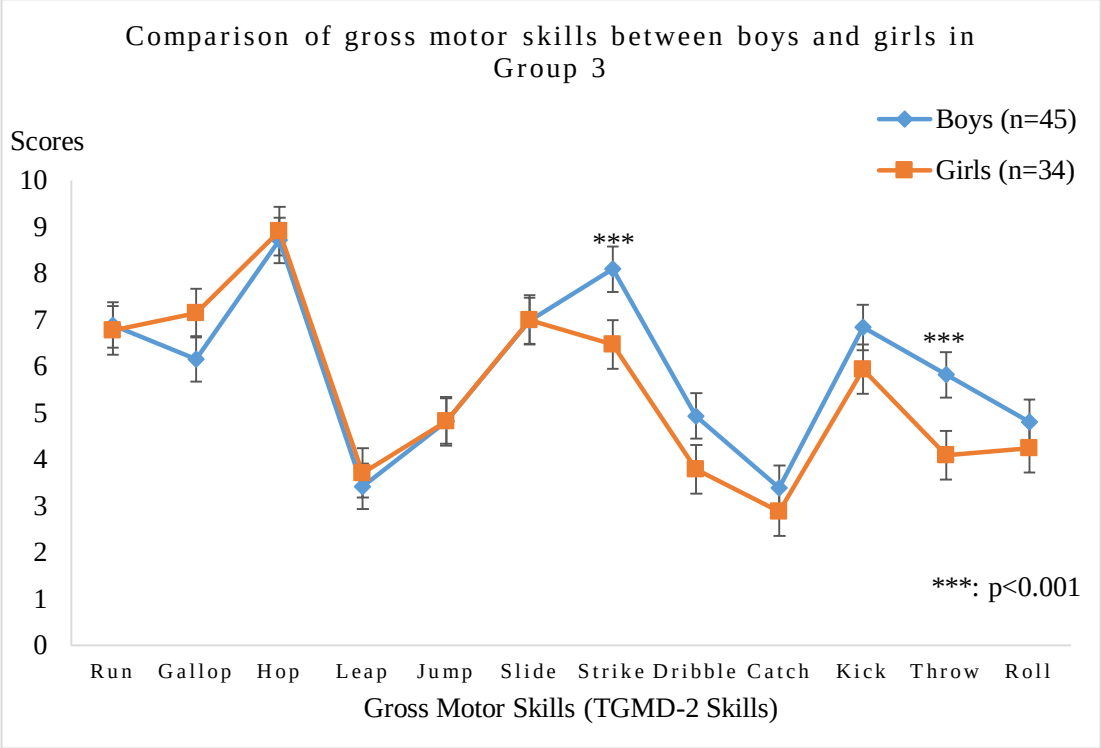

Figure 5-26 (a). Comparison of gross motor skills (individual skills) between boys and girls in Group 3 (Yangon Private School)

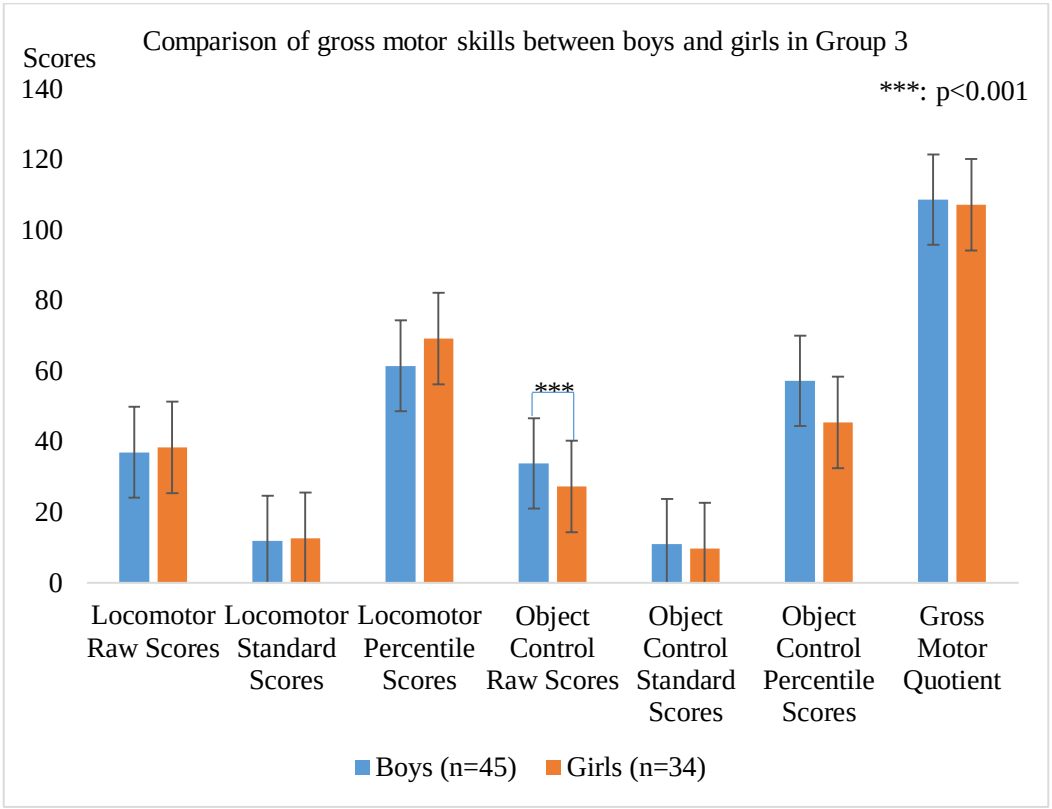

Figure 5-26 (b). Comparison of gross motor skills between boys and girls in Group 3 (Yangon Private School)

5.3.2. Comparison of Gross Motor Skills in the boys among three groups

Table 5-9 and Figure 5-27 to 5-45 show the comparison of the gross motor skills in the boys among three groups. The significant differences were found on the demographic characteristics, all locomotor skills except the slide, most of the object control skills except the catch, the overhand throw, and the underhand roll. The significant difference was also seen on the Gross Motor Quotient among the groups.

Table 5-9. Comparison of demographic characteristics and gross motor skills among three groups (boys)

Demographic characteristics and gross motor skills	Group 1 Yangon Public	Group 2 Rural Public	Group3 Yangon Private		Partial Eta Squared	Observed Power
Number (%)	65 (38.7)	58 (34.5)	45 (26.8)			
Age (years)	5.31 ± 0.29	5.45 ± 0.26	5.39 ± 0.32			
Height (cm)	105.6 ± 6.27	101.7 ± 5.01	111.2 ± 6.79	***	0.28	1.00
Weight (kg)	16.9 ± 2.36	16.4 ± 2.55	20.0 ± 4.38	***	0.19	1.00
BMI (kg/m^2)	15.2 ± 1.83	15.9 ± 1.71	16.2 ± 2.83	*	0.04	0.65
Run	6.71 ± 1.81	7.72 ± 0.87	6.89 ± 1.63	**	0.09	0.95
Gallop	6.23 ± 2.42	7.31 ± 1.66	6.16 ± 2.78	*	0.05	0.76
Hop	8.39 ± 2.59	9.41 ± 1.63	8.71 ± 2.53	*	0.04	0.60
Leap	3.25 ± 1.81	4.97 ± 1.01	3.42 ± 1.84	***	0.20	1.00
Horizontal Jump	4.49 ± 2.29	6.05 ± 2.07	4.82 ± 2.17	***	0.09	0.96
Slide	7.02 ± 2.24	7.59 ± 1.53	6.98 ± 1.63		0.02	0.39
LRS	36.1 ± 8.45	43.1 ± 5.81	37.0 ± 6.97	***	0.16	1.00
LSS	11.8 ± 3.72	15.2 ± 3.27	11.9 ± 3.59	***	0.18	1.00
Locomotor Percentiles	63.7 ± 30.4	87.9 ± 20.7	61.5 ± 29.2	***	0.17	1.00
Striking a stationary ball	7.42 ± 1.99	6.38 ± 2.44	8.09 ± 1.94	***	0.09	0.96
Stationary Dribble	1.45 ± 2.61	1.48 ± 2.74	4.93 ± 3.37	***	0.23	1.00
Catch	3.57 ± 1.85	3.41 ± 1.86	3.38 ± 1.80		0.00	0.08
Kick	7.79 ± 0.80	7.24 ± 1.54	6.84 ± 1.78	**	0.07	0.90
Overhand Throw	5.11 ± 2.42	5.89 ± 1.85	5.82 ± 2.12		0.03	0.49
Underhand Roll	5.08 ± 2.03	4.52 ± 1.38	4.80 ± 2.02		0.02	0.30
OCRS	30.4 ± 6.68	28.9 ± 7.28	33.8 ± 8.23	**	0.06	0.86
OCSS	9.65 ± 2.27	9.00 ± 2.45	11.0 ± 3.19	***	0.08	0.94
Object Control Percentiles	46.0 ± 24.1	38.7 ± 25.2	57.2 ± 30.2	**	0.07	0.89
Sum of Standard Scores	21.4 ± 5.05	24.2 ± 4.41	22.9 ± 5.58	**	0.06	0.81
Gross Motor Quotient	104.2 ± 15.2	112.7 ± 13.2	108.6 ± 16.7	**	0.06	0.81

Mean ± SD

Significant differences among the groups *: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

LRS: Locomotor Raw Scores, LSS: Locomotor Standard Scores, OCRS: Object Control Raw Scores, OCSS: Object Control Standard Scores

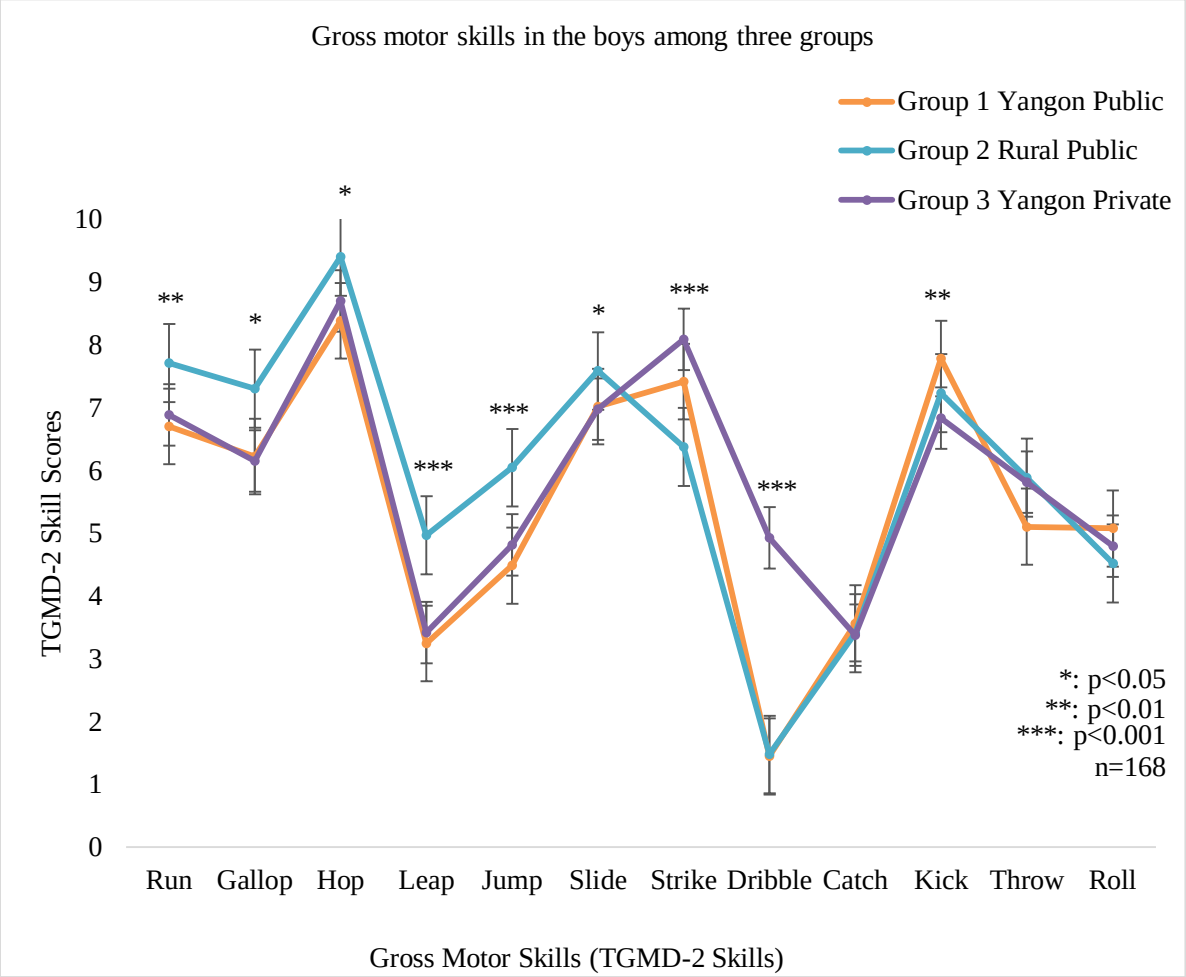

Figure 5-27. Comparison of gross motor skills in the boys among three groups

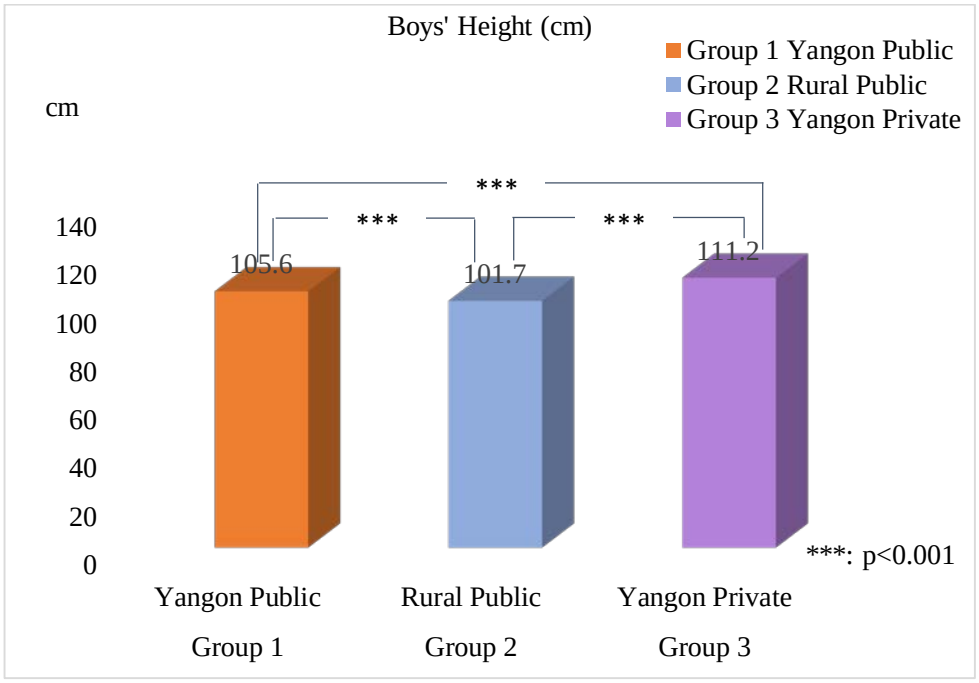

Figure 5-28. Comparison of height in the boys among three groups

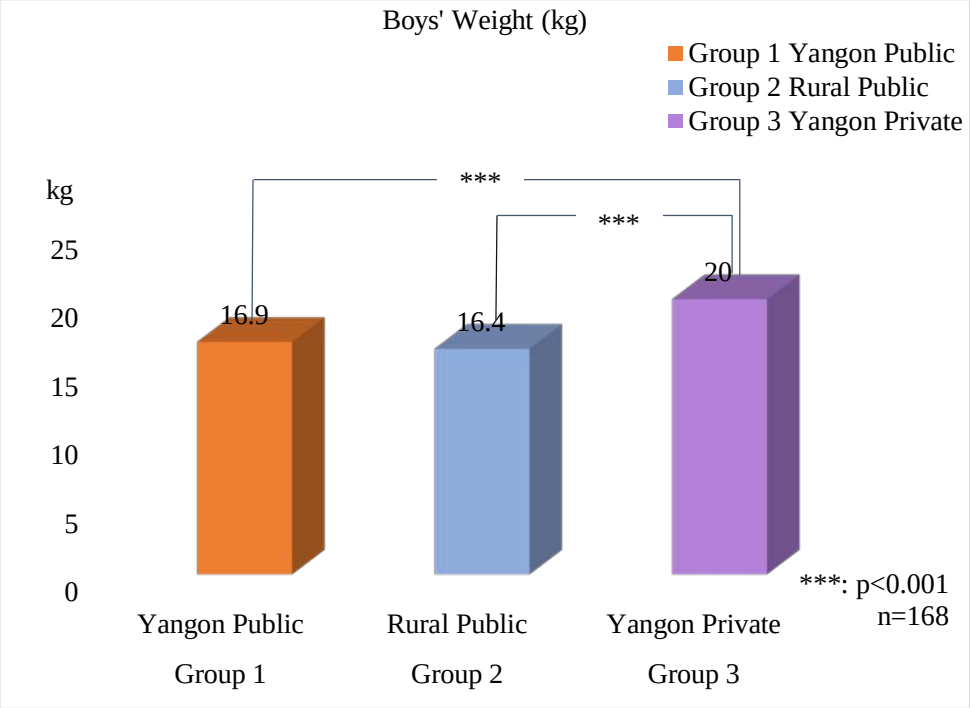

Figure 5-29. Comparison of weight in the boys among three groups

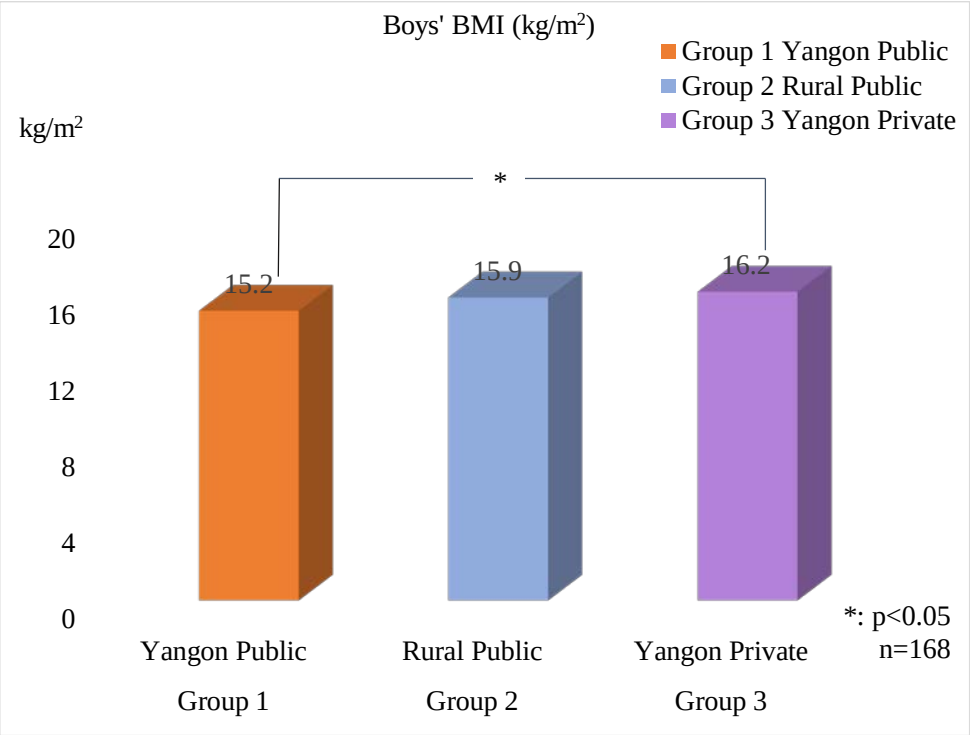

Figure 5-30. Comparison of BMI in the boys among three groups

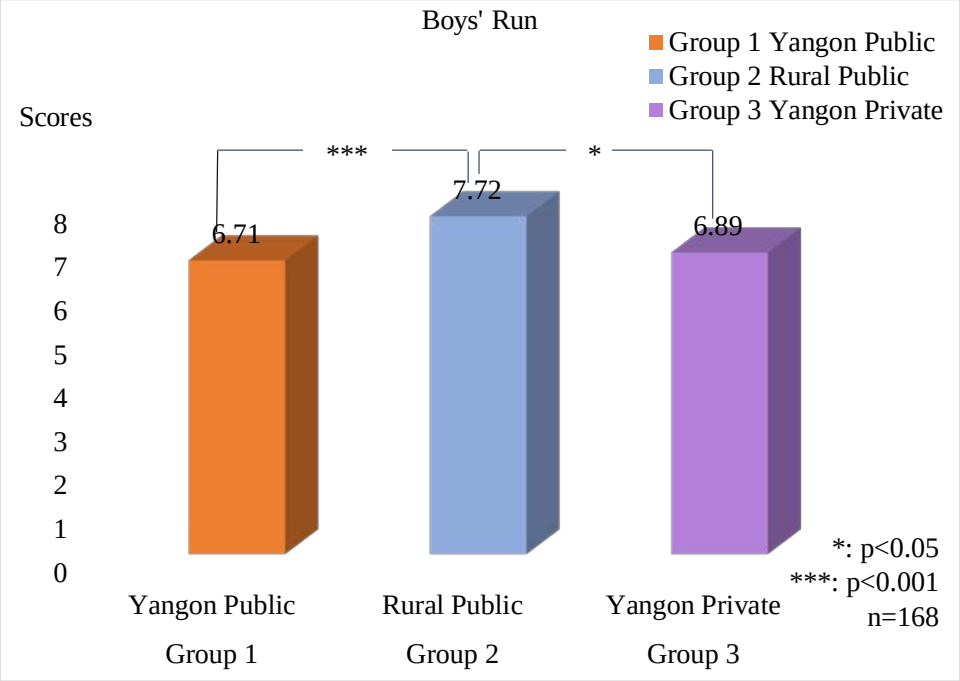

Figure 5-31. Comparison of Run in the boys among three groups

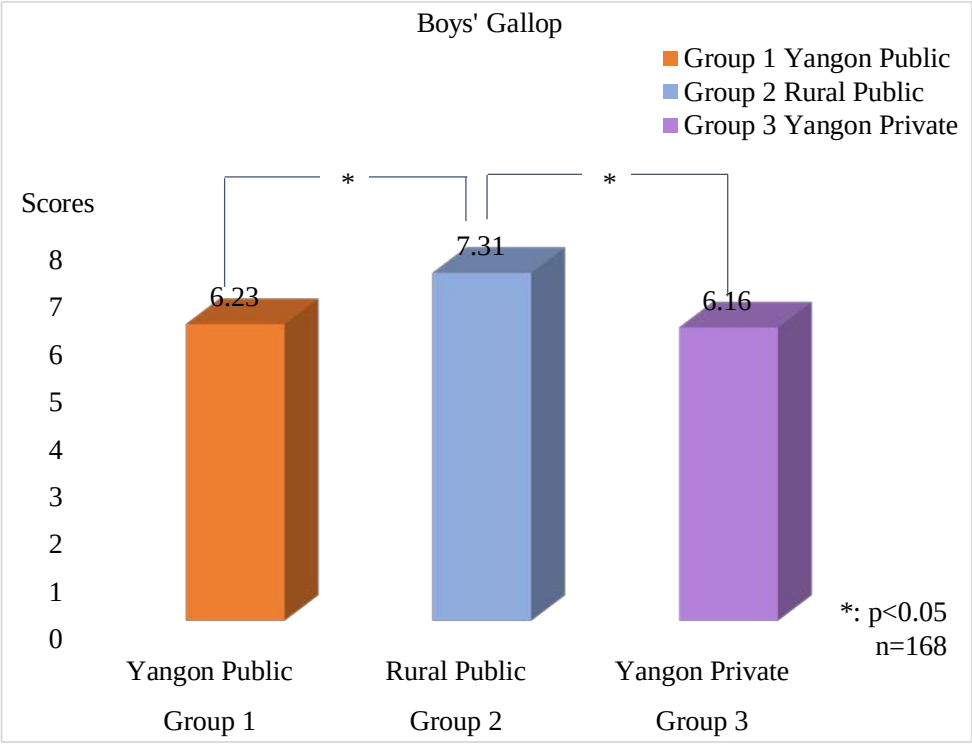

Figure 5-32. Comparison of Gallop in the boys among three groups

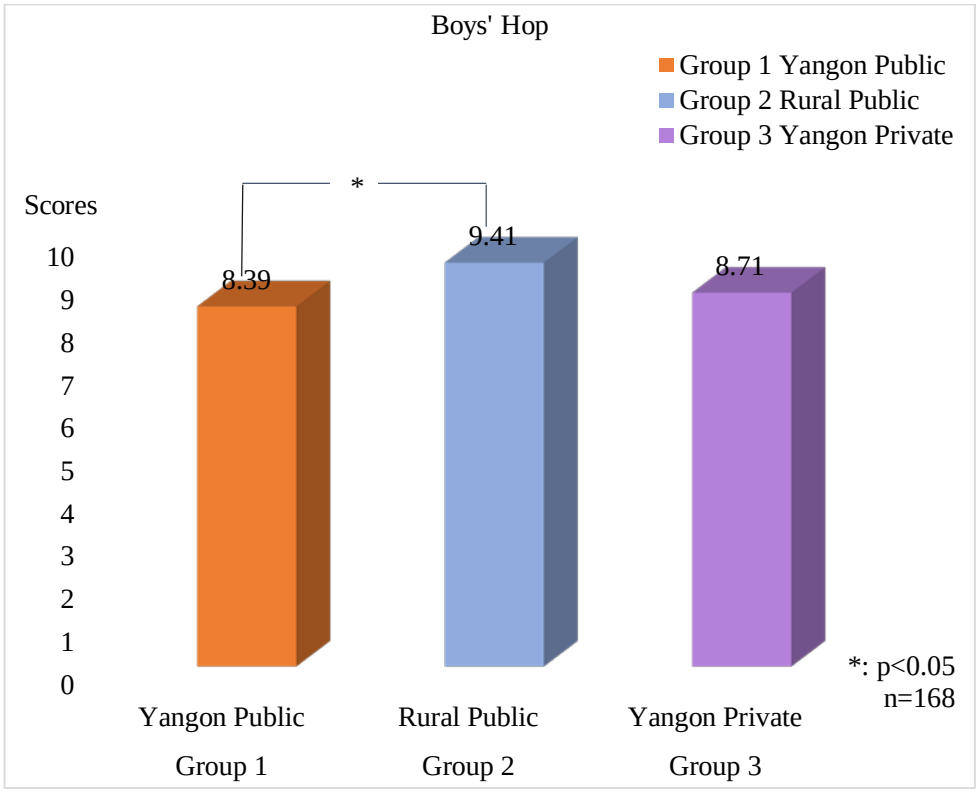

Figure 5-33. Comparison of Hop in the boys among three groups

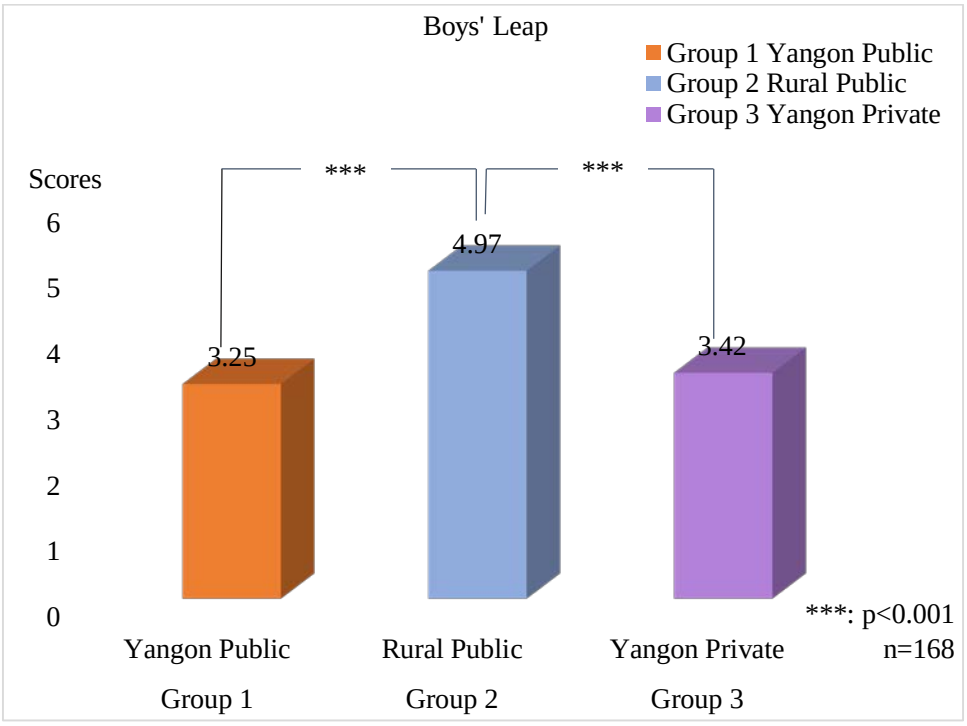

Figure 5-34. Comparison of Leap in the boys among three groups

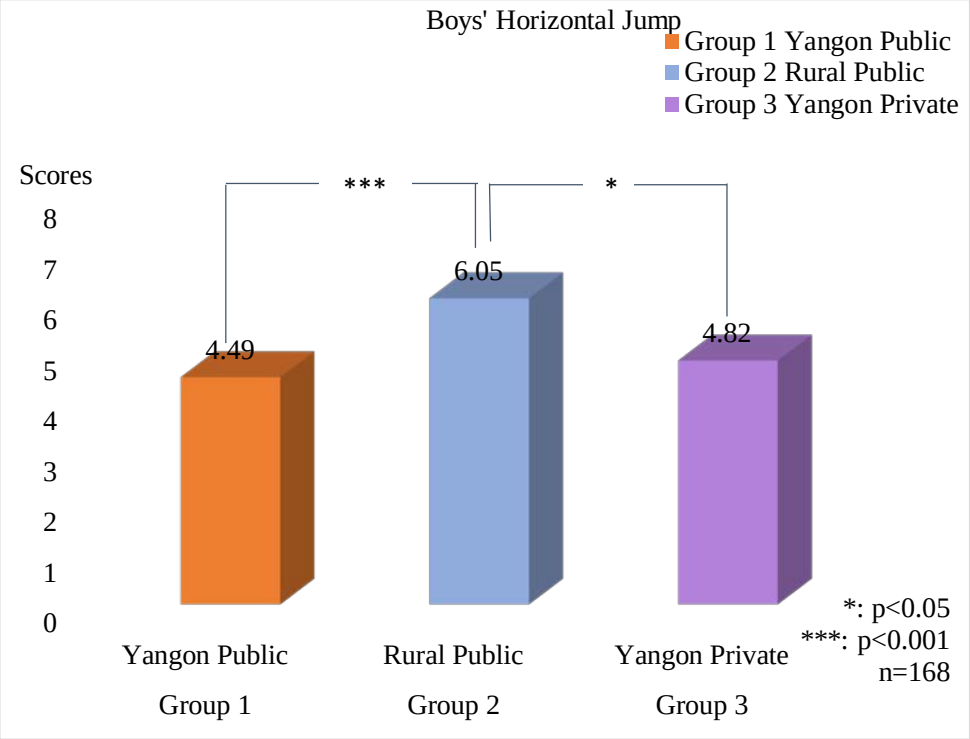

Figure 5-35. Comparison of Horizontal Jump in the boys among three groups

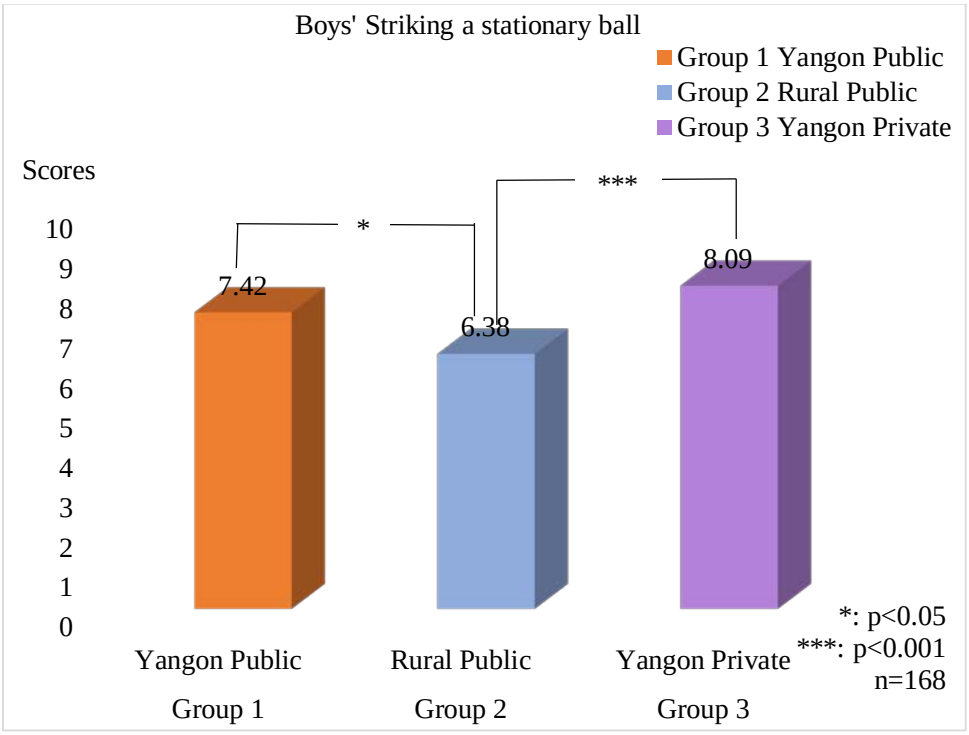

Figure 5-36. Comparison of Striking a stationary ball in the boys among three groups

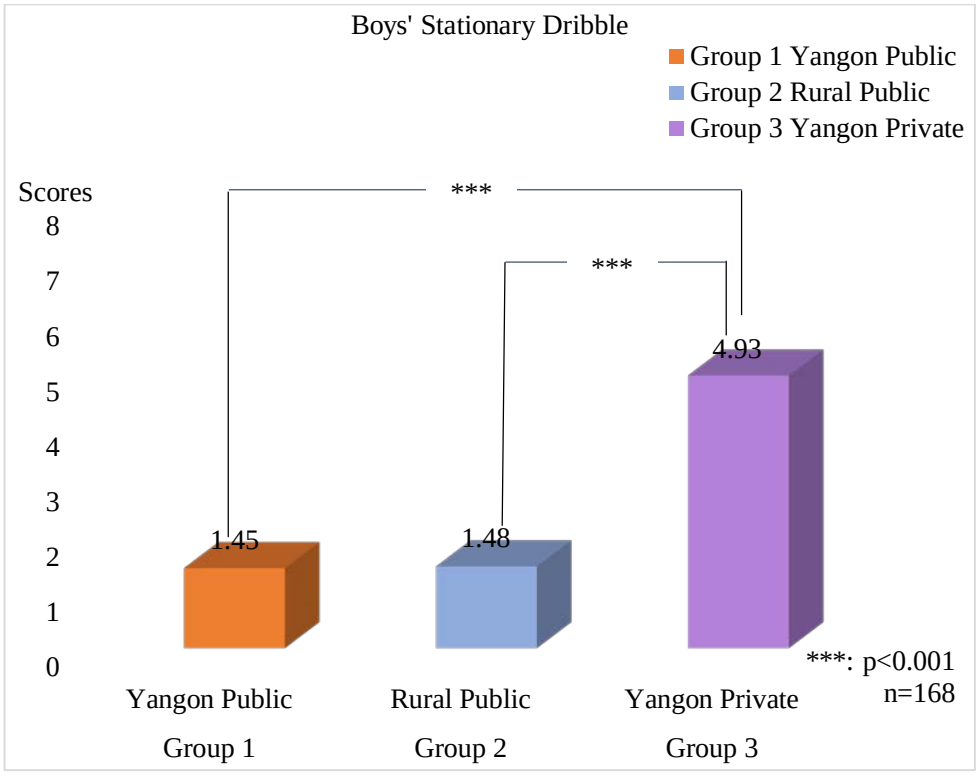

Figure 5-37. Comparison of Stationary Dribble in the boys among three groups

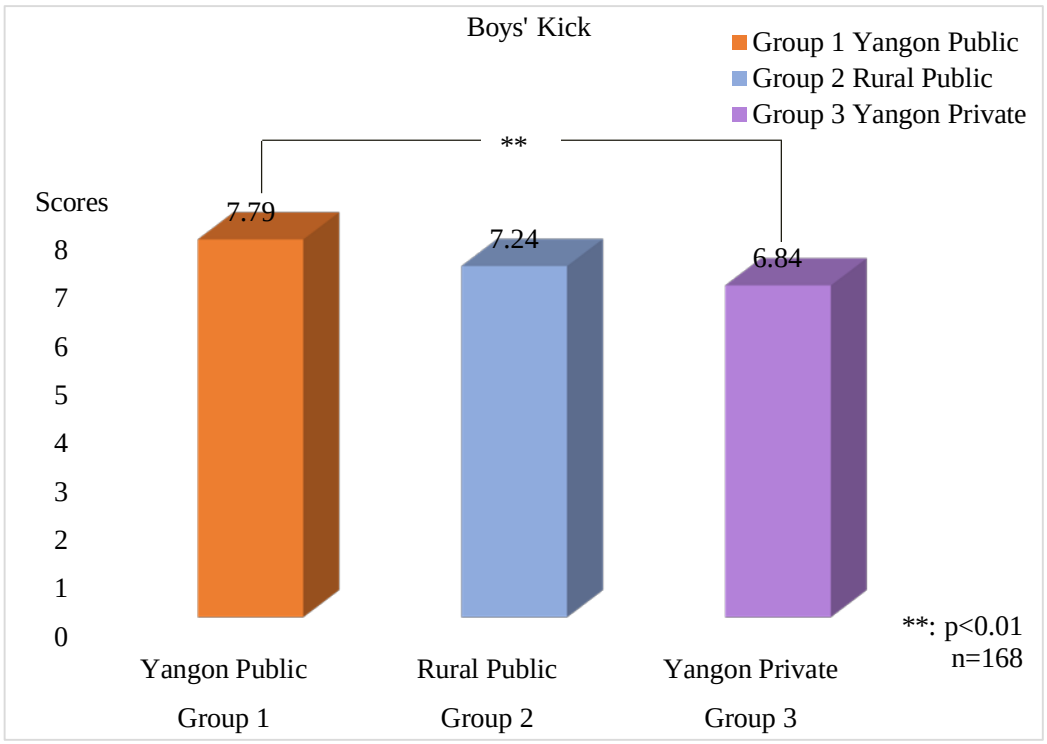

Figure 5-38. Comparison of Kick in the boys among three groups

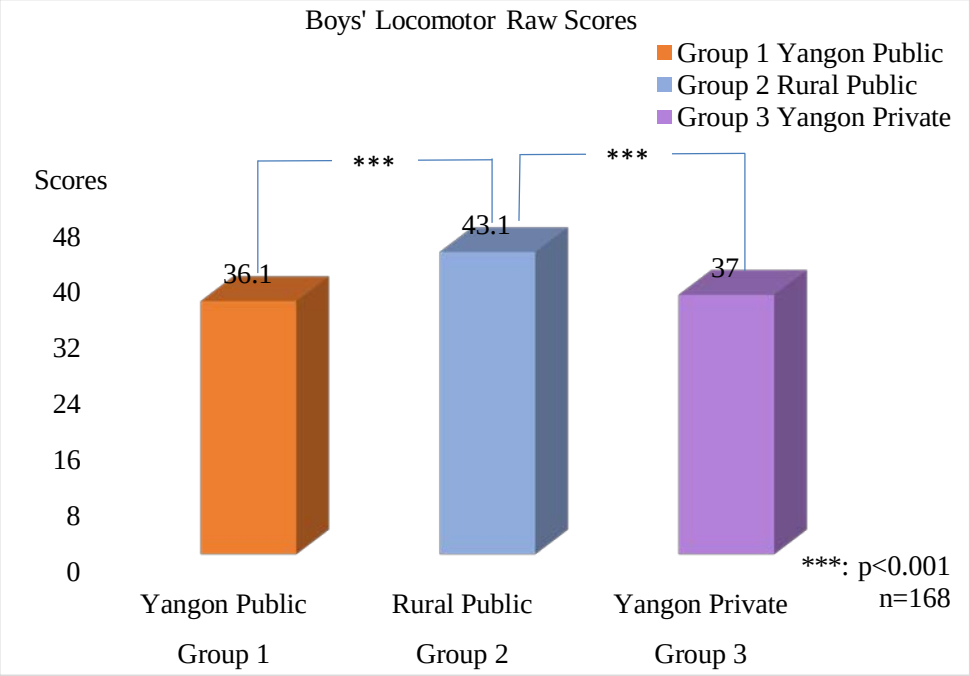

Figure 5-39. Comparison of Locomotor Raw Scores in the boys among three groups

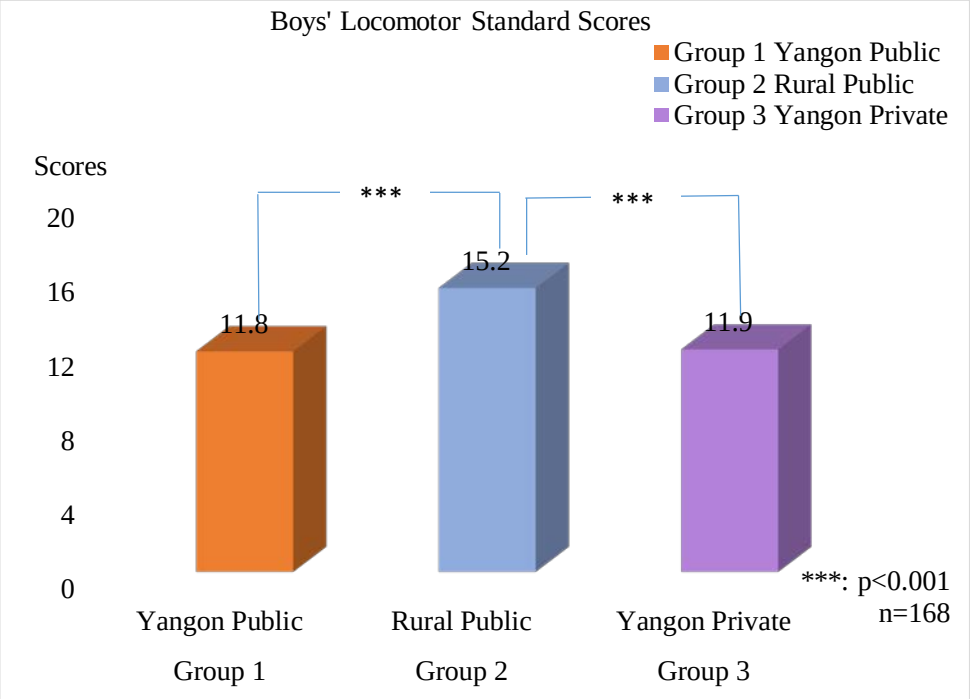

Figure 5-40. Comparison of Locomotor Standard Scores in the boys among three groups

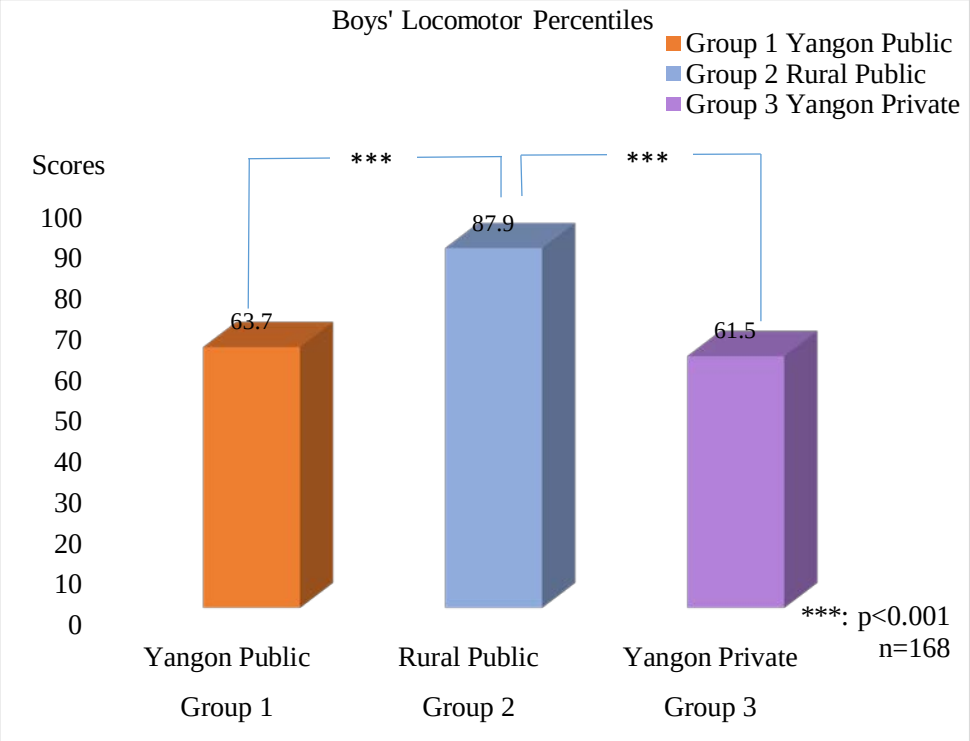

Figure 5-41. Comparison of Locomotor Percentiles in the boys among three groups

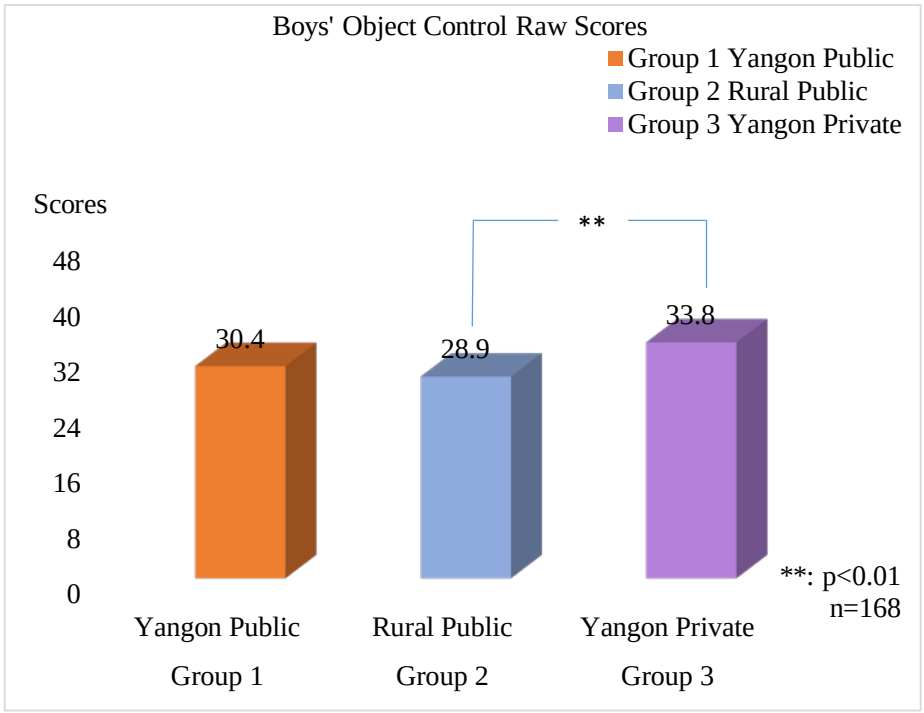

Figure 5-42. Comparison of Object Control Raw Scores in the boys among three groups

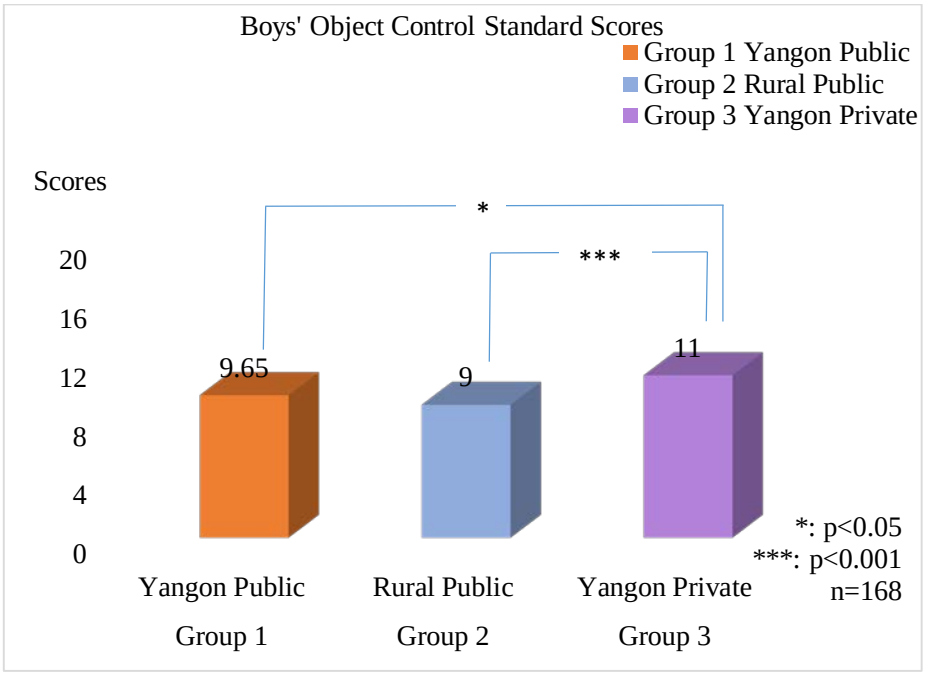

Figure 5-43. Comparison of Object Control Standard Scores in the boys among three groups

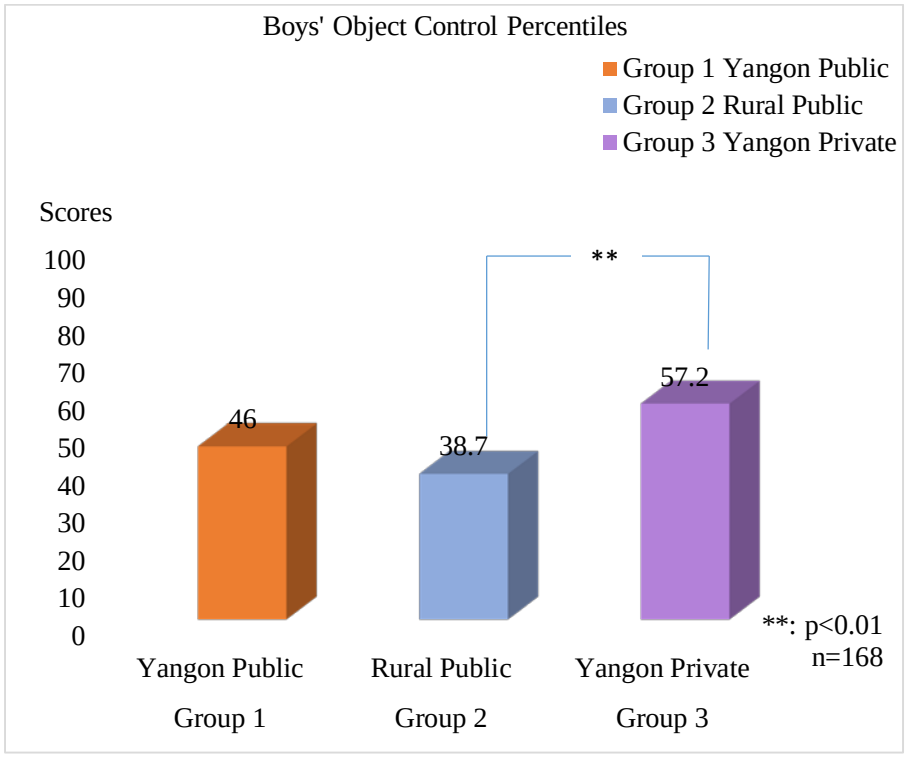

Figure 5-44. Comparison of Object Control Percentiles in the boys among three groups

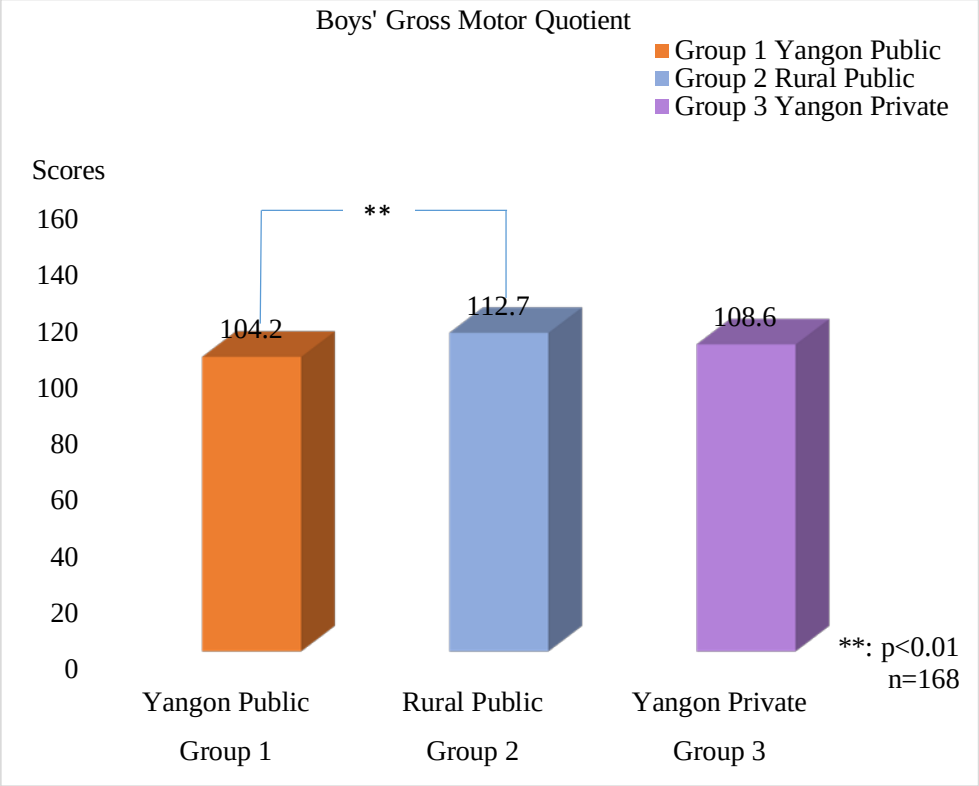

Figure 5-45. Comparison of Gross Motor Quotient in the boys among three groups

5.3.3. Comparison of Gross Motor Skills in the girls among three groups

Table 5-10 and Figure 5-46 to 5-57 show the comparison of the girls among three groups. There were significant differences on height and weight of the subjects among the groups. The significant differences were found on the run, the leap, the raw scores, the standard scores, and the percentiles of the locomotor skills. The significant differences were also found on the dribble, the kick and the throw of the object control skills, and the Gross Motor Quotient among three groups. The highest scores were mostly seen in Group 2 except the dribble.

Table 5-10. Comparison of demographic characteristics and gross motor skills among three groups (girls)

Demographic characteristics and gross motor skills	Group 1 Yangon Public	Group 2 Rural Public	Group3 Yangon Private		Partial Eta Squared	Observed Power
Number (%)	66 (45.8)	44 (30.6)	34 (23.6)			
Age (years)	5.36 ± 0.32	5.47 ± 0.29	5.39 ± 0.32			
Height (cm)	106.4 ± 7.45	101.8 ± 5.33	109.2 ± 7.15	***	0.15	0.99
Weight (kg)	16.9 ± 2.74	15.9 ± 2.11	18.7 ± 3.84	***	0.11	0.97
BMI (kg/m^2)	14.9 ± 2.04	15.3 ± 1.27	15.6 ± 2.36		0.02	0.34
Run	6.36 ± 1.98	7.91 ± 0.42	6.77 ± 1.84	***	0.15	0.99
Gallop	6.82 ± 2.29	7.18 ± 1.74	7.15 ± 2.15		0.01	0.13
Hop	8.80 ± 2.37	8.82 ± 2.45	8.91 ± 2.52		0.00	0.05
Leap	3.15 ± 1.57	4.82 ± 0.99	3.71 ± 1.31	***	0.22	1.00
Horizontal Jump	4.76 ± 1.91	5.23 ± 2.03	4.82 ± 2.21		0.01	0.18
Slide	7.21 ± 1.46	7.27 ± 1.62	7.00 ± 2.22		0.00	0.09
LRS	37.1 ± 6.87	41.2 ± 6.71	38.4 ± 7.21	*	0.06	0.78
LSS	11.7 ± 3.07	14.0 ± 3.54	12.6 ± 3.68	**	0.08	0.89
Locomotor Percentiles	65.9 ± 27.1	80.3 ± 24.9	69.2 ± 28.5	*	0.05	0.70
Striking a stationary ball	5.96 ± 2.25	6.09 ± 1.97	6.47 ± 2.09		0.01	0.16
Stationary Dribble	0.85 ± 2.02	0.91 ± 2.34	3.79 ± 3.69	***	0.19	1.00
Catch	3.11 ± 1.76	3.50 ± 1.94	2.88 ± 1.63		0.02	0.26
Kick	6.71 ± 1.79	7.09 ± 1.69	5.94 ± 2.44	*	0.05	0.64
Overhand Throw	3.85 ± 2.28	5.77 ± 1.98	4.09 ± 2.01	***	0.14	0.99
Underhand Roll	4.18 ± 1.42	4.36 ± 1.16	4.24 ± 1.37		0.00	0.09
OCRS	24.7 ±5.84	27.7 ± 7.31	27.3 ± 8.02	*	0.04	0.61
OCSS	8.96 ± 2.34	10.0 ± 2.92	9.77 ± 3.17		0.03	0.47
Object Control Percentiles	38.8 ± 24.6	48.4 ± 29.6	45.5 ± 30.5		0.02	0.36
Sum of Standard Scores	20.6 ± 4.26	24.0 ± 4.55	22.4 ± 5.63	***	0.09	0.92
Gross Motor Quotient	101.9 ± 12.8	112.1 ± 13.7	107.2 ± 16.9	***	0.09	0.92

Mean ± SD

Significant differences among the groups *: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

LRS: Locomotor Raw Scores, LSS: Locomotor Standard Scores, OCRS: Object Control Raw Scores, OCSS: Object Control Standard Scores

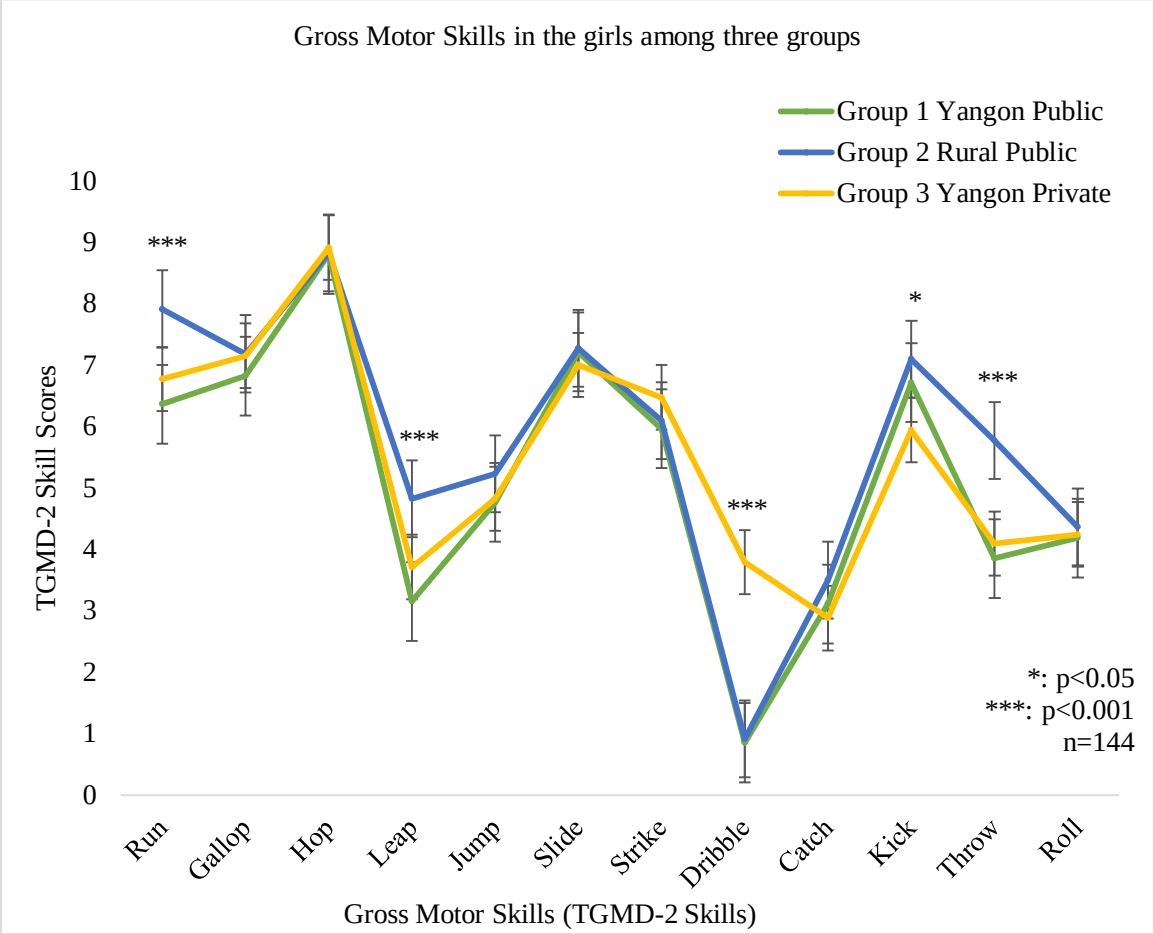

Figure 5-46. Comparison of gross motor skills in the girls among three groups

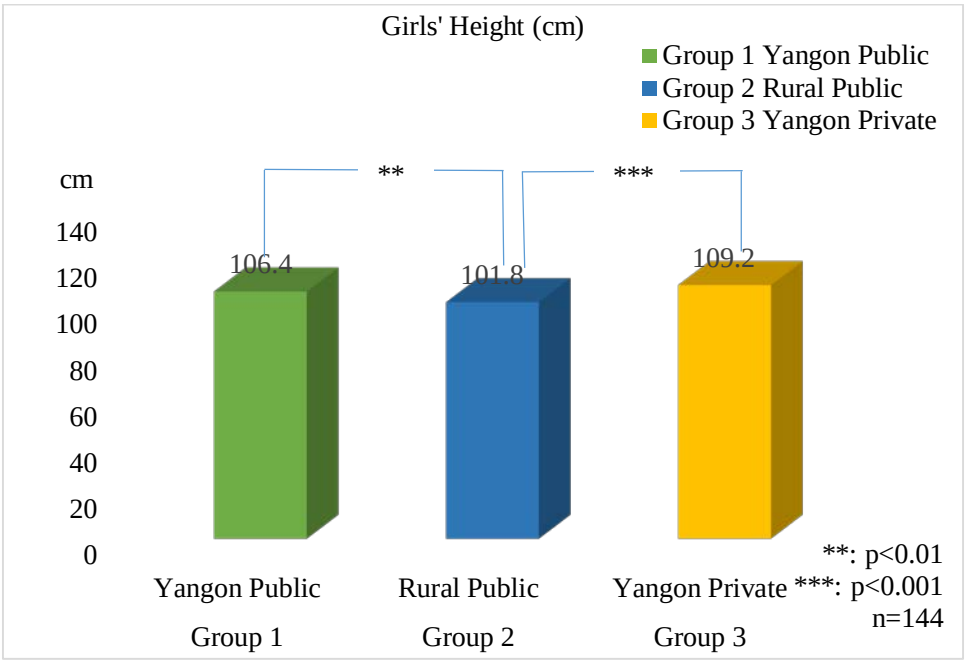

Figure 5-47. Comparison of height in the girls among three groups

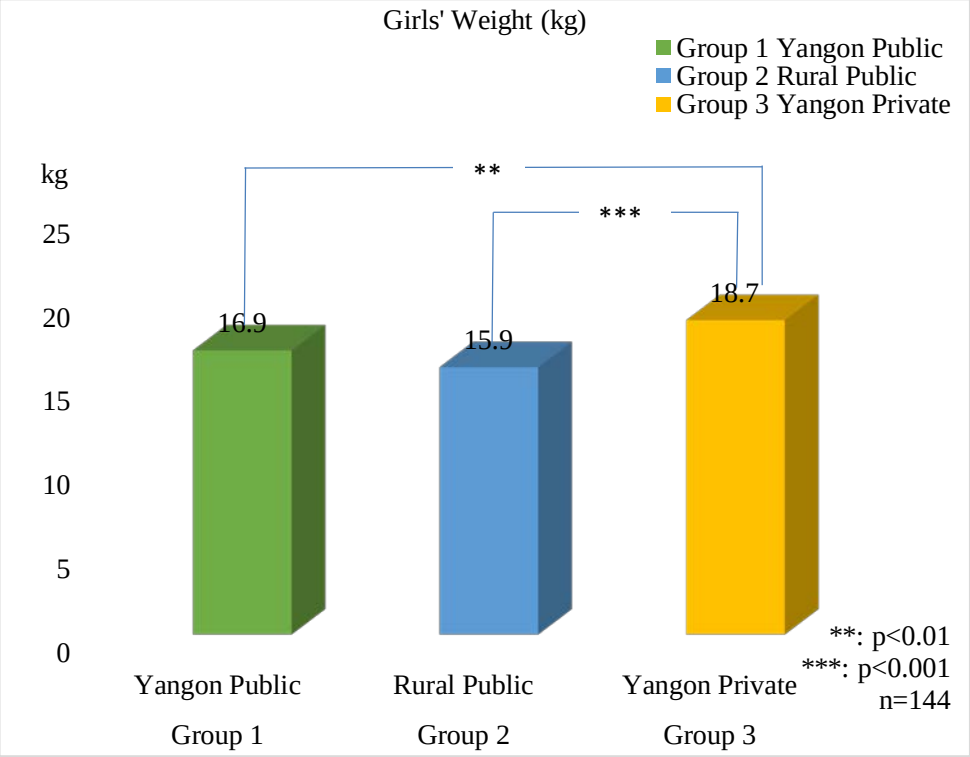

Figure 5-48. Comparison of weight in the girls among three groups

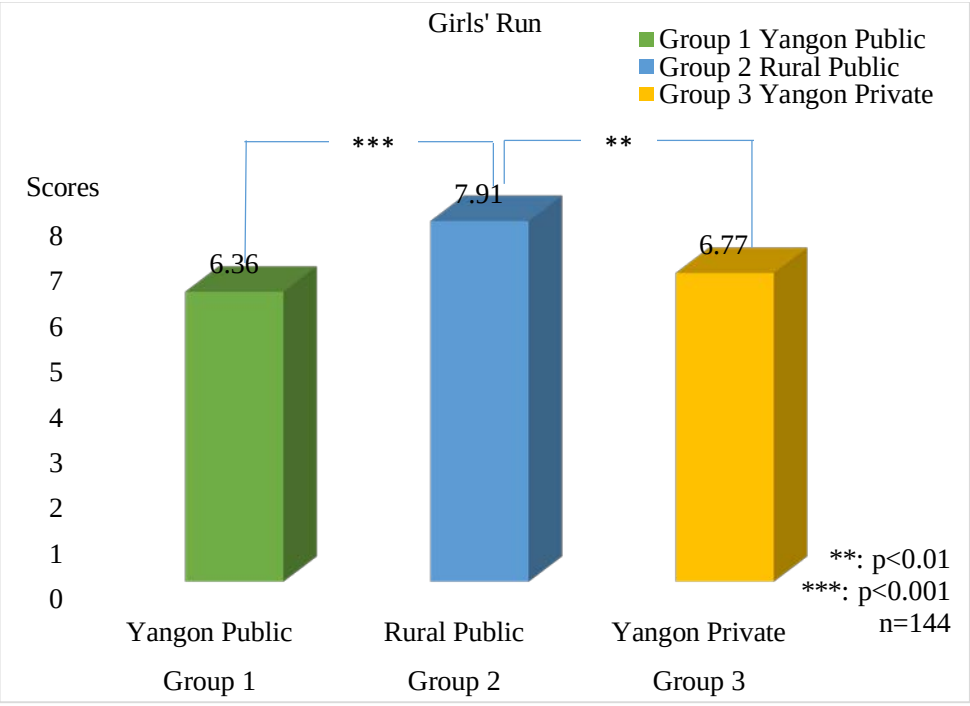

Figure 5-49. Comparison of Run in the girls among three groups

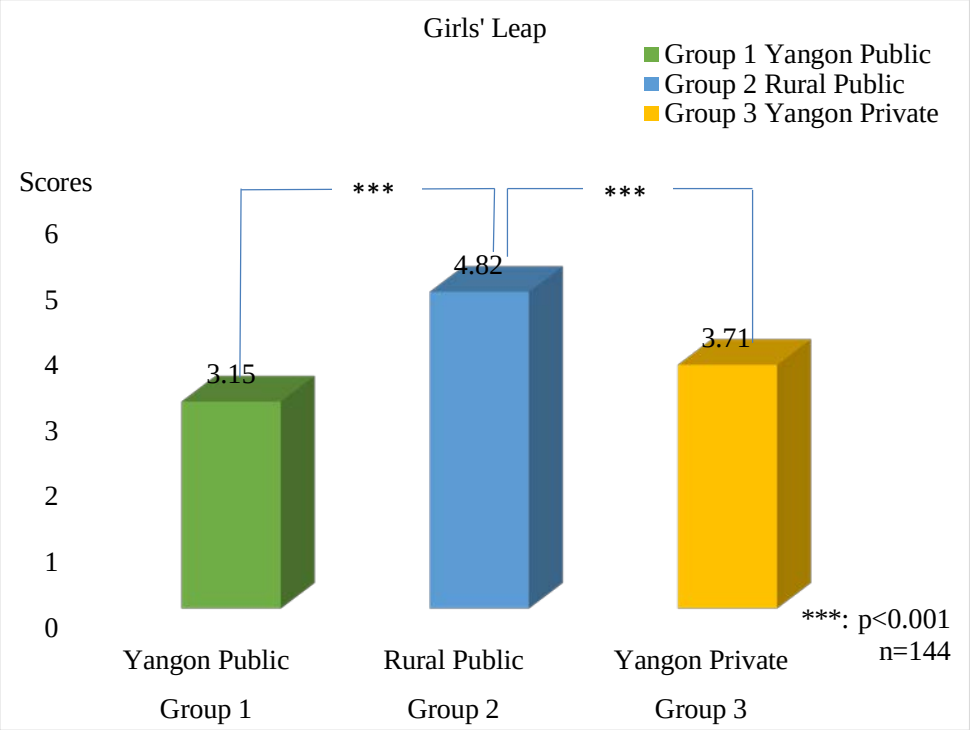

Figure 5-50. Comparison of Leap in the girls among three groups

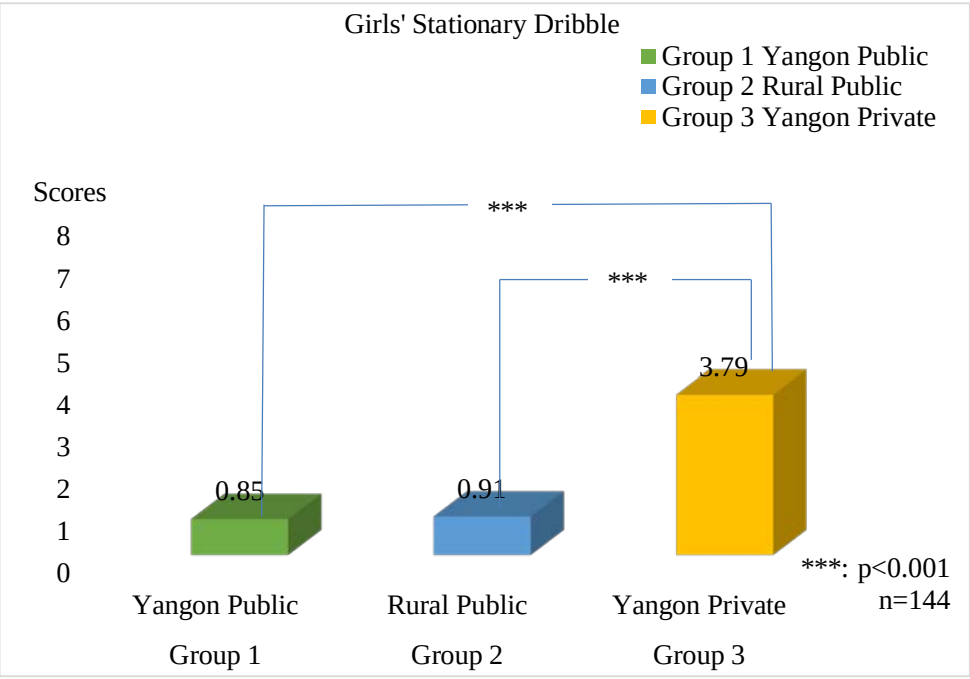

Figure 5-51. Comparison of Stationary Dribble in the girls among three groups

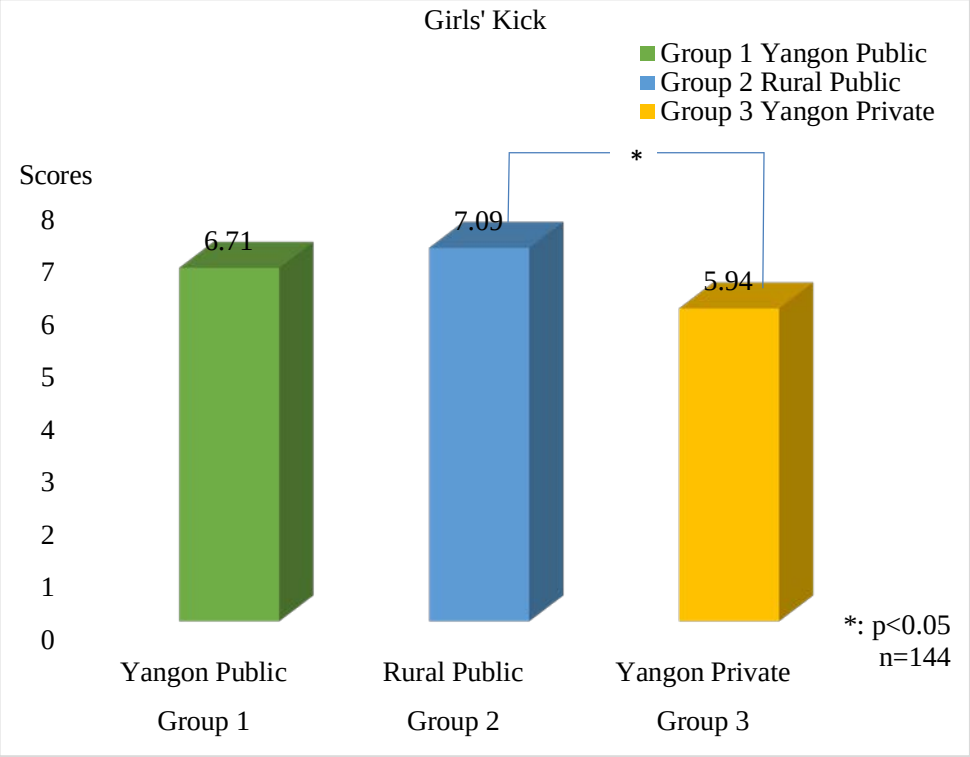

Figure 5-52. Comparison of Kick in the girls among three groups

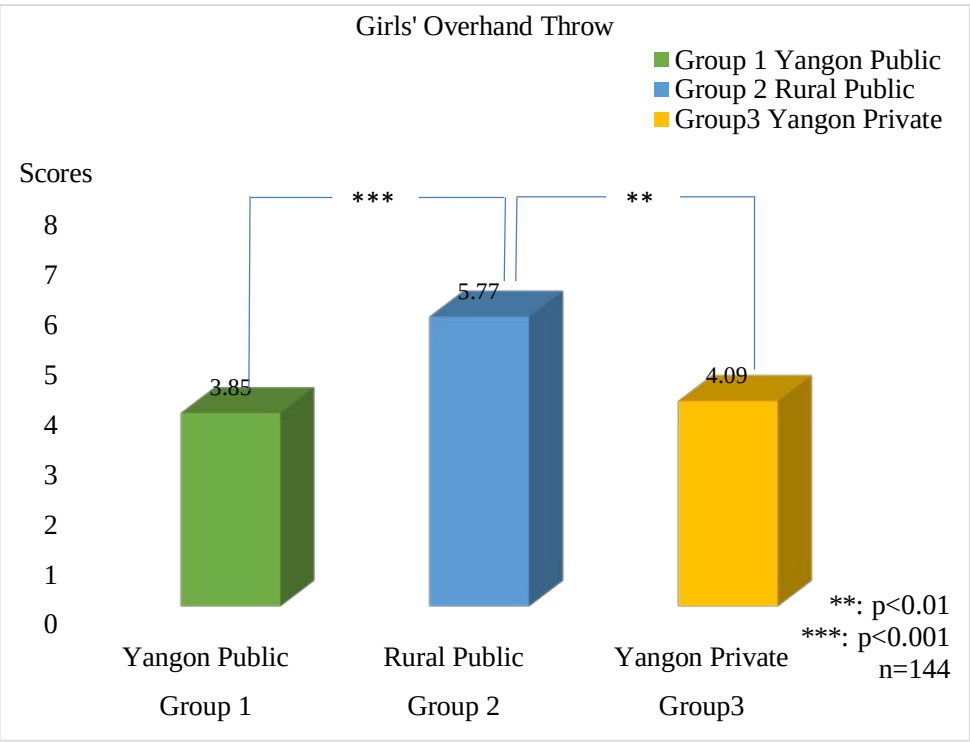

Figure 5-53. Comparison of Throw in the girls among three groups

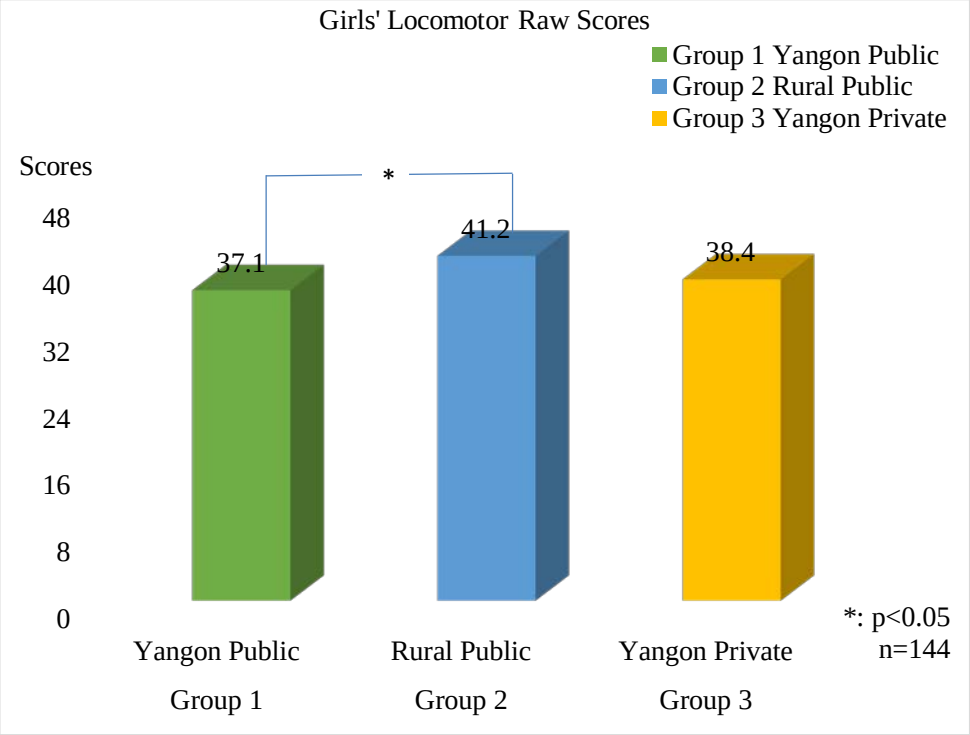

Figure 5-54. Comparison of Locomotor Raw Scores in the girls among three groups

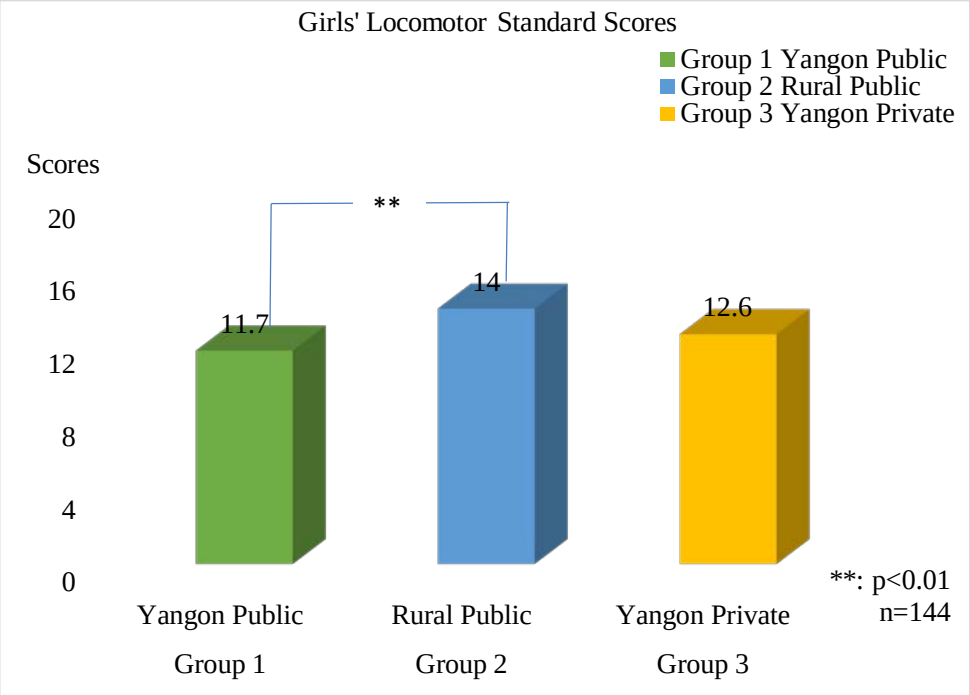

Figure 5-55. Comparison of Locomotor Standard Scores in the girls among three groups

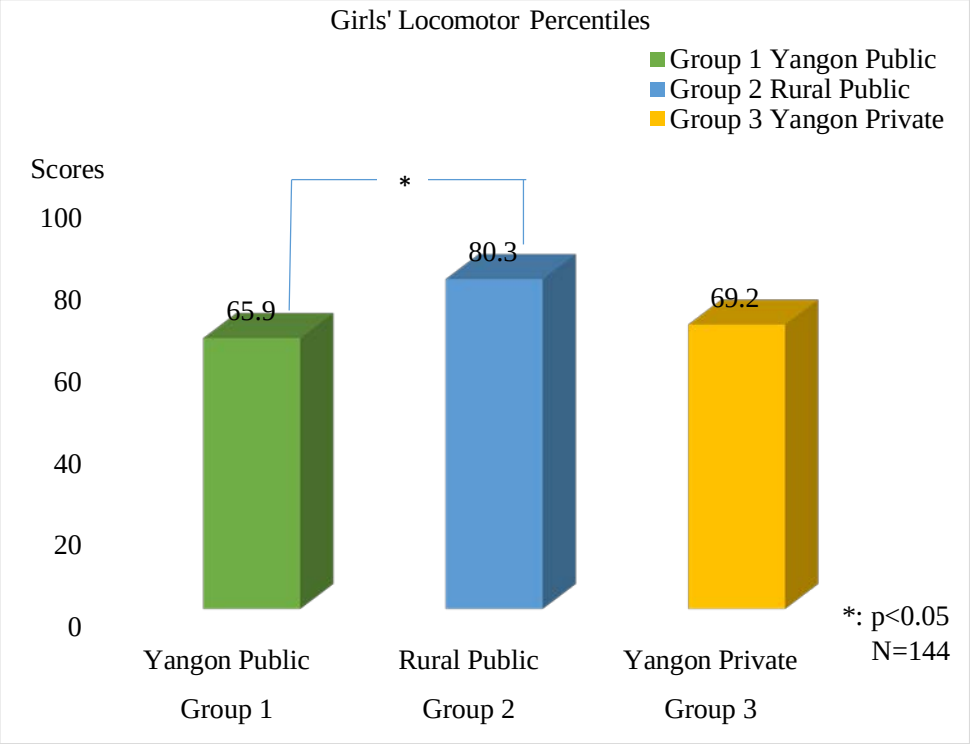

Figure 5-56. Comparison of Locomotor Percentiles in the girls among three groups

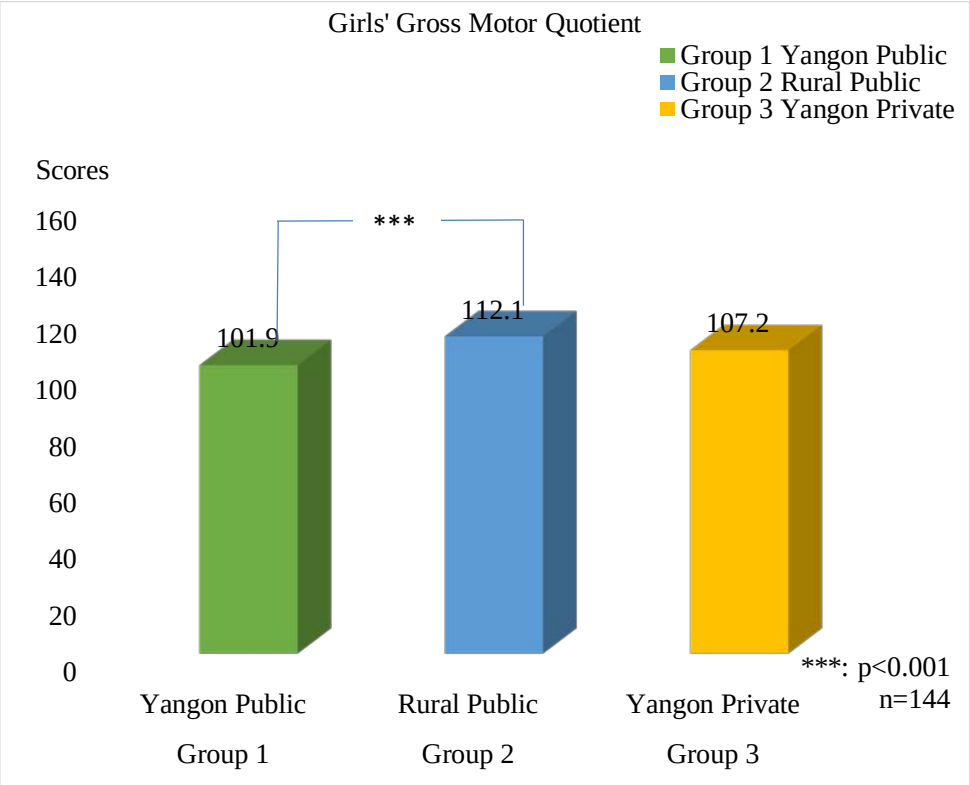

Figure 5-57. Comparison of Gross Motor Quotient in the girls among three groups

5.3.4. Results of Socio-demographic factors

5.3.4.1. Biological factors

(i) Gender distribution of Subjects

Figure 5-58 shows gender distribution of the subjects in all three groups.

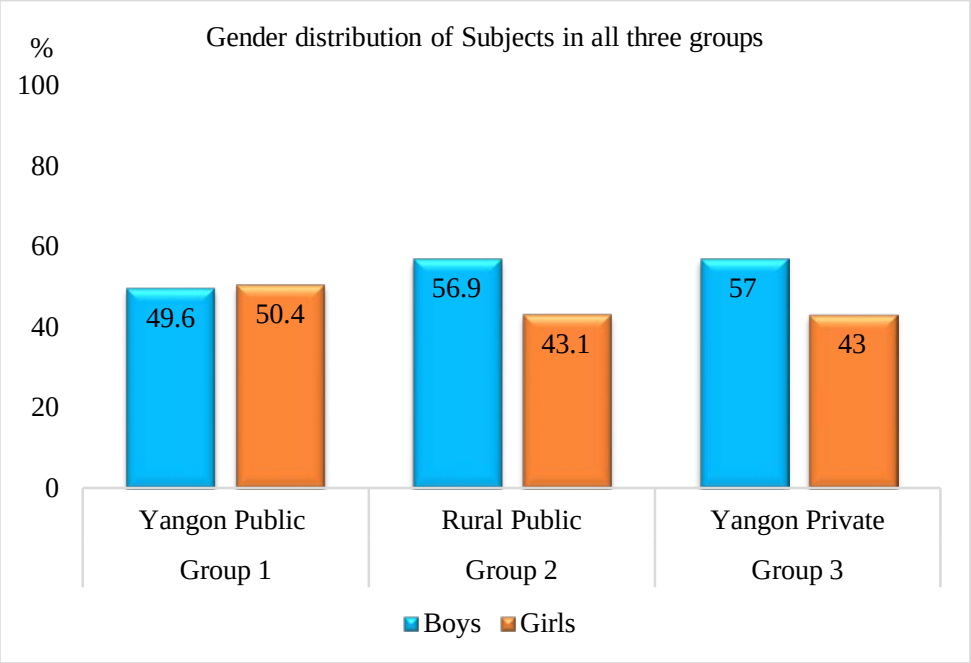

Figure 5-58. Gender distribution of Subjects in all three groups

(ii) Weight status depending on BMI of Subjects

Figure 5-59 shows the percentage of the subjects according to their weight status depending on the BMI in all three groups.

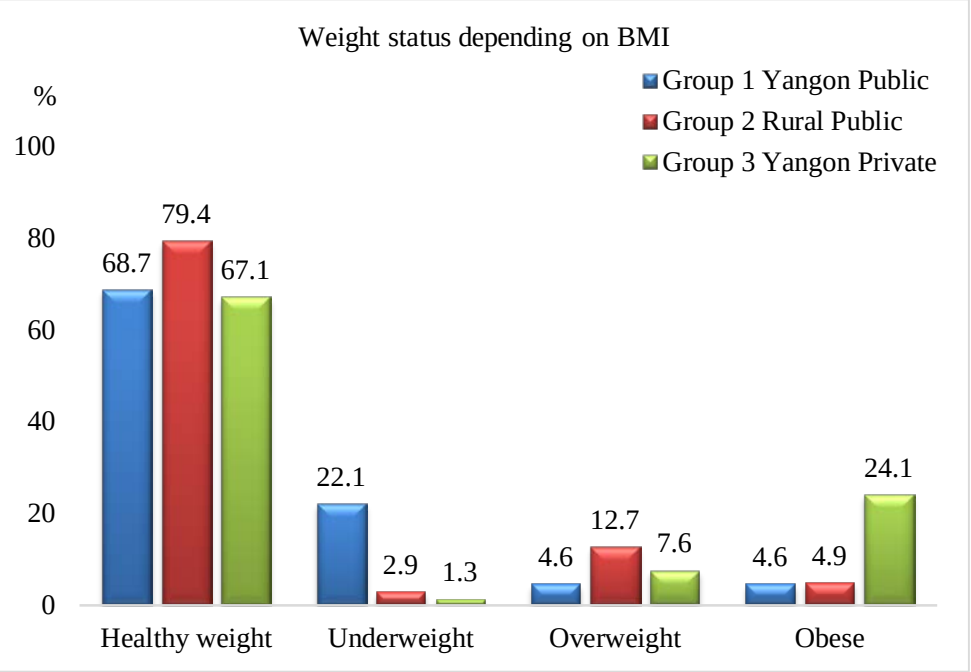

Figure 5-59. Weight status depending on BMI of Subjects in all three groups

5.3.4.2. Environmental factors

(i) Types of Schools

Figure 5-60 shows the number and percentage of the subjects in each of all three groups.

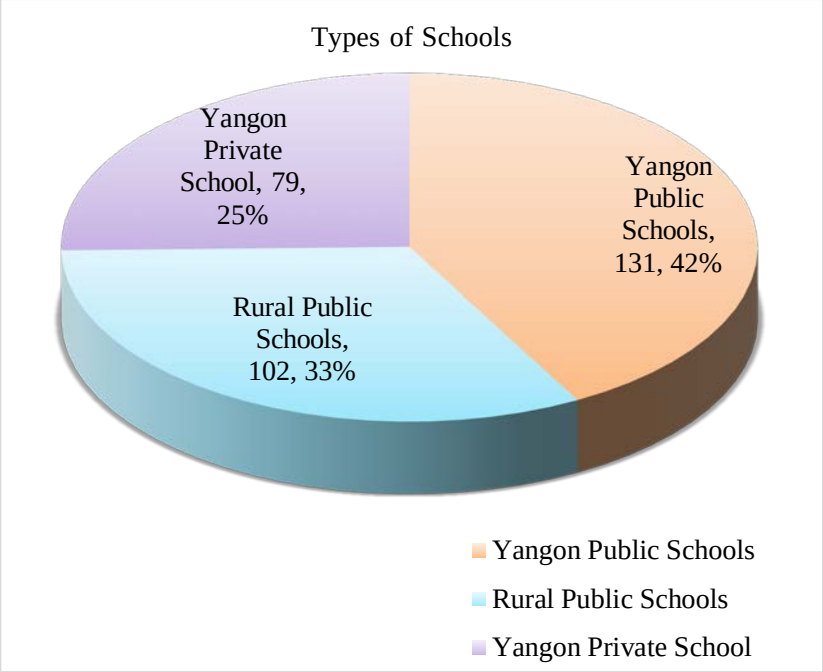

Figure 5-60. Distribution of the Subjects in three types of schools

(ii) Types of Playgrounds

Figure 5-61 (a) and (b) show types of playground in all three groups.

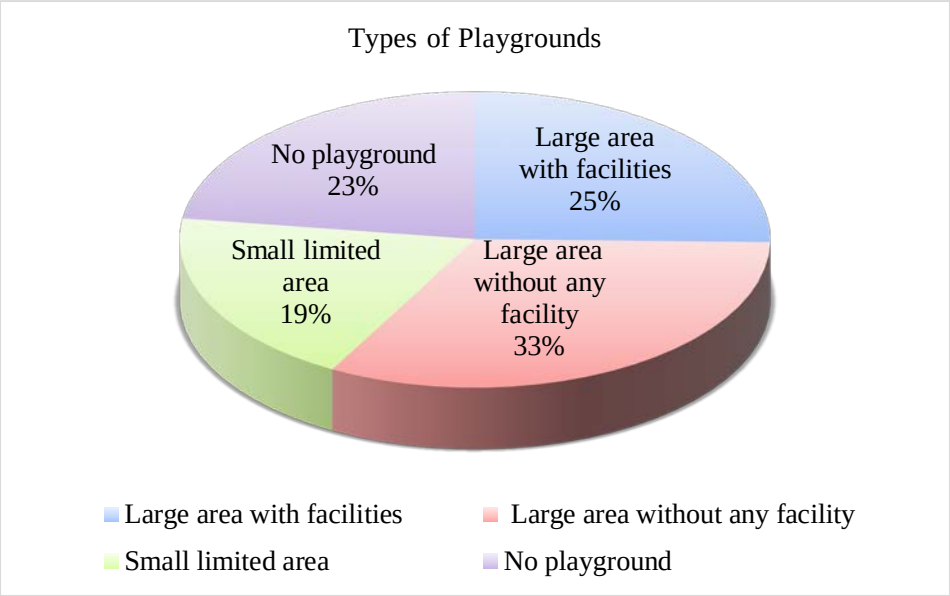

Figure 5-61 (a) Types of Playgrounds of Subjects in all three groups

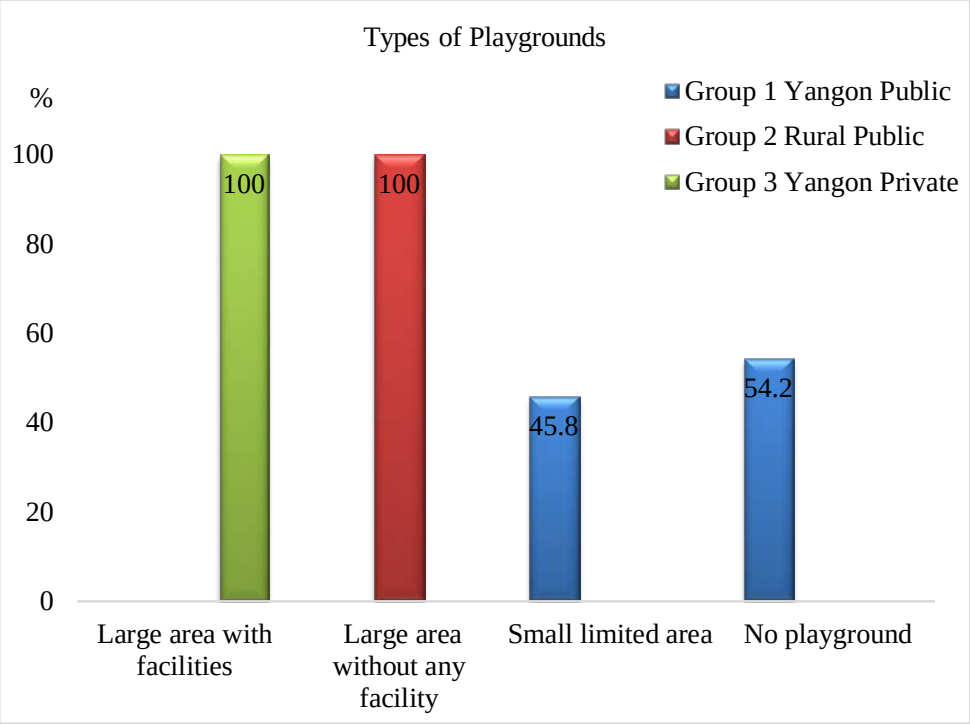

Figure 5-61 (b) Types of Playgrounds of Subjects in all three groups

(iii) Location of Playgrounds

Figure 5-62 (a) and (b) show location of playgrounds in all three groups.

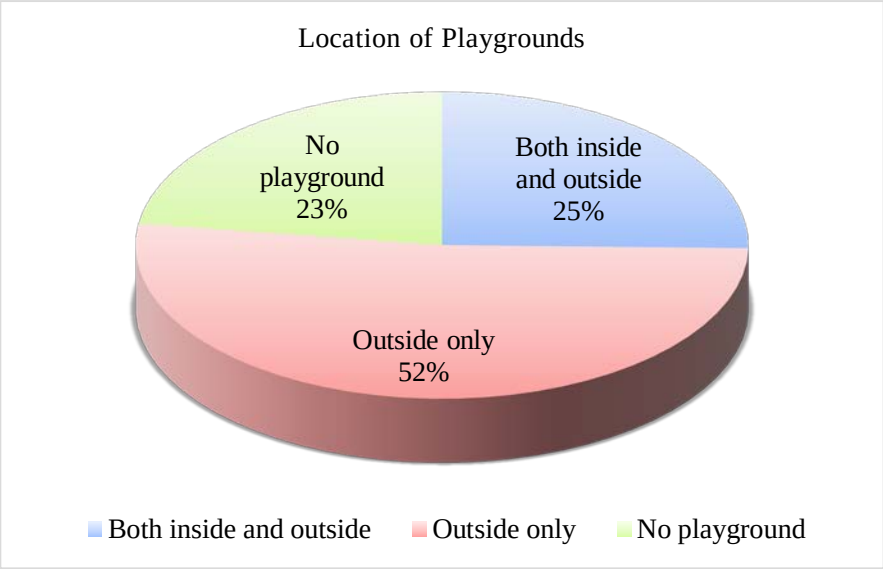

Figure 5-62 (a) Location of Playgrounds of Subjects in all three groups

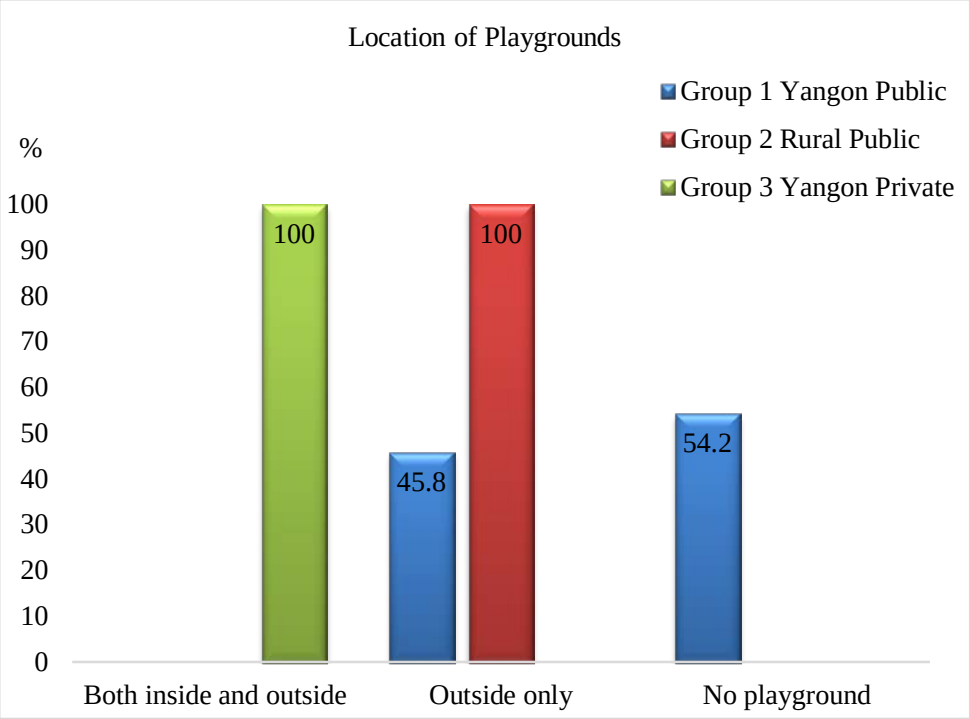

Figure 5-62 (b) Location of Playgrounds of Subjects in all three groups

(iv) Types of Houses

Figure 5-63 (a) and (b) show types of housing conditions of the subjects in all three groups.

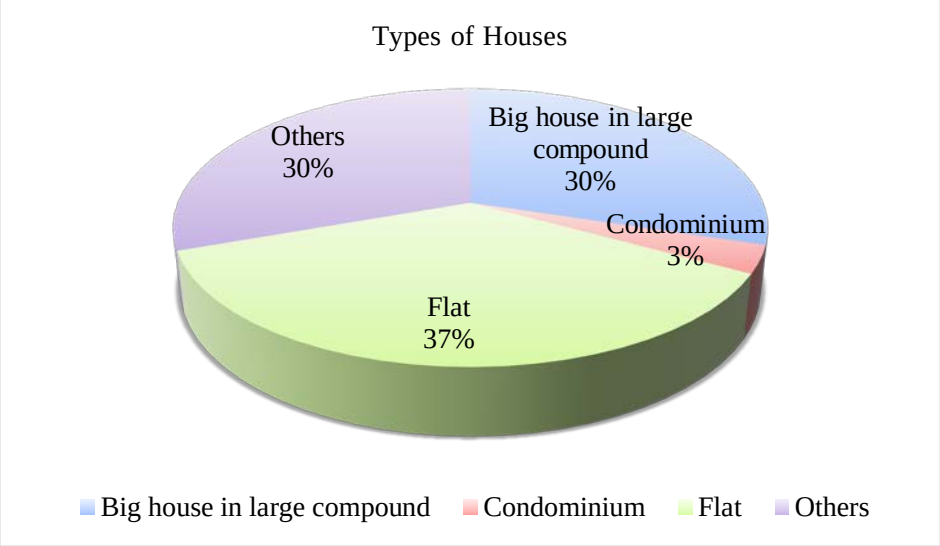

Figure 5-63 (a) Types of Houses of Subjects in all three groups

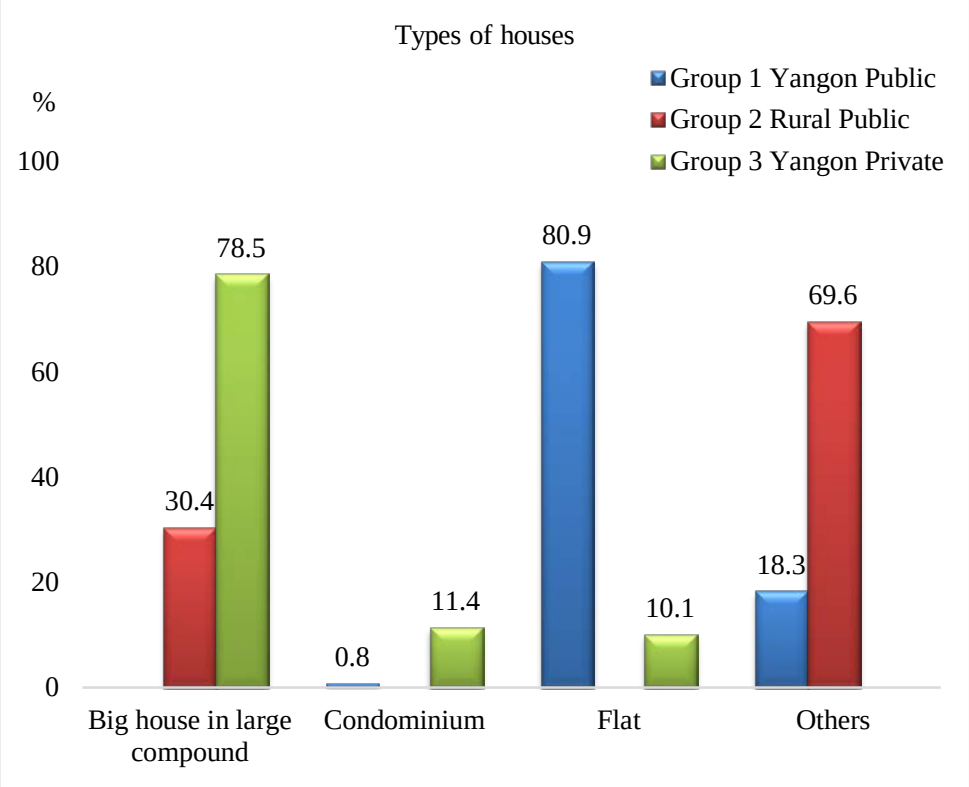

Figure 5-63 (b) Types of Houses of Subjects in all three groups

(v) Occupational Status of Parents

Figure 5-64 (a), (b), and (c) show parental occupational status of the subjects in all three groups.

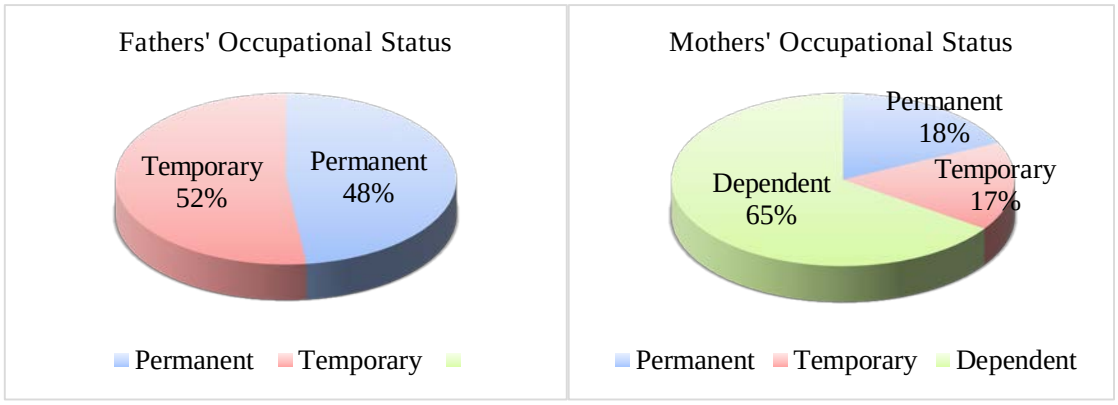

Figure 5-64 (a) Figure 5-64 (b)

Figure 5-64 (a) Fathers' Occupational Status and (b) Mothers' Occupational Status of all subjects

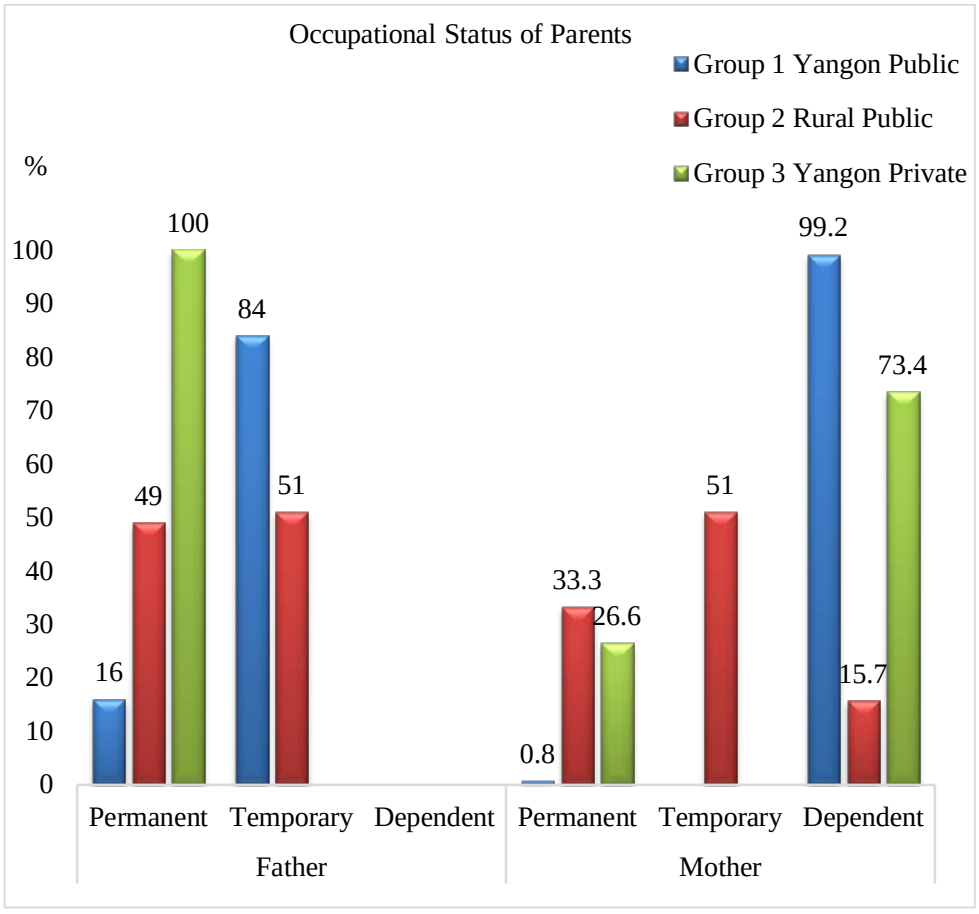

Figure 5-64 (c) Occupational Status of Parents of Subjects in all three groups

(vi) Educational Status of Parents

Figure 5-65 (a), (b), and (c) show parental education status of the subjects in all three groups.

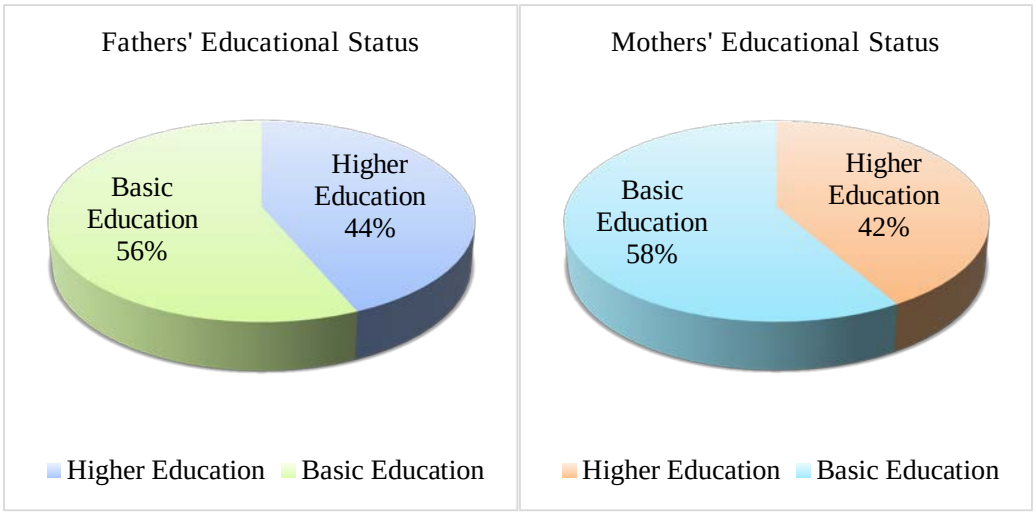

Figure 5-65 (a) Figure 5-65 (b)

Figure 5-65 (a) Fathers' Educational Status and (b) Mothers' Educational Status of all subjects

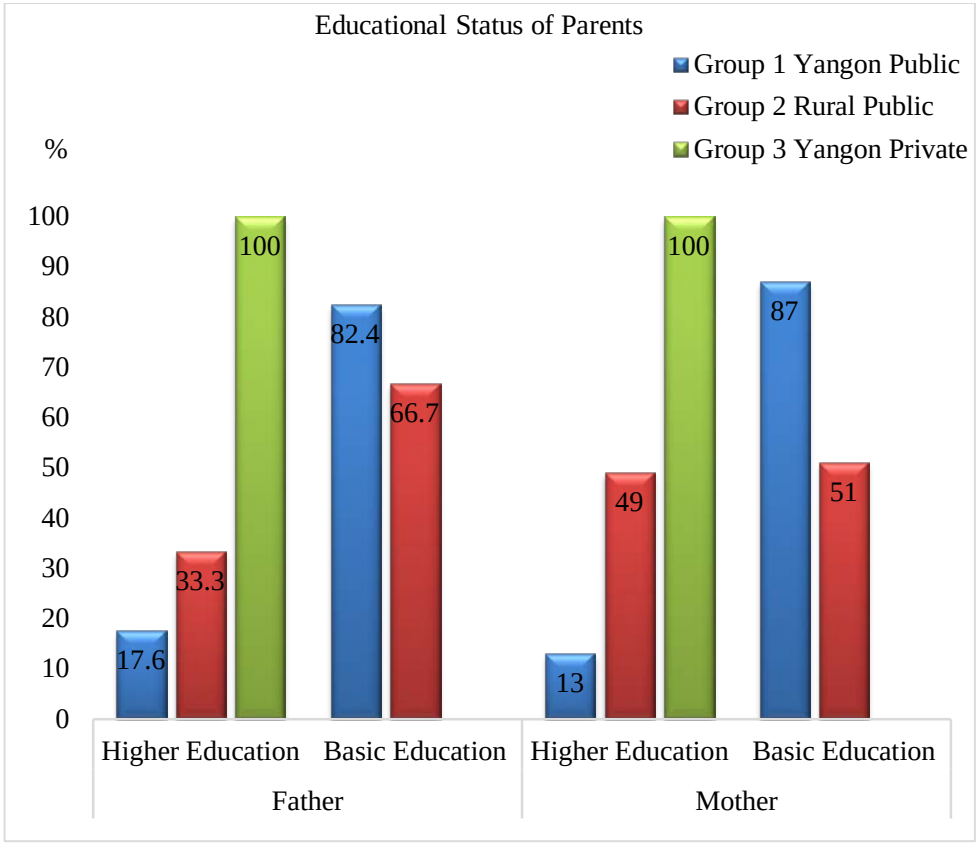

Figure 5-65 (c) Educational Status of Parents of Subjects in all three groups

5.3.5. Relation between Gross Motor Skill Development and Biological as well as Environmental factors (Results of Multivariate Multiple Regression analysis)

A multivariate multiple regression was calculated to predict the gross motor skill development (the locomotor raw scores, the locomotor standard scores, the object control raw scores, the object control standard scores, and the GMQ) based on two biological and eight environmental factors.

There were statistically significant differences in the gross motor skill development based on gender, types of school, types of playground, location of playground, types of house, and occupation of father but there were not statistically significant differences in the gross motor skill development based on weight ranks, occupation of mother, and educational levels of both parents (Table 5-11).

Table 5-11. Results of Gross motor skill development predicted by Biological and Environmental factors

Independent variables		*F* (4, 298)		Wilks' Lambda	Partial Eta-Squared
Biological factors	Gender	83.9	***	0.47	0.53
	Weight Status	0.99		0.99	0.01
Environmental factors	Types of school	6.54	***	0.92	0.08
	Types of playground	5.52	***	0.93	0.07
	Location of playground	4.31	**	0.95	0.06
	Types of house	3.1	*	0.96	0.04
	Father's occupation	4.49	**	0.94	0.06
	Mother's occupation	0.38		1.00	0.01
	Father's education level	0.51		0.99	0.01
	Mother's education level	1.59		0.98	0.02

*: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

Table 5-12 shows the results of Multivariate Multiple Regression analysis for the gross motor skills (five dependent variables) and Table 5-13 shows the results of relation between each gross motor skill development (dependent variable) and each socio-demographic factor (independent variable).

Table 5-12. Results of Multivariate Multiple Regression analysis for the gross motor skills (five dependent variables)

Dependent Variables	R squared	Adjusted R squared
Locomotor Raw Scores	0.16	0.13
Locomotor Standard Scores	0.19	0.16
Object Control Raw Scores	0.16	0.13
Object Control Standard Scores	0.07	0.04
Gross Motor Quotient	0.12	0.09

Table 5-13. Results of Relation between Gross Motor Skill Development and Socio-demographic factors

Biological and Environmental Factors	Locomotor Raw Scores			Locomotor Standard Scores			Object Control Raw Scores			Object Control Standard Scores			Gross Motor quotient		
	$F_{(1, 301)}$		η_p^2	$F_{(1, 301)}$		η_p^2	$F_{(1, 301)}$		η_p^2	$F_{(1, 301)}$		η_p^2	$F_{(1, 301)}$		η_p^2
Gender	0.00		0.000	0.45		0.001	35.6	***	0.106	1.80		0.006	4.50		0.005
Weight Status	2.80		0.009	2.42		0.008	1.79		0.006	1.91		0.006	3.40		0.011
Types of school	7.05	**	0.023	8.98	**	0.029	11.0	***	0.035	8.36	**	0.027	0.26		0.001
Types of playground	12.7	***	0.041	16.7	***	0.050	2.37		0.008	2.11		0.007	3.98	*	0.013
Location of playground	9.63	**	0.031	12.8	***	0.041	0.74		0.002	0.96		0.003	3.93	*	0.013
Types of house	9.70	**	0.031	11.9	***	0.038	0.00		0.000	0.03		0.000	6.43	*	0.021
Father's occupation	2.26		0.007	5.80	*	0.019	4.34	*	0.014	3.81		0.014	0.38		0.001
Mother's occupation	1.18		0.004	0.85		0.003	0.56		0.002	0.47		0.002	1.07		0.004
Father's education level	0.01		0.000	0.01		0.000	1.82		0.006	1.59		0.005	0.40		0.001
Mother's education level	2.94		0.010	4.40		0.014	1.63		0.005	1.30		0.004	4.49		0.015

Significant influence of the biological and environmental factors on the gross motor skill development, *: p<0.05, **: p<0.01, ***: p<0.001.

η_p^2 : Partial Eta Squared

5.3.5.1. Relation between Gross Motor Skill Development and Gender

Gender had statistically significant effect only on the object control raw scores $F_{(1, 301)} = 35.6$, $p<0.000$, partial Eta-squared = 0.106.

5.3.5.2. Relation between Gross Motor Skill Development and Types of schools

Types of schools had statistically significant effect on the:
Locomotor Raw Scores $F_{(1, 301)} = 7.05$, $p<0.01$, partial Eta-squared = 0.023
Locomotor Standard Scores $F_{(1, 301)} = 8.98$, $p<0.01$, partial Eta-squared = 0.029
Object Control Raw Scores $F_{(1, 301)} = 11.0$, $p<0.001$, partial Eta-squared = 0.035
Object Control Standard Scores $F_{(1, 301)} = 8.36$, $p<0.01$, partial Eta-squared = 0.027

5.3.5.3. Relation between Gross Motor Skill Development and Types of playgrounds

Types of playground had statistically significant effect on the:
Locomotor Raw Scores $F_{(1, 301)} = 12.7$, $p<0.001$, partial Eta-squared = 0.041
Locomotor Standard Scores $F_{(1, 301)} = 16.7$, $p<0.001$, partial Eta-squared = 0.050
GMQ $F_{(1, 301)} = 3.98$, $p<0.05$, partial Eta-squared = 0.013

5.3.5.4. Relation between Gross Motor Skill Development and Location of playground

Location of playground had statistically significant effect on the:
Locomotor Raw Scores $F_{(1, 301)} = 9.63$, $p<0.01$, partial Eta-squared = 0.031
Locomotor Standard Scores $F_{(1, 301)} = 12.8$, $p<0.001$, partial Eta-squared = 0.041
GMQ $F_{(1, 301)} = 3.93$, $p<0.05$, partial Eta-squared = 0.013

5.3.5.5. Relation between Gross Motor Skill Development and Types of houses

Types of house has statistically significant effect on the:
Locomotor Raw Scores $F_{(1, 301)} = 9.70$, $p<0.01$, partial Eta-squared = 0.031
Locomotor Standard Scores $F_{(1, 301)} = 11.9$, $p<0.001$, partial Eta-squared = 0.038
GMQ $F_{(1, 301)} = 6.43$, $p<0.05$, partial Eta-squared = 0.021

5.3.5.6. Relation between Gross Motor Skill Development and Occupation of Father

Occupation of Father had statistically significant effect on the:
Locomotor Standard Scores $F_{(1, 301)} = 5.80$, $p<0.05$, partial Eta-squared = 0.019
Object Control Raw Scores $F_{(1, 301)} = 4.34$, $p<0.05$, partial Eta-squared = 0.014

5.3.6. Relation between Gross Motor Skill Development and Socio-demographic factors (Results of Multiple Linear Regression analysis)

5.3.6.1. Relation between the Locomotor Raw Scores and Socio-demographic factors

A multiple linear regression was calculated to predict the locomotor raw scores based on two biological and eight environmental factors. A significant regression was found as F (10, 301) = 5.820, p<0.001 with R= 0.403, R^2 = 0.403, adjusted R^2 = 0.134, and standard error of the estimate = 6.976. The results are shown in Table 5-14 and Figure 5-66 to 5-68.

Table 5-14. Relationship between Locomotor Raw Scores and Socio-demographic factors

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	
(Constant)	58.6	6.74		8.70	***
Gender	0.03	0.81	0.00	0.04	
Weight Status	-0.97	0.58	-0.10	-1.67	
Types of Schools	-5.43	2.04	-0.58	-2.66	**
Types of Playgrounds	-9.95	2.79	-1.46	-3.57	***
Location of Playgrounds	9.01	2.90	0.83	3.10	**
Types of Houses	-1.85	0.59	-0.30	-3.12	**
Occupation of Father	-2.83	1.89	-0.19	-1.50	
Occupation of Mother	-0.88	0.81	-0.09	-1.09	
Education of Father	0.35	3.32	0.02	0.11	
Education of Mother	5.66	3.31	0.37	1.71	

a. Dependent Variable: Locomotor Raw Scores

**: p<0.01, ***: p<0.001

The predicted locomotor raw scores were equal to

Y_{LRS}=58.64 + (0.03Gender) + (-0.97Weight Status) + (-5.43Types of Schools) + (-9.95Types of Playgrounds) + (9.01Location of Playgrounds) + (-1.85Types of Houses) + (-2.83Occupation of Father) + (-0.88Occupation of Mother) + (0.35Education of Father) + (5.66Education of Mother)

Among ten socio-demographic factors (independent variables), only four i.e. Types of Schools, Types of Playgrounds, Location of Playgrounds, and Types of Houses were significant predictors of the locomotor raw scores of the subjects.

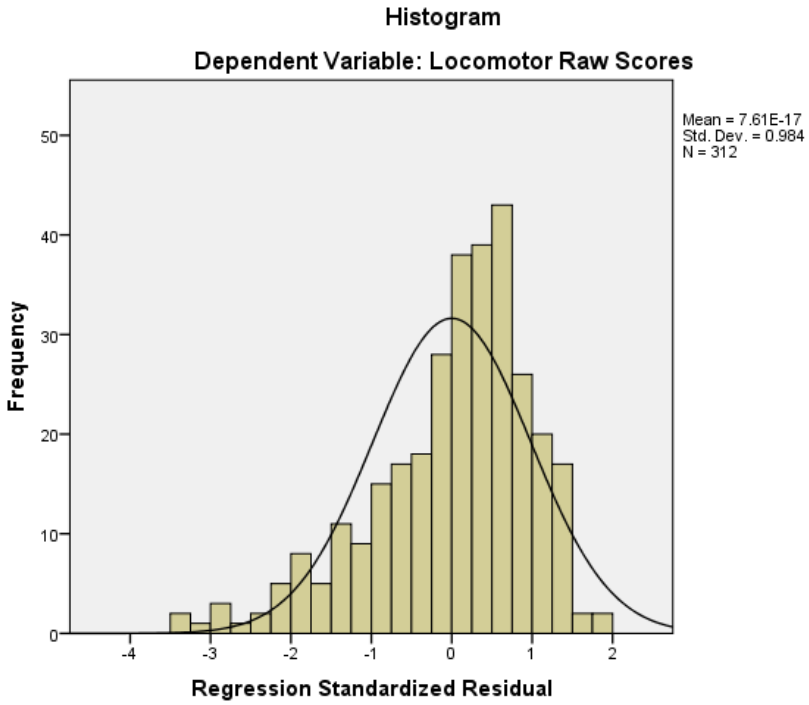

Figure 5-66. A histogram of Locomotor Raw Scores

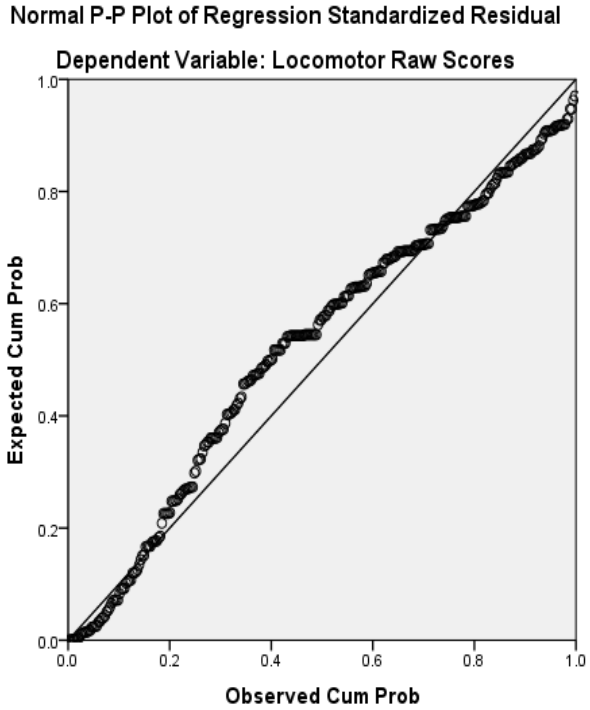

Figure 5-67. Normal P-P Plot of Regression Standardized Residual for Locomotor Raw Scores

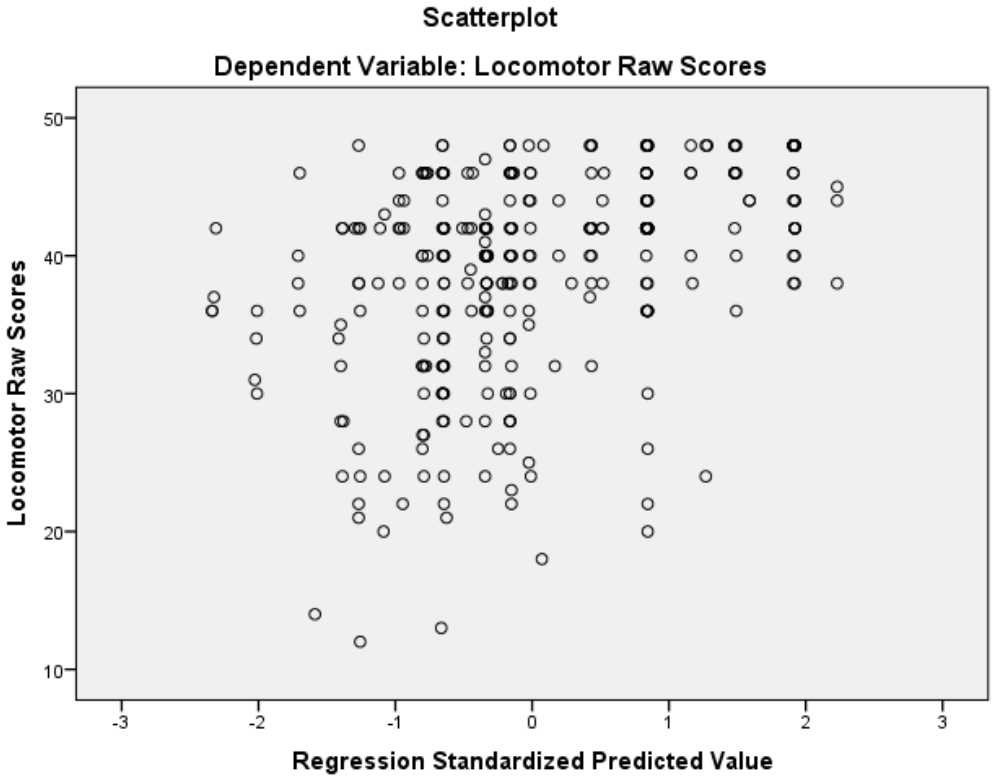

Figure 5-68. Scatter Plot for Locomotor Raw Scores

5.3.6.2. Relation between the Locomotor Standard Scores and Socio-demographic factors

A multiple linear regression was calculated to predict the locomotor standard scores based on two biological and eight environmental factors. A significant regression was found as F (10, 301) = 7.05, $p<0.001$ with R= 0.436, $R^2 = 0.190$, adjusted $R^2 = 0.163$, and standard error of the estimate = 3.387. The results are shown in Table 5-15 and Figure 5-69 to 5-71.

Table 5-15. Relationship between Locomotor Standard Scores and Socio-demographic factors

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	
	B	Std. Error	Beta		
(Constant)	23.8	3.27		7.28	***
Gender	-0.26	0.39	-0.04	-0.67	
Weight Status	-0.44	0.28	-0.09	-1.56	
Types of Schools	-2.97	0.99	-0.65	-3.00	**
Types of Playgrounds	-5.36	1.35	-1.59	-3.97	***
Location of Playgrounds	5.04	1.41	0.94	3.57	***
Types of Houses	-0.99	0.29	-0.32	-3.45	***
Occupation of Father	-2.20	0.92	-0.30	-2.41	*
Occupation of Mother	-0.36	0.39	-0.08	-0.92	
Education of Father	0.16	1.61	0.02	0.10	
Education of Mother	3.37	1.61	0.45	2.10	

a. Dependent Variable: Locomotor Standard Scores

*: $p<0.05$, **: $p<0.01$, ***: $p<0.001$

The predicted locomotor standard scores were equal to

Y_{LSS}=23.8 + (-0.26Gender) + (-0.44Weight Status) + (-2.97Types of Schools) + (-5.36Types of Playgrounds) + (5.04Location of Playgrounds) + (-0.99Types of Houses) + (-2.20Occupation of Father) + (-0.36Occupation of Mother) + (0.16Education of Father) + (3.37Education of Mother)

Among ten socio-demographic factors (independent variables), Types of Schools, Types of Playgrounds, Location of Playgrounds, Types of Houses, and Occupation of Father were significant predictors of the locomotor standard scores.

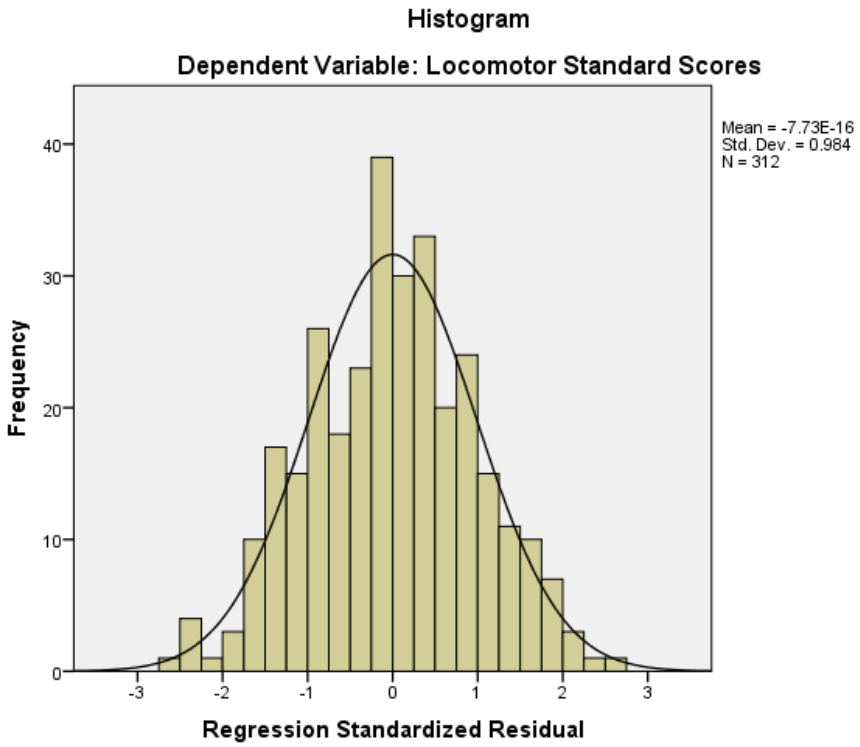

Figure 5-69. A histogram of Locomotor Standard Scores

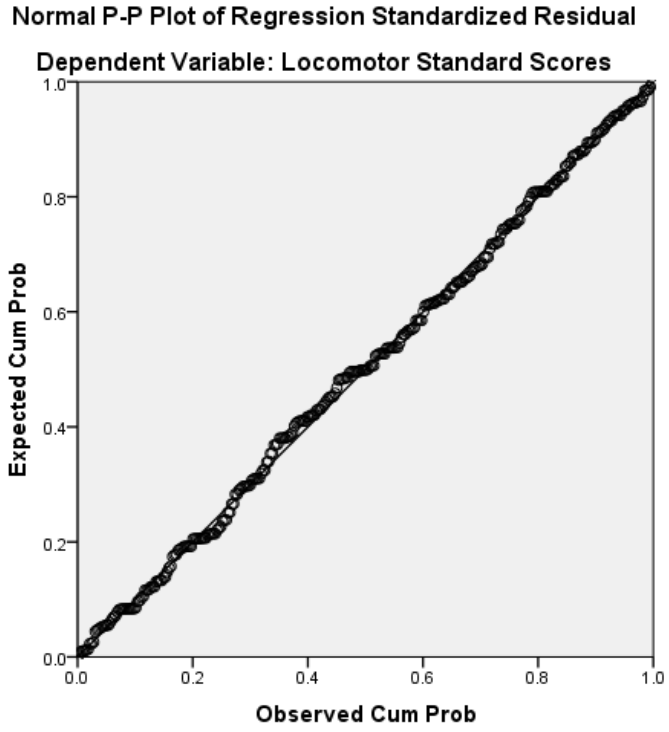

Figure 5-70. Normal P-P Plot of Regression Standardized Residual for Locomotor Standard Scores

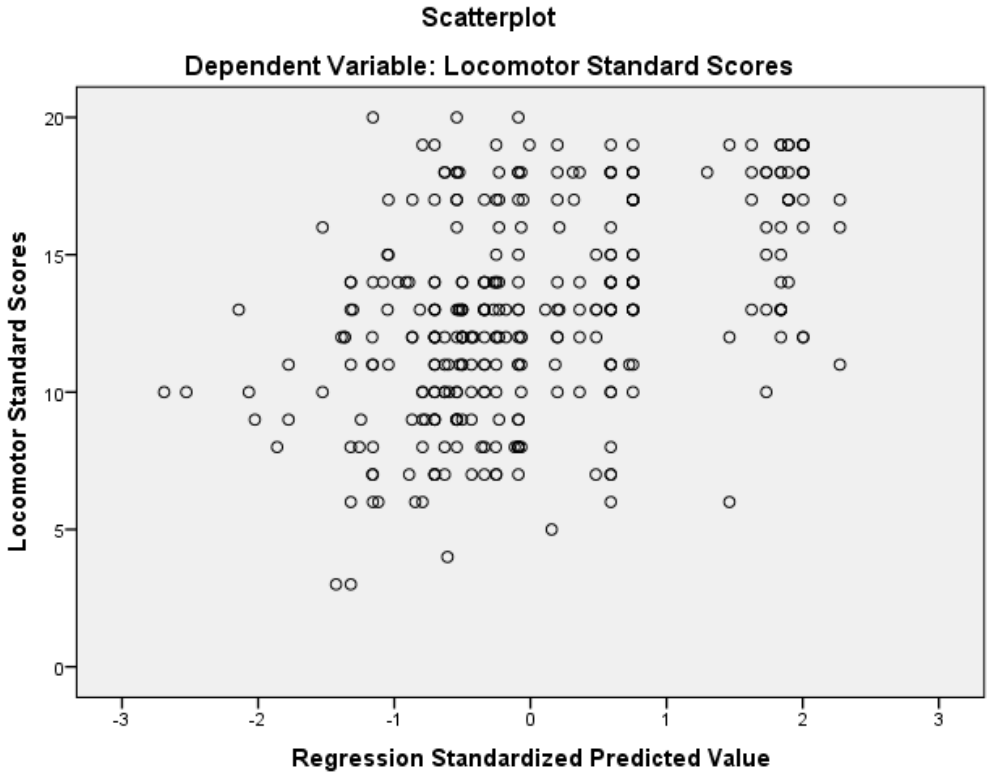

Figure 5-71. Scatter Plot for Locomotor Standard Scores

5.3.6.3. Relation between the Object Control Raw Scores and Socio-demographic factors

A multiple linear regression was calculated to predict the object control raw scores based on two biological and eight environmental factors. A significant regression was found as F (10, 301) = 5.79, $p<0.001$ with R= 0.402, $R^2 = 0.161$, adjusted $R^2 = 0.133$, and standard error of the estimate = 7.090. The results are shown in Table 5-16 and Figure 5-72 to 5-74.

Table 5-16. Relationship between Object Control Raw Scores and Socio-demographic factors

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	
	B	Std. Error	Beta		
(Constant)	15.4	6.85		2.25	*
Gender	-4.89	0.82	-0.32	-5.97	***
Weight Status	-0.79	0.59	-0.08	-1.34	
Types of Schools	6.88	2.08	0.73	3.31	***
Types of Playgrounds	4.36	2.83	0.63	1.54	
Location of Playgrounds	-2.53	2.95	-0.23	-0.86	
Types of Houses	-0.04	0.60	-0.01	-0.07	
Occupation of Father	3.99	1.92	0.26	2.08	*
Occupation of Mother	-0.62	0.82	-0.06	-0.75	
Education of Father	-4.55	3.37	-0.30	-1.35	
Education of Mother	4.30	3.36	0.28	1.28	

a. Dependent Variable: Object Control Raw Scores

*: $p<0.05$, ***: $p<0.001$

The predicted object control raw scores were equal to

Y_{OCRS}=15.4 + (-4.89Gender) + (-0.79Weight Status) + (6.88Types of Schools) + (4.36Types of Playgrounds) + (-2.53Location of Playgrounds) + (-0.04Types of Houses) + (3.99Occupation of Father) + (-0.62Occupation of Mother) + (-4.55Education of Father) + (4.30Education of Mother)

Among ten socio-demographic factors (independent variables), Gender, Types of Schools, and Occupation of Father were significant predictors of the object control raw scores.

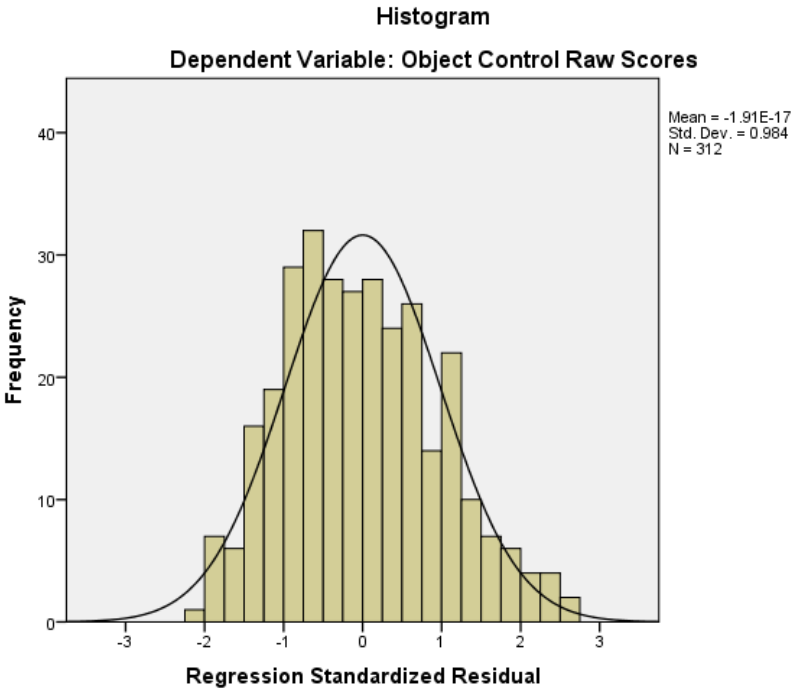

Figure 5-72. A histogram of Object Control Raw Scores

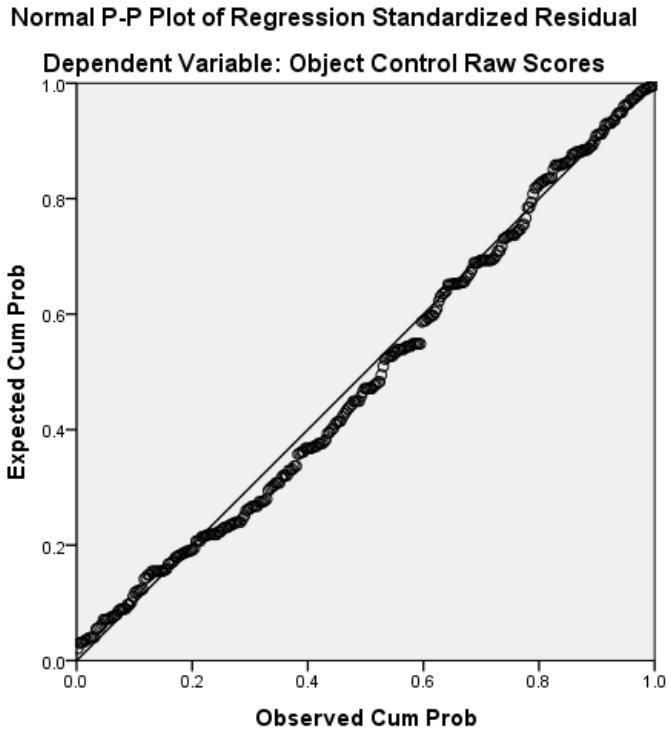

Figure 5-73. Normal P-P Plot of Regression Standardized Residual for Object Control Raw Scores

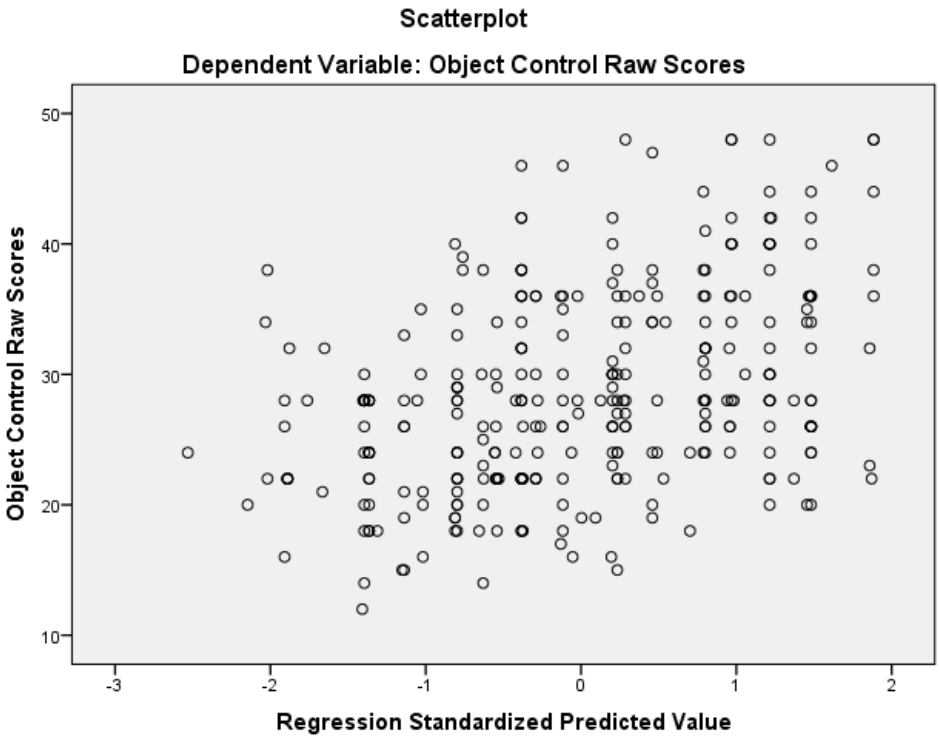

Figure 5-74. Scatter Plot for Object Control Raw Scores

5.3.6.4. Relation between the Object Control Standard Scores and Socio-demographic factors

A multiple linear regression was calculated to predict the object control standard scores based on two biological and eight environmental factors. A significant regression was found as F (10, 301) = 2.31, $p<0.05$ with R= 0.267, $R^2 = 0.71$, adjusted $R^2 = 0.040$, and standard error of the estimate = 2.672. The results are shown in Table 5-14 and Figure 5-72 to 5-74.

Table 5-14. Relationship between Object Control Standard Scores and Socio-demographic factors

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	
	B	Std. Error	Beta		
(Constant)	3.92	2.58		1.52	
Gender	-0.41	0.31	-0.08	-1.34	
Weight Status	-0.31	0.22	-0.08	-1.38	
Types of Schools	2.26	0.78	0.67	2.89	**
Types of Playgrounds	1.55	1.07	0.62	1.45	
Location of Playgrounds	-1.09	1.11	-0.28	-0.98	
Types of Houses	-0.04	0.23	-0.02	-0.18	
Occupation of Father	1.41	0.72	0.26	1.95	
Occupation of Mother	-0.21	0.31	-0.06	-0.68	
Education of Father	-1.60	1.27	-0.29	-1.26	
Education of Mother	1.44	1.27	0.26	1.14	

a. Dependent Variable: Object Control Standard Scores

**: $p<0.01$

The predicted object control standard scores were equal to

Y_{OCSS}=3.92 + (-0.41Gender) + (-0.31Weight Status) + (2.26Types of Schools) + (1.55Types of Playgrounds) + (-1.09Location of Playgrounds) + (-0.04Types of Houses) + (1.41Occupation of Father) + (-0.21Occupation of Mother) + (-1.60Education of Father) + (1.44Education of Mother)

Among ten socio-demographic factors (independent variables), Types of Schools was significant predictor of the object control standard scores.

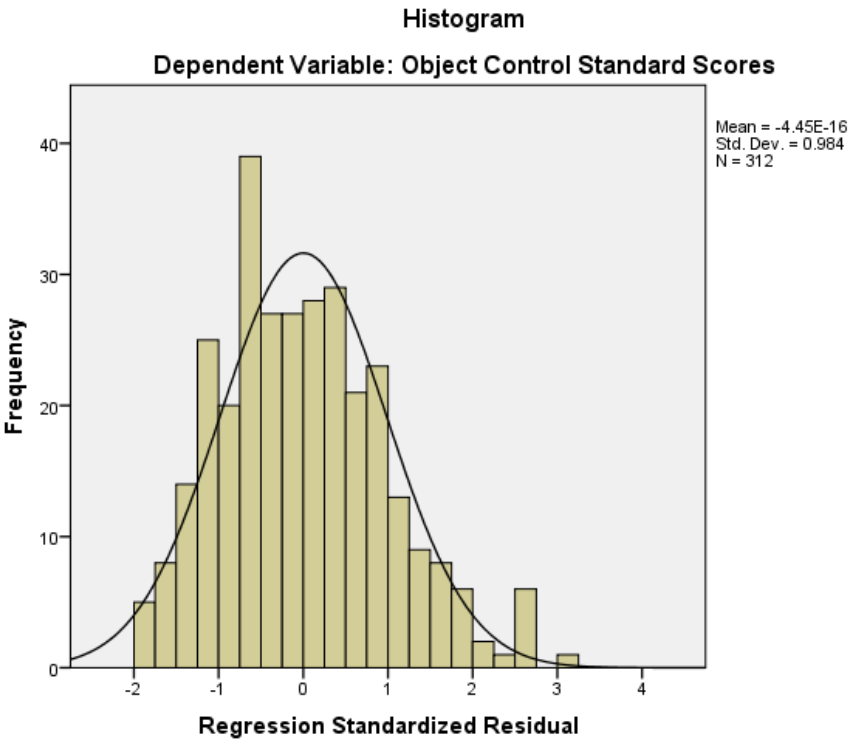

Figure 5-75. A histogram of Object Control Standard Scores

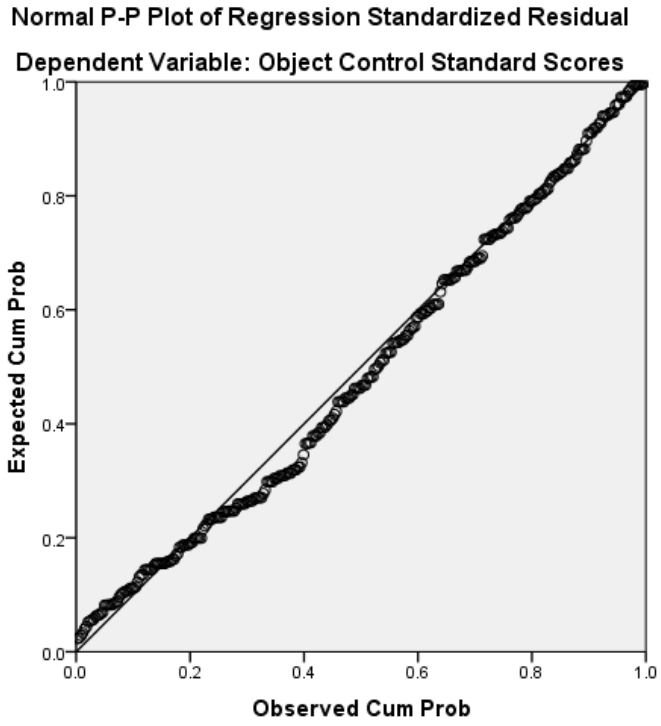

Figure 5-76. Normal P-P Plot of Regression Standardized Residual for Object Control Standard Scores

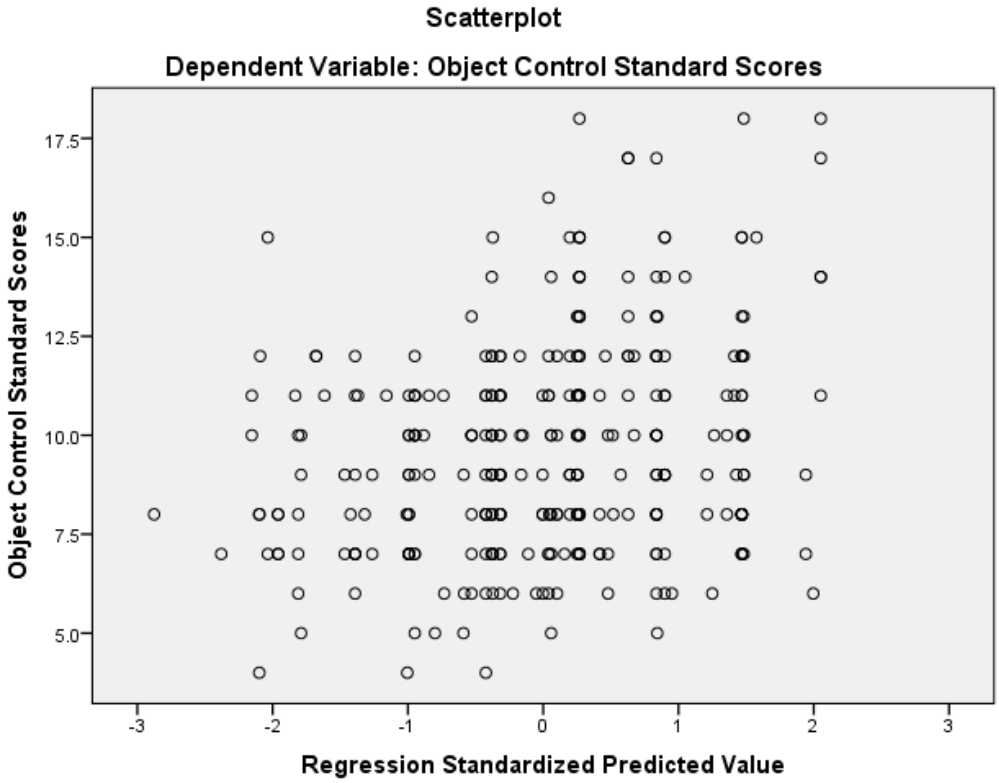

Figure 5-77. Scatter Plot for Object Control Standard Scores

5.3.6.5. Relation between the Gross Motor Quotient and Socio-demographic factors

A multiple linear regression was calculated to predict the Gross Motor Quotient based on two biological and eight environmental factors. A significant regression was found as F (10, 301) = 3.99, $p<0.001$ with R= 0.342, $R^2 = 0.117$, adjusted $R^2 = 0.088$, and standard error of the estimate = 14.373. The results are shown in Table 5-18 and Figure 5-78 to 5-80.

Table 5-18. Relationship between Gross Motor Quotient and Socio-demographic factors

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	
	B	Std. Error	Beta		
(Constant)	123.2	13.9		8.87	***
Gender	-2.03	1.66	-0.07	-1.22	
Weight Status	-2.23	1.19	-0.11	-1.87	
Types of Schools	-2.13	4.21	-0.11	-0.51	
Types of Playgrounds	-11.5	5.74	-0.84	-1.99	*
Location of Playgrounds	11.9	5.98	0.55	1.98	*
Types of Houses	-3.10	1.22	-0.25	-2.54	*
Occupation of Father	-2.38	3.88	-0.08	-0.61	
Occupation of Mother	-1.73	1.67	-0.09	-1.03	
Education of Father	-4.32	6.84	-0.14	-0.63	
Education of Mother	14.43	6.81	0.47	2.12	

a. Dependent Variable: GMQ

*: $p<0.05$***: $p<0.001$

The predicted Gross Motor Quotient was equal to

Y_{GMQ}=123.2 + (-2.03Gender) + (-2.23Weight Status) + (-2.13Types of Schools) + (-11.4Types of Playgrounds) + (11.8Location of Playgrounds) + (-3.10Types of Houses) + (-2.38Occupation of Father) + (-1.73Occupation of Mother) + (-4.32Education of Father) + (14.4Education of Mother)

Among ten socio-demographic factors (independent variables), Types of Playgrounds, Location of Playgrounds, and Types of Houses were significant predictors of the Gross Motor Quotient.

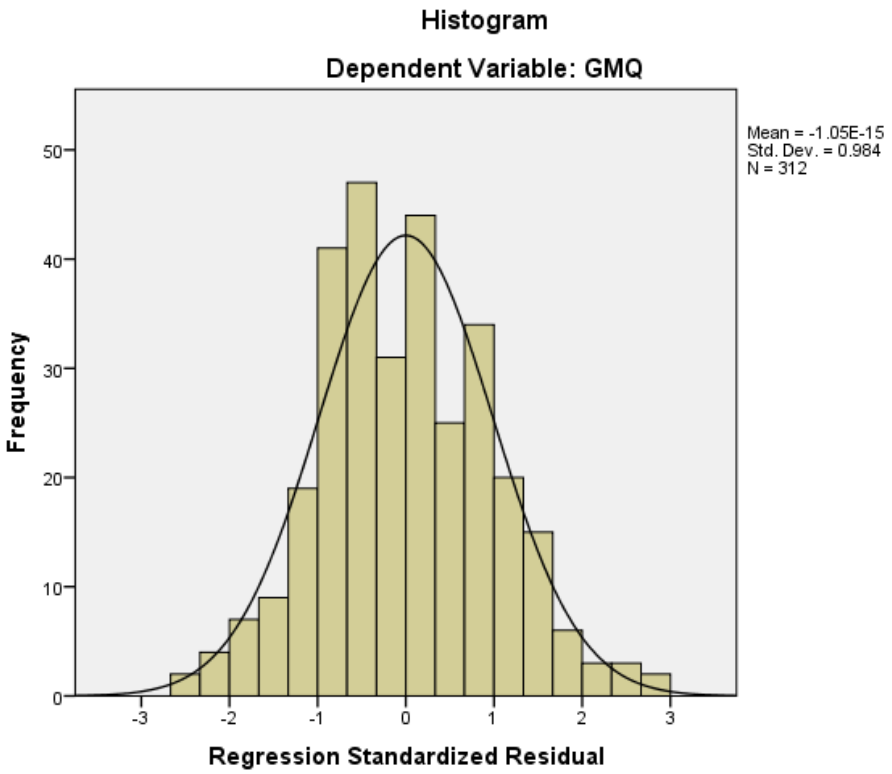

Figure 5-78. A histogram of GMQ

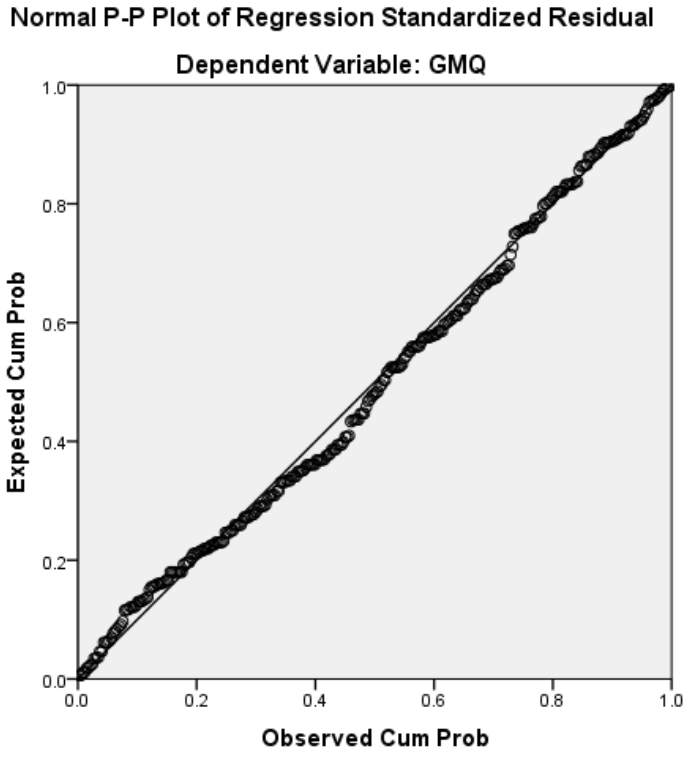

Figure 5-79. Normal P-P Plot of Regression Standardized Residual for GMQ

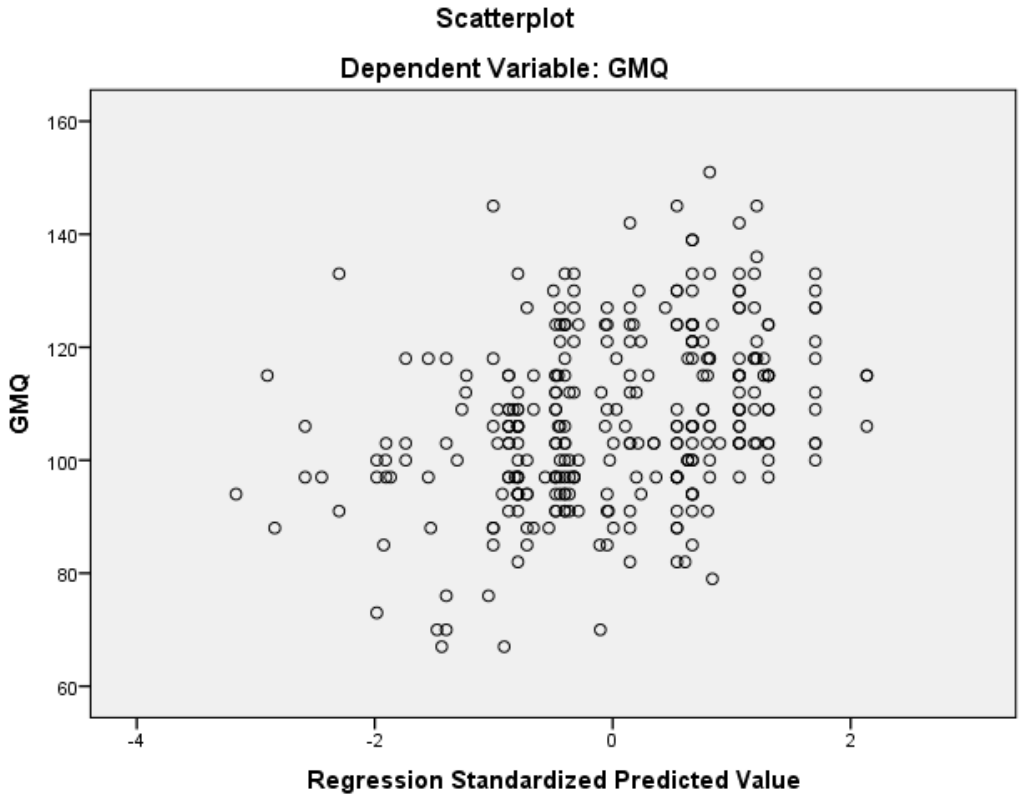

Figure 5-80. Scatter Plot for GMQ

5.4. Discussion

5.4.1. Gender

The multivariate multiple regression revealed that there were statistically significant differences in the gross motor skill development based on the gender of the subjects in this study. The findings were in line with the previous studies reporting the gender based differences on the gross motor skill development or motor competence. The gender significantly influenced only on the object control raw scores. The scores for the locomotor skills were not significantly different between the boys and girls. The findings of the gender based differences of the previous studies using the TGMD-2 have already been discussed in the Study 2 (Chapter 4).

5.4.2. Weight Status or BMI

5.4.2.1. No Relation

There were not statistically significant differences in the gross motor skill development based on weight ranks or the BMI. The findings of the current study were concurred with the previous studies which reported that there were not significant correlations between motor competences including gross motor skills and the BMI or weight status[55, 67, 70, 71, 106, 112, 122, 125, 146].

Yang et al. stated that the BMI had a very limited influence on the locomotor and object control skills in the preschoolers aged between 3- and 7-year-old[55]. Catenassi et al. also stated that the gross motor skills measured with the TGMD-2 did not relate with BMI in their study on relationship between BMI and gross motor skill in four to six year-old children[67]. Two studies in Brazil by Spessato et al. also stated that the BMI was not significantly correlated with motor competence which was measured with the TGMD-2[70, 71]. Logan et al. had also concluded that no significant relationship between motor skill proficiency measured with MABC-2 and the BMI in their study on the relationship between motor skill proficiency and BMI in preschool children[106]. Mülazımoğlu-Ballı, 2016 investigated the correlation between motor proficiency, measured with the BOT-2, and BMI in preschool children in Turkey and the result was found that no significant relationship between BOT-2 scores and the BMI[112]. Kemp and Pienaar examined relationships between body composition and motor and physical competence of Grade 1 learners in South Africa. They used the TGMD-2 only for the object control skills and they reported that no differences were found between the object control skills and the BMI[122]. The study on relations between some anthropometric characteristics and fundamental movement skills in eight-year-old children in Croatia by Franjko et al. also reported that there were not significant correlations between the fundamental movement skills in TGMD-2 scores and the BMI[125]. No significant correlation between the fundamental movement skills and the BMI in Australian children was also reported by Hume et al[146].

5.4.2.2. Relation

The findings of the current study were different from some previous studies which reported that the relation between the motor skills and weight status[53, 54, 91, 92, 97, 98, 107, 109, 110, 117, 121, 124, 134, 152].

Khalaj and Amri assessed the mastery of gross motor skills in obese and normal-weight KG children by using the TGMD-2 and they reported that obese children had poorer gross motor skill performance compare to their normal-weight peers[53]. They also reported the similar findings in their other study[54]. Nervik et al. reported that the children with high BMI had difficulties with their gross motor skills in the children aged 3- to 5-year-old[91]. Hamilton et al. also reported that negative correlation was found between BMI & visual motor integration scores[92]. Two studies by Vameghi et al. also reported that overweight and obese children have lower performance than normal children and negative correlations between some gross motor skills and the BMI[97, 98]. D'Hondt et al. had found that the children with higher BMI or obese children had lower motor skills[107]. Normal weight children performed significantly better than obese children[124]. Castetbon and Andreyeva concluded that motor skills are adversely associated with childhood obesity only for skills most directly related to body weight[109]. Roberts et al. had found that obesity displayed lower gross motor skill levels[110]. Cliff et al., 2012 had found that the scores of all 12 gross motor skills of the TGMD-2 were lower among overweight/obese Australian children[117]. Siahkohian et al investigated the relationships between fundamental movement skills, measured with the TGMD-2, and BMI of the 7-to-8 year-old children and the results showed significant negative correlations between the raw scores of the locomotor skills and the BMI[121]. Duncan et al examined the association between functional movement and overweight and obesity in British children[124]. They had found that total functional movement score was significantly, negatively correlated with BMI[124]. DeMeester et al also reported that the children with higher BMI had lower motor competence[134]. Gentier et al. stated that obese children were worse on fine and gross motor skills than healthy-weight peers[152].

5.4.3. Environmental Factors (Schools, Playgrounds, Houses, Parental occupation and education)

There were statistically significant differences were found on the individual locomotor skills, except the hop and the slide, and the individual object control skills, except the catch and the roll. The statistically significant differences were also found on the raw, standard, and percentile scores of both locomotor and object control skills as well as the GMQ.

The subjects from the Group 2 (Rural Public schools) had the highest scores on the raw, standard, and percentile scores of the locomotor skills among three groups but they had lower object control skills. The reasons of this findings might be presence of enough open spaces around homes and schools in the rural area and absence of structured gross motor skill programs and inadequate equipment, for example different sizes of balls, for every child at the schools in the Group 2 (Rural Public schools). The highest scores on the raw, standard, and percentile scores of the object control skills were found in the subjects from the Group 3

(Yangon Private schools). This might be due to the structured physical education class including ball skills for 45 minutes once a week in the Group 3. The scores for the gross motor skills, both the locomotor and the object control skills, were significantly lower in the subjects in the Group 1 (Yangon Public schools) when compared to the other two groups. The majority of subjects in the Group 1 (Yangon Public schools) spent their free play time in their class room because of lack of playgrounds or limited spaces for free play at the schools. There was also absence of structured gross motor skill programs and inadequate equipment, for example different sizes of balls, for every child at the schools in the Group 1 (Yangon Public schools).

A multivariate multiple regression results of this study revealed that there were statistically significant differences in the gross motor skill development based on types of school, types of playground, location of playground, types of house, and occupation of father.

The findings of the current study were similar to the previous studies[52, 66, 87, 95, 103, 104, 151].

Chow and Louie examined the influence of preschool type (public vs private) on motor skill performance in preschool children ages 3 to 6.5 years by using the TGMD-2 in Hong Kong[52]. The public preschools provided limited spaces for free play with only indoor physical play areas while the private preschools provided both indoor and outdoor physical play areas which were at least twice the size of the public preschools in their study[52]. They had found that children from private preschools performed better on the locomotor skills than those from public preschools[52]. Tsapakidou et al., 2014 compared the locomotor skills with the TGMD-2 in 8- to 9-year old children between two clearly different public elementary schools based on socioeconomic status[87]. Their results showed that there was statistically significant difference on the locomotor skills between the two schools[87]. Giagazoglou et al. determined effects of the characteristics of two different preschool-type setting (public vs private) on gross motor development of 4- to 6-year old preschoolers in Greece[95]. The private preschools in their study had plenty of open space for playing, gymnasia, courts, and playgrounds and included daily exercise physical activity programs[95]. However, the public preschools in their study had limited spaces for sports and free play and did not include any physical education lessons[95]. Their results showed that the locomotor skills of the children from the private schools displayed higher quotients[95]. True et al. examined the contribution of various preschool environmental characteristics to children's locomotor, object control, and total gross motor scores in 3- to 5-year old children from three types of preschools in the US[103]. They used the Children's Activity and Movement in Preschool Study Motor Skills Protocol which was similar in nature to the TGMD-2[103]. They reported that the size of outdoor playground was one of the significant predictors of the locomotor score and total motor score[103].

Gadžić et al., 2015 determined the influence of certain socio-demographic factors on the relationships between motor and cognitive abilities of the primary school students[151]. They concluded that residential status and father's education had a significant influence on the motor and cognitive abilities[151]. The subjects from urban area in their study had higher scores in the majority of motor tests (except for rural girls) [151].

Hua et al., measures the motor performance of 3- to 6-year old Han ethnic children in China by using MABC-2 and they had also found that the presence of indoor or outdoor space for play in home and school environments influences on the motor skill development of the children[104].

Duarte et al. also used the TGMD-2 to assess the gross motor skill development of the Brazilian children between 36 and 42 months of age and they examined the relationship between motor development, socio-demographic and the child's home environment conditions[66]. The results of their study also stated that the gross motor skill development of the children was significantly different based on home environments[66].

The results of the research by Tsapakidou et al., 2014 showed that children's performance was not influenced by their paternal education level, while influenced by their maternal level of education[87].

The limitations of this study were that the groups could not be differentiate based on the SES, and the reliable and valid standardized questionnaire was not used for assessing home and school environments. Although this study assessed four different categories of houses but the results was determined by presence or absence of spaces around home environments. Notwithstanding the subject lived in "other type of house" (Figure 5-10 (e) and (f)), which means a small house or hut, the subject in rural area had better scores on the locomotor skills when compared to those who lived in the same type of house in urban area. Future studies are still needed to assess home environment with the standardized assessment tool and find out other factors influencing the gross motor skill development.

5.5. Conclusion

In conclusion, the results of the Study 3 revealed that the gross motor skill development of KG children in Myanmar was influenced by gender and environment conditions (presence or absence of playground or open space for free play) of schools and home.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This thesis had one general aim and six specific aims (objectives) which were described in the Chapter 2.

The aims were achieved through three linked studies.

The first study, reliability study of the TGMD-2, recruited 5-year-old KG students of 2016-2017 academic year from one public school in Yangon city area (Urban) in July and August 2016. The reliability of the TGMD-2 for assessing Myanmar KG aged children was confirmed by using the inter-rater, the test-retest, and the intra-rater reliability tests. The reliability coefficients for the test items of the TGMD-2 showed good to excellent agreement or consistency.

The second study recruited the KG students of 2016-2017 academic year from one private school and three public schools in Yangon city area (Urban) and four public schools in one rural administrative area of Bago region (West) of Myanmar. The mean scores of the TGMD-2 were compared between the boys and girls and also between urban and rural areas. The results showed the significant differences between two genders and also between two areas. Most of the locomotor skills were not significantly different between the boys and girls but the boys had significantly better scores on the object control skills. The subjects from rural area had better scores on the locomotor skills while the subjects from Yangon (urban area) had better object control skills.

The third study recruited the same subjects from the second study after excluding the subjects who involved in the first study, who were older than 6-year- old and who did not give consents for socio-demographic factors. The mean scores of the TGMD-2 were compared among three types of schools. The best performances of the locomotor skills were found in the subjects from the Group 2 and the object control skills were found in the Group 3. The subjects with “very poor” level were only found in the Group 1. The influence of biological and environmental factors (10 independent variables) on the gross motor skill development (locomotor raw scores, locomotor standard scores, object control raw scores, object control standard scores, and the GMQ of TGMD-2) (5 dependent variables) were determined. The results revealed that statistically significant differences in the gross motor skill development based on some factors (gender, and presence or absence of playground or open space for free play at schools and home. The environment of schools and home play an important role in the gross motor skills development.

In conclusion, the TGMD-2 can be used for assessing the gross motor skill development in Myanmar KG children. The findings will be able to provide the normative reference for the mastery level of the gross motor skills in 5-year-old children for future studies not only in Myanmar but also in other countries. The findings will be able to provide some consideration for the policy makers in the improvement of new KG education system and supporting facilities in the schools.

6.2. Recommendations for service provision and future research

It would be better if the public schools in urban area (Yangon city area) had playgrounds or enough open spaces for free play for the children.

It would be better if the public schools were provided with regular structured gross motor skill exercise programs and necessary equipment for the gross motor skill development.

It will be better if Physical Therapists involve in the school health services which have been implemented with the collaboration of the Department of Public Health under the MOHS and the Department of basic Education under the MOE in Myanmar to provide systematic and standardized assessment of the gross motor skill development and necessary structured gross motor skill exercise programs. If Physical Therapists work in the educational environment or involve in the team of the school health services in the future, it will be more benefit for all the students, especially for the children, with and without disabilities.

Future studies are still necessary:

1) To investigate the reliability of the TGMD-2 in different age groups
2) To study the gross motor skill development of the children in different age groups to be able to establish the normative samples of the gross motor skill development for Myanmar
3) To study the gross motor skill development of the children in different major ethnic groups in different states and regions in Myanmar using larger nationwide data
4) To find out other possible factors such as different ethnicity and culture or others influencing the gross motor skill development
5) To determine the efficacy of exercise programs or gross motor skill development programs for those whose skill ranks are poor
6) To study fine motor skill development of the motor domain, and other developmental domains of the KG aged children

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List of Publications and Conference Presentations

Publications

1) Thanda Aye, Soe Thein, Thaingi Hlaing: Effects of strength training program on hip extensors and knee extensors strength of lower limb in children with spastic diplegic cerebral palsy. J Phys Ther Sci, 2016, 28 (2): 671-676.

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Conference Presentations

1) Thanda Aye: Physiotherapy Education in University of Medical Technology, Yangon, Myanmar. 第 3 回日本リハビリテーション国際交流協会学術大会, Tokyo, Japan　2015/07/25

2) Thanda Aye, Tsugumi Kuramoto-Ahuja, Heonsoo Han, Hitoshi Maruyama: Immediate effects of medical stretching on Hamstrings flexibility. 第 80 回理学療法科学学会学術大会　IUHW, Odawara Campus, Japan　2016/01/24

3) Thanda Aye: Current situation and future of Physical Therapy in Myanmar. International Symposium, 30th Anniversary Congress of Society of Physical Therapy Science, Tokyo, Japan 2016/06/18

4) Thanda Aye, Tsugumi Kuramoto-Ahuja, Hitoshi Maruyama: Presentation of TGMD-2 (Test of Gross Motor Development, Second edition).第 86 回理学療法科学学会学術大会　IUHW, Odawara Campus, Japan　2017/01/22

5) Thanda Aye, Tsugumi Kuramoto-Ahuja, Heonsoo Han, Hitoshi Maruyama: Comparison between Immediate effects of two medical stretching techniques on Hamstrings flexibility. 第 87 回理学療法科学学会学術大会　IUHW, Narita Campus, Japan　2017/03/12

APPENDICES

TGMD–2

Test of Gross Motor Development–Second Edition

Profile/Examiner Record Form

Section I. Identifying Information

Name _____ School _____

Male ☐ Female ☐ Grade _____ Referred by _____

Date of Testing _____ _____ _____ Reason for Referral _____

Date of Birth _____ _____ _____ Examiner _____

Age _____ _____ _____ Examiner's Title _____

Section II. Record of Scores

First Testing

	Raw Score	Standard Score	Percentile	Age Equivalent
Locomotor	____	____	____	____
Object Control	____	____	____	____
Sum of Standard Scores		____		
Gross Motor Quotient		____	____	

Second Testing

	Raw Score	Standard Score	Percentile	Age Equivalent
Locomotor	____	____	____	____
Object Control	____	____	____	____
Sum of Standard Scores		____		
Gross Motor Quotient		____	____	

Section III. Testing Conditions

A. Place Tested _____

	Interfering				Not Interfering
B. Noise Level	1	2	3	4	5
C. Interruptions	1	2	3	4	5
D. Distractions	1	2	3	4	5
E. Light	1	2	3	4	5
F. Temperature	1	2	3	4	5

G. Notes and other considerations _____

Section IV. Other Test Data

Name of Test	Date	Standard Score	TGMD–2 Equivalent

Section V. Profile of Standard Scores

Standard Scores	Locomotor	Object Control	Standard Scores	Quotients	Gross Motor Quotient	Quotients
20	.	.	20	150	.	150
19	.	.	19	145	.	145
18	.	.	18	140	.	140
17	.	.	17	135	.	135
16	.	.	16	130	.	130
15	.	.	15	125	.	125
14	.	.	14	120	.	120
13	.	.	13	115	.	115
12	.	.	12	110	.	110
11	.	.	11	105	.	105
10	__	__	10	100	__	100
9	.	.	9	95	.	95
8	.	.	8	90	.	90
7	.	.	7	85	.	85
6	.	.	6	80	.	80
5	.	.	5	75	.	75
4	.	.	4	70	.	70
3	.	.	3	65	.	65
2	.	.	2	60	.	60
1	.	.	1	55	.	55

Additional copies of this form (#9262) may be purchased from
PRO-ED, 8700 Shoal Creek Blvd., Austin, TX 78757-6897
800/897-3202 Fax 800/397-7633 www.proedinc.com

Section VI. Subtest Performance Record

Preferred Hand: Right ☐ Left ☐ Not Established ☐
Preferred Foot: Right ☐ Left ☐ Not Established ☐

Locomotor Subtest

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Run	60 feet of clear space, and two cones	Place two cones 50 feet apart. Make sure there is at least 8 to 10 feet of space beyond the second cone for a safe stopping distance. Tell the child to run as fast as he or she can from one cone to the other when you say "Go." Repeat a second trial.	1. Arms move in opposition to legs, elbows bent			
			2. Brief period where both feet are off the ground			
			3. Narrow foot placement landing on heel or toe (i.e., not flat footed)			
			4. Nonsupport leg bent approximately 90 degrees (i.e., close to buttocks)			
					Skill Score	
2. Gallop	25 feet of clear space, and tape or two cones	Mark off a distance of 25 feet with two cones or tape. Tell the child to gallop from one cone to the other. Repeat a second trial by galloping back to the original cone.	1. Arms bent and lifted to waist level at takeoff			
			2. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot			
			3. Brief period when both feet are off the floor			
			4. Maintains a rhythmic pattern for four consecutive gallops			
					Skill Score	
3. Hop	A minimum of 15 feet of clear space	Tell the child to hop three times on his or her preferred foot (established before testing) and then three times on the other foot. Repeat a second trial.	1. Nonsupport leg swings forward in pendular fashion to produce force			
			2. Foot of nonsupport leg remains behind body			
			3. Arms flexed and swing forward to produce force			
			4. Takes off and lands three consecutive times on preferred foot			
			5. Takes off and lands three consecutive times on nonpreferred foot			
					Skill Score	
4. Leap	A minimum of 20 feet of clear space, a beanbag, and tape	Place a beanbag on the floor. Attach a piece of tape on the floor so it is parallel to and 10 feet away from the beanbag. Have the child stand on the tape and run up and leap over the beanbag. Repeat a second trial.	1. Take off on one foot and land on the opposite foot			
			2. A period where both feet are off the ground longer than running			
			3. Forward reach with the arm opposite the lead foot			
					Skill Score	

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
5. Horizontal Jump	A minimum of 10 feet of clear space and tape	Mark off a starting line on the floor. Have the child start behind the line. Tell the child to jump as far as he or she can. Repeat a second trial.	1. Preparatory movement includes flexion of both knees with arms extended behind body			
			2. Arms extend forcefully forward and upward reaching full extension above the head			
			3. Take off and land on both feet simultaneously			
			4. Arms are thrust downward during landing			
					Skill Score	
6. Slide	A minimum of 25 feet of clear space, a straight line, and two cones	Place the cones 25 feet apart on top of a line on the floor. Tell the child to slide from one cone to the other and back. Repeat a second trial.	1. Body turned sideways so shoulders are aligned with the line on the floor			
			2. A step sideways with lead foot followed by a slide of the trailing foot to a point next to the lead foot			
			3. A minimum of four continuous step–slide cycles to the right			
			4. A minimum of four continuous step–slide cycles to the left			
					Skill Score	
				Locomotor Subtest Raw Score (sum of the 6 skill scores)		

Object Control Subtest

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Striking a Stationary Ball	A 4-inch lightweight ball, a plastic bat, and a batting tee	Place the ball on the batting tee at the child's belt level. Tell the child to hit the ball hard. Repeat a second trial.	1. Dominant hand grips bat above nondominant hand			
			2. Nonpreferred side of body faces the imaginary tosser with feet parallel			
			3. Hip and shoulder rotation during swing			
			4. Transfers body weight to front foot			
			5. Bat contacts ball			
					Skill Score	
2. Stationary Dribble	An 8- to 10-inch playground ball for children ages 3 to 5; a basketball for children ages 6 to 10; and a flat, hard surface	Tell the child to dribble the ball four times without moving his or her feet, using one hand, and then stop by catching the ball. Repeat a second trial.	1. Contacts ball with one hand at about belt level			
			2. Pushes ball with fingertips (not a slap)			
			3. Ball contacts surface in front of or to the outside of foot on the preferred side			
			4. Maintains control of ball for four consecutive bounces without having to move the feet to retrieve it			
					Skill Score	

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
3. Catch	A 4-inch plastic ball, 15 feet of clear space, and tape	Mark off two lines 15 feet apart. The child stands on one line and the tosser on the other. Toss the ball underhand directly to the child with a slight arc aiming for his or her chest. Tell the child to catch the ball with both hands. Only count those tosses that are between the child's shoulders and belt. Repeat a second trial.	1. Preparation phase where hands are in front of the body and elbows are flexed			
			2. Arms extend while reaching for the ball as it arrives			
			3. Ball is caught by hands only			
					Skill Score	
4. Kick	An 8- to 10-inch plastic, playground, or soccer ball; a beanbag; 30 feet of clear space; and tape	Mark off one line 30 feet away from a wall and another line 20 feet from the wall. Place the ball on top of the beanbag on the line nearest the wall. Tell the child to stand on the other line. Tell the child to run up and kick the ball hard toward the wall. Repeat a second trial.	1. Rapid continuous approach to the ball			
			2. An elongated stride or leap immediately prior to ball contact			
			3. Nonkicking foot placed even with or slightly in back of the ball			
			4. Kicks ball with instep of preferred foot (shoelaces) or toe			
					Skill Score	
5. Overhand Throw	A tennis ball, a wall, tape, and 20 feet of clear space	Attach a piece of tape on the floor 20 feet from a wall. Have the child stand behind the 20-foot line facing the wall. Tell the child to throw the ball hard at the wall. Repeat a second trial.	1. Windup is initiated with downward movement of hand/arm			
			2. Rotates hip and shoulders to a point where the nonthrowing side faces the wall			
			3. Weight is transferred by stepping with the foot opposite the throwing hand			
			4. Follow-through beyond ball release diagonally across the body toward the nonpreferred side			
					Skill Score	
6. Underhand Roll	A tennis ball for children ages 3 to 6; a softball for children ages 7 to 10; two cones; tape; and 25 feet of clear space	Place the two cones against a wall so they are 4 feet apart. Attach a piece of tape on the floor 20 feet from the wall. Tell the child to roll the ball hard so that it goes between the cones. Repeat a second trial.	1. Preferred hand swings down and back, reaching behind the trunk while chest faces cones			
			2. Strides forward with foot opposite the preferred hand toward the cones			
			3. Bends knees to lower body			
			4. Releases ball close to the floor so ball does not bounce more than 4 inches high			
					Skill Score	
					Object Control Subtest Raw Score (sum of the 6 skill scores)	

Appendix 2 Simple Socio-demographic Questionnaire

Name of School ---------- Date 2016/-----MM/----DD

Name of child---------- Father's name---------- Mother's name----------

Address----------

I. Biological factors

i. Gender 1 Boy ☐ 2 Girl ☐

ii. Height ☐ cm Weight ☐ kg

II. Environmental factors

Playground in school (Choose only ONE) ☑

1. Large area with facilities for gross motor skill development (e.g. slides, swings) ☐
2. Large area without any facility ☐
3. Small limited area ☐
4. No playground ☐

Type of house (Choose only ONE) ☑

i. A house in large compound ☐
ii. Condominium ☐
iii. Apartment/Flat ☐
iv. Other ☐

Education Background of the child's parents (Choose only ONE each for father and mother) ☑

		Father	Mother
i. Higher Education (Diploma/ Bachelor/ Master/ Doctorate)	1	☐	☐
ii. Basic Education (No formal education/ Religious school/ Primary school/ Middle school/ High school)	2	☐	☐

Occupation of the child's parents (Choose only ONE each for father and mother) ☑

		Father	Mother
i. Permanent (employer/ employee of government or non-government organization)	1	☐	☐
(Specify occupation of Father---------- Mother----------)			
ii. Temporary (worker on daily wage/take up any job that comes by)	2	☐	☐
iii. Dependent	3	☐	☐

Income per month of the child's parents (total income of family) (Choose only ONE) ☑

1. More than 500,001MMK 1 ☐
2. 300,001-500,000MMK 2 ☐
3. 100,000-300,000MMK 3 ☐

လူမှုလူဦးရေဆိုင်ရာမေးခွန်းလွှာ (မြန်မာဘာသာပြန်ဆိုချက်)

ကျောင်းအမည် ------------------------ ရက်စွဲ ၂၀၁၆ ခုနှစ် -----လ -----ရက်

ကလေးအမည် -------------------------- အဘအမည်---------------------------အမိအမည်---------------------------

နေရပ်လိပ်စာ --

၁။ ဇီဝဆိုင်ရာအချက်များ

က။ ကျား/မ ကျား ☐ မ ☐

ခ။ အရပ်အမြင့် ☐ စင်တီမီတာ ကိုယ်အလေးချိန် ☐ ကီလိုဂရမ်

၂။ ပတ်ဝန်းကျင်ဆိုင်ရာအချက်များ

ကျောင်းရှိကစားကွင်းအခြေအနေ (တစ်ခုသာရွေးချယ်ပါ) ☑

၁) အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတိုးတက်မှုအတွက်အထောက်အကူပြုကစားစရာများရှိသောကျယ်ဝန်းသောနေရာ (ဥပမာ- လျှော၊ ဒန်း များရှိခြင်း)	၁	☐
၂) ကစားစရာမရှိသောကျယ်ဝန်းသောနေရာ	၂	☐
၃) ကျဉ်းမြောင်းသောနေရာ	၃	☐
၄) ကစားကွင်းမရှိပါ	၄	☐

နေအိမ်အခြေအနေ (တစ်ခုသာရွေးချယ်ပါ) ☑

၁) ခြံဝင်းကျယ်အတွင်းရှိလုံးချင်းအိမ်	၁	☐
၂) ကွန်ဒိုမီနီယမ်	၂	☐
၃) ကန့်ထရိုက်တိုက်ခန်း	၃	☐
၄) အခြား (အထက်ဖော်ပြပါနေရာများမဟုတ်သည့်နေရာ)	၄	☐

မိဘ/ အုပ်ထိန်းစောင့်ရှောက်သူ၏ပညာရေး အခြေအနေ (မိခင် ဖခင်အတွက်တစ်ခုစီရွေးချယ်ပါ) ☑		ဖခင်	မိခင်
၁။ အဆင့်မြင့်ပညာ (ဒီပလိုမာ/ ဘွဲ့ကြို/ မဟာဘွဲ့/ ပါရဂူဘွဲ့)	၁	☐	☐
၂။ အခြေခံပညာ (အခြား/ ဘာသာရေးကျောင်း/ မူလတန်း/ အလယ်တန်း/ အထက်တန်း)	၂	☐	☐

မိဘ/ အုပ်ထိန်းစောင့်ရှောက်သူ၏ အလုပ်အကိုင် (မိခင် ဖခင်အတွက်တစ်ခုစီရွေးချယ်ပါ) ☑		ဖခင်	မိခင်
၁။ အမြဲတမ်းအလုပ်အကိုင် (အလုပ်ရှင်/ဝန်ထမ်း) (အလုပ်အကိုင်ဖော်ပြရန် ဖခင်------------------------ မိခင်-------------------------)	၁	☐	☐
၂။ ယာယီအလုပ်အကိုင် (နေ့စား/ ကျပန်း)	၂	☐	☐
၃။ မှီခို	၃	☐	☐

မိဘ/ အုပ်ထိန်းစောင့်ရှောက်သူ၏ လစဉ်ဝင်ငွေ (မိသားစုဝင်အားလုံး၏ဝင်ငွေပေါင်း)အခြေအနေ (တစ်ခုသာရွေးချယ်ပါ) ☑

၁။ ငွေကျပ် ၅၀၀'၀၀၀/- အထက်	၁	☐
၂။ ငွေကျပ် ၃၀၀'၀၀၀/- မှ ၅၀၀'၀၀၀/-	၂	☐
၃။ ငွေကျပ် ၁၀၀'၀၀၀/- ၃၀၀'၀၀၀/-	၃	☐

Appendix 3

Online BMI Calculator for Child and Teen in CDC[178)]

https://nccd.cdc.gov/dnpabmi/Calculator.aspx?CalculatorType=Metric

BMI Calculator for Child and Teen

(English | Metric)

1. Birth Date: Month Day Year
2. Date of Measurement: Month Day Year
3. Sex: Boy Girl
4. Height, to nearest .1 cm: 0.0 cm
5. Weight, to nearest .1 kg: 0.0 kg

Calculate

BMI Calculator for Child and Teen

(English | Metric)

1. Birth Date: June 10 2011
2. Date of Measurement: August 27 2016
3. Sex: Boy Girl
4. Height, to nearest .1 cm: 110.0 cm
5. Weight, to nearest .1 kg: 17.0 kg

Calculate

Information Entered

Age: 5 years 2 months

Sex: girl

Birth Date: Friday, June 10, 2011

Height: 110 centimeters

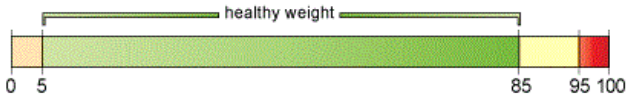
Date of Measurement: Saturday, August 27, 2016

Weight: 17 kilograms

Results

Based on the height and weight entered, the **BMI is 14.0**, placing the BMI-for-age **at the 15th percentile** for girls aged 5 years 2 months. This child has a **healthy weight**.

- What does this mean?
- What should you do?



underweight, less than the 5th percentile
healthy weight, 5th percentile up to the 85th percentile
overweight, 85th to less than the 95th percentile
obese, equal to or greater than the 95th percentile

Appendix 4

Informed Consent Form for Parents/Guardians of Participants
Ethics Review Committee
University of Medical Technology, Yangon
Ministry of Health and Sports
Republic of the Union of Myanmar

Name of Principal Researcher	:	Thanda Aye
Name of Organization	:	University of Medical Technology, Yangon
Title of the Study	:	Relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar

PART I: Information Sheet

Introduction

I am Thanda Aye, assistant lecturer of the department of Physiotherapy, University of Medical Technology, Yangon and second year student of doctoral program in Health Sciences (Physical Therapy) at International University of Health and Welfare (IUHW), Japan. I am doing research on examining relation between gross motor skill development and socio-demographic factors among kindergarten (KG) students in public and private schools in urban (Yangon city) area and rural area in Myanmar. I am going to give you information and invite you and your child to be part of this research. You do not have to decide today whether or not you will give permission for your child to participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or my supervisors.

Purpose of the research

The purpose of this research is to determine relation between gross motor skill development and socio-demographic factors among KG students in public and private schools in Myanmar. Gross motor skill development includes six locomotor (run, gallop, horizontal jump, hop, leap and slide) functions and six object control (striking a stationary ball, stationary dribble, catch, kick, overhand throw and underhand roll) functions. The early assessment of motor skills and development has gained great importance recently. Motor assessment is particularly important during the preschool and school years as it monitors developmental changes and identifies developmental delays.

Type of Research Intervention

This study is a cross sectional analytic study, without intervention. You need to fill out a simple questionnaire and your child needs to perform six locomotor functions and six object control functions for ten minutes.

Participant Selection

You are being invited to allow your child to take part in this research because we feel that your experience as a parent/guardian can contribute much to our understanding and knowledge of local health practices.

Voluntary Participation

You need to voluntarily allow participation of your child in this research and you have the right to refuse for participation and withdraw from the research at any time. The refusal for participation or withdrawal will not affect your relationship with the school of your child.

Procedures

We would like to invite you and your child to take part in this research project.

If you decide to allow participation of your child, you will be asked to answer the questionnaire yourself. The information recorded is confidential, and no one else except the principal researcher and supervisors will have access to your survey.

Then, your child will have to perform six locomotor functions and six object control functions. All gross motor function activities will be demonstrated by the principal researcher. The child will have to perform each activity twice. Total duration for assessment will last about 10 minutes for each child. The performance of the child will be recorded by video camera if you and your child permit.

Duration

This research takes place over maximum ten days in each school. During that time, it will be necessary for you to come to the study site only one day for 15 minutes.

Risks and Discomforts

There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the survey if you feel the question(s) are too personal or if talking about them makes you uncomfortable.

There is also a risk that the child may feel tired during gross motor skill assessment. If the child says feeling tired or if the child seems to be unwell, the assessment will be immediately stopped.

Benefits

There is direct benefit to your child that gross motor skill development of your child will be exactly known. If the result of your child is not good, training program related to gross motor skill development and referral to doctors will be given as needed. Your participation is likely to help us find out more about gross motor skill development of KG students in Myanmar and its relation with socio-demographic factors.

Incentives

You will not be provided any incentive to take part in the research.

Confidentiality

The information about you will not be shared to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you and your child will have a number on it instead of your names. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone.

Sharing the Results

The knowledge that we get from this research will be shared as doctoral degree thesis of IUHW and we will also publish the results in medical research journals so that other interested people may learn from the research. The names of you and your child and any other identifying details will never be revealed in any other publication of the results of this research.

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact any of the following:

Principal Researcher	:	Thanda Aye 15S3027
Mobile	:	+95-9-5048652, +95-9-799854524, +81-70-2797-1116
Email	:	15s3027@g.iuhw.ac.jp, jinhua06@gmail.com
Address	:	Department of Physiotherapy University of Medical Technology, Yangon
Associate-supervisor-1 (Local)	:	Professor Dr. Khin Saw Oo (Professor/ Head)
Mobile	:	+95-9-5021702
Email	:	khinsawoorehab@gmail.com
Address	:	Department of Rehabilitation Medicine University of Medicine (2) Yangon
Associate-supervisor-2 (Local)	:	Associate Professor Dr. Myo Thuzar Khin (Head)
Mobile	:	+95-9-250287864
Email	:	myothuzarkhin@gmail.com
Address	:	Department of Physiotherapy University of Medical Technology, Yangon
Principal supervisor	:	Professor Dr. Hitoshi Maruyama
Mobile	:	+81-90-6488-6460
Email	:	hmaru@iuhw.ac.jp
Vice-supervisor	:	Assistant Professor Tsugumi Kuramoto-Ahuja
Mobile	:	+81-90-6501-8685
Email	:	tkuramoto@iuhw.ac.jp
Address	:	Physical Therapy Department Graduate School of Health and welfare Sciences International University of Health and Welfare Ohtawara campus, 2600-1 Kitakanemaru, Ohtawara-city, Tochigi-prefecture, Post code: 324-8501 Japan.

Part II: Certificate of Consent

I have been invited to participate by myself and my child in research about Relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar.

I understand that I will participate to fill out questionnaires and my child needs to perform six locomotor functions and six object control functions for ten minutes.

I have been informed that the risks are minimal. I have been given with the names and addresses of researcher and supervisors.

I have read the foregoing information. I have had the opportunity to ask questions about it. I have been answered the questions to my satisfaction. I consent voluntarily to participate me and my child in this research. I understand that we have the right to withdraw from the research at any time without in any way affecting communication between my child and school.

Parent/ Guardian

Signature : ----------

Name : ----------

Relation to child : ----------

Date : ----------

Day/month/year

Name of researcher : ----------

Signature of researcher : ----------

Date : ----------

Day/month/year

A copy of this Informed Consent Form has been provided to the participant----------.

Informed Consent Form for Parents/Guardians of Participants (Myanmar version)

လူပုဂ္ဂိုလ်များအပေါ် သုတေသနစမ်းသပ်မှုဆိုင်ရာကျင့်ဝတ်ကော်မတီ

ဆေးဘက်ဆိုင်ရာနည်းပညာတက္ကသိုလ်၊ ရန်ကုန်

ကျန်းမာရေးနှင့်အားကစားဝန်ကြီးဌာန

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်

(မြန်မာဘာသာပြန်ဆိုချက်)

မိဘ/ အုပ်ထိန်းသူ၏ နားလည်သဘောတူကြောင်းခွင့်ပြုချက်ပုံစံ

အဓိကသုတေသီအမည် ။ သန္တာအေး

အဖွဲ့အစည်းအမည် ။ ဆေးဘက်ဆိုင်ရာနည်းပညာတက္ကသိုလ်၊ ရန်ကုန်

သုတေသနခေါင်းစဉ် ။ မြန်မာနိုင်ငံရှိ အစိုးရနှင့်ပုဂ္ဂလိကကျောင်းများရှိမူလတန်းကလေးငယ်များ၏ အကြီးစား
လှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှုနှင့်လူမှုလူဦးရေဆိုင်ရာအချက်များဆက်စပ်မှုကိုရှာဖွေခြင်း

အပိုင်း (၁) သုတေသနနှင့်ပတ်သက်သည့်အကြောင်းအရာများ

မိတ်ဆက်ခြင်း

ကျွန်ုပ်သည် ဆေးဘက်ဆိုင်ရာနည်းပညာတက္ကသိုလ်၊ ရန်ကုန်၊ ဆေးဘက်ဆိုင်ရာခန္ဓာသန်စွမ်းမှုနည်းပညာဌာန မှ လက်ထောက်ကထိကဖြစ်ပြီး ဂျပန်နိုင်ငံ အပြည်ပြည်ဆိုင်ရာကျန်းမာရေးနှင့်ပြုစုစောင့်ရှောက်ရေးတက္ကသိုလ် ဆေးဘက်ဆိုင်ရာခန္ဓာသန်စွမ်းမှုနည်းပညာ ပါရဂူသင်တန်း ဒုတိယနှစ်ကျောင်းသူ သန္တာအေး ဖြစ်ပါသည်။ ကျွန်ုပ်သည် မြန်မာနိုင်ငံ ရန်ကုန်မြို့ပေါ် နှင့် ကျေးလက်တောရွာရှိ အစိုးရနှင့်ပုဂ္ဂလိကကျောင်းများမှ သူငယ်တန်းကလေးငယ်များ၏ အကြီးစားလှုပ်ရှားမှု စွမ်းရည်ဖွံ့ဖြိုးတက်မှုနှင့် လူမှုလူဦးရေဆိုင်ရာအချက်များ ဆက်စပ်မှုကိုရှာဖွေခြင်း သုတေသနအားပြုလုပ်မည်ဖြစ်ပါသည်။ကျွန်ုပ်သည်သု တေသနနှင့် ပတ်သက်သည့် အကြောင်းအရာများကို ပြောပြမည်ဖြစ်ပြီး သင်နှင့်သင်၏ကလေးငယ်အား သုတေသနတွင် ပါဝင်ပါရန်ဖိတ်ခေါ်ပါသည်။

သင်၏ကလေးငယ်အား သုတေသနတွင် ပါဝင်ပါရန်ခွင့်ပြုကြောင်းကိုယနေ့မဆုံးဖြတ်လည်း ဖြစ်ပါသည်။ မဆုံးဖြတ်မီသင်သည် သုတေသန အကြောင်း စိတ်သက်တောင့်သက်သာခံစားရကြောင်း မည်သူ့ကိုမဆို ပြောပြနိုင်ပါသည်။

ဤနားလည်သဘောတူကြောင်းခွင့်ပြုချက်ပုံစံတွင် သင်နားမလည်သော စကားလုံးများပါနိုင်ပါသည်။ နားမလည်သော စကားရပ်များရှိပါက ကျွန်ုပ် (သို့မဟုတ်) ကျွန်ုပ်၏ ကြီးကြပ်သူများ ထံ မေးမြန်းနိုင်ပါသည်။

သုတေသန၏ရည်ရွယ်ချက်

သုတေသန၏ရည်ရွယ်ချက်မှာ မြန်မာနိုင်ငံရှိ အစိုးရနှင့်ပုဂ္ဂလိကကျောင်းများရှိသူငယ်တန်းကလေးငယ်များ၏ အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှု နှင့် လူမှုလူဦးရေဆိုင်ရာအချက်များဆက်စပ်မှု ကိုရှာဖွေရန် ဖြစ်ပါသည်။ အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှု တွင် လှုပ်ရှားသွားလာမှု ခြောက်မျိုး (ပြေးခြင်း၊ ကဆုန်ပေါက်ခြင်း၊ ခြေတစ်ပေါင်ကျိုးခုန်ခြင်း၊ ခုန်လွှားခြင်း၊ အလျားခုန်ခြင်း၊ ဘေးတိုက်ပြေးခြင်း) နှင့် ပစ္စည်းထိန်းကိုင်မှု ခြောက်မျိုး (ငြိမ်နေသာဘောလုံးအားရိုက်ခြင်း၊ တစ်နေရာတည်းတွင်ဘောလုံးပုတ်ခြင်း၊ ဘောလုံးဖမ်းခြင်း၊ ဘောလုံးကန်ခြင်း၊ ဘောလုံးမြှောက်ပစ်ခြင်း၊ ဘောလုံးလိမ့်ခြင်း) တို့ပါဝင်ပါသည်။ လှုပ်ရှားမှုစွမ်းရည်နှင့် ဖွံ့ဖြိုးတက်မှုကို စောစီးစွာစစ်ဆေးခြင်းသည်လတ်တလောတွင်အရေးကြီးလှပါသည်။လှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှုကို မူကြိုအရွယ်နှင့် ကျောင်းနေစဉ်စစ်ဆေးခြင်းသည် အရေးကြီးပါသည်။ အဘယ်ကြောင့်ဆိုသော် ၎င်းသည် ဖွံ့ဖြိုးတက်မှုပြောင်းလဲခြင်းကို မီးမောင်းထိုးပြပြီး ဖွံ့ဖြိုးတက်မှုနောင့်နှေးခြင်းကို သိရှိနိုင်သောကြောင့် ဖြစ်ပါသည်။

သုတေသနဆောင်ရွက်ပုံအမျိုးအစား

ဤသုတေသနသည် တစ်ကြိမ်တည်းသာစမ်းသပ်စစ်ဆေးသော ကုသမှုမပါဝင်သော သုတေသနဖြစ်ပါသည်။ သင်သည် မေးခွန်းလွှာကို ဖြည့်စွက်ရမည် ဖြစ်ပြီး သင့်ကလေးသည် လှုပ်ရှားသွားလာမှုခြောက်မျိုး နှင့် ပစ္စည်းထိန်းကိုင်မှုခြောက်မျိုး တို့ကို ဆယ်မိနစ်ခန့် ပြုလုပ်ရမည် ဖြစ်ပါသည်။

သုတေသနတွင်ပါဝင်မည့်သူများကိုရွေးချယ်ခြင်း

သင်၏ကလေးငယ်အားသုတေသနတွင်ပါဝင်ပါရန်ခွင့်ပြုစေရန် သင့်အား ဖိတ်ခေါ်ရခြင်း မှာ သင်သည် ကလေး၏ မိဘ/ အုပ်ထိန်းသူ အနေဖြင့် ကျွန်ုပ်တို့၏ နားလည်မှု နှင့် ဒေသဆိုင်ရာ ကျန်းမာရေး ဗဟုသုတများကို မျှဝေနိုင်မည့်သူဟု ထင်ရသောကြောင့် ဖြစ်ပါသည်။

မိမိဆန္ဒအလျောက်သုတေသနတွင်ပါဝင်ခြင်း

သင်မှ သင့်ကလေးအား မိမိ၏စိတ်ဆန္ဒအလျောက် သုတေသနတွင်ပါဝင်ရန်သဘောတူ ခွင့်ပြုရန်လိုအပ်ပြီး သင်နှင့်သင့်ကလေးကိုယ်တိုင်ကသုတေသနတွင်ပါဝင်ရန်ငြင်းဆန်ပိုင်ခွင့်ရှိကာသုတေသနမှနှုတ်ထွက်လိုပါက အချိန်မရွေးနှုတ်ထွက်ခွင့်ရှိပါသည်။ သုတေသန တွင်ပါဝင်ရန် ငြင်းဆန်ခြင်း သို့မဟုတ် သုတေသနမှ နှုတ်ထွက်ခြင်း တို့ကြောင့် ပါဝင်သူများနှင့် ကလေးတက်နေသောကျောင်းတို့ကြား ဆက်ဆံရေးကို ထိခိုက်လိမ့်မည်မဟုတ်ပါ။

သုတေသနလုပ်ငန်းလုပ်ဆောင်ချက်အဆင့်ဆင့်

သင်နှင့်သင်၏ကလေးငယ်အား သုတေသနတွင် ပါဝင်ပါရန်ဖိတ်ခေါ်ပါသည်။

အကယ်၍ သင်၏ကလေးငယ်အား သုတေသနတွင်ပါဝင်စေရန် ခွင့်ပြုကြောင်း ဆုံးဖြတ်ပြီးပါက မေးခွန်းလွှာကို သင်ကိုယ်တိုင် ဖြေဆိုရပါမည်။ ကောက်ယူသောအချက်အလက်များကို သုတေသီ နှင့် ကြီးကြပ်သူများ မှ လွဲ၍ အခြားသူများ ကြည့်ပိုင်ခွင့်မရှိစေရန် လျှို့ဝှက်ထားမည် ဖြစ်ပါသည်။

သင့်ကလေးသည် လူပ်ရှားသွားလာမှုခြောက်မျိုး နှင့် ပစ္စည်းထိန်းကိုင်မှုခြောက်မျိုး တို့ကို ပြုလုပ်ရမည် ဖြစ်ပါသည်။ အကြီးစားလှုပ်ရှားမှု စွမ်းရည်အားလုံးကို သုတေသီမှ သရုပ်ပြပေးပါမည်။ ကလေးသည် လှုပ်ရှားမှုစွမ်းရည်တိုင်းကို နှစ်ကြိမ်လုပ်ဆောင်ရပါမည်။ ကလေးတစ်ဦးအတွက်စမ်းသပ်စစ်ဆေးချိန်သည် ၁၀ မိနစ်ခန့်သာ ကြာမည်ဖြစ်ပါသည်။ ကလေး၏ လုပ်ဆောင်မှုကို သင်နှင့်သင်၏ကလေးမှ ခွင့်ပြုပါက ဗီဒီယိုဖြင့် မှတ်တမ်းတင်ပါမည်။

အချိန်ကြာမြင့်မှု

ဤသုတေသနကို ကျောင်းတစ်ကျောင်းလျှင် ဆယ်ရက်ကြာ ပြုလုပ်ပါမည်။ ထိုကာလအတွင်း သင်သည် ကျောင်းသို့ တစ်ရက်တည်းသာ ၁၅ မိနစ်ခန့် လာရန်လိုပါသည်။

ထိခိုက်နိုင်မှုနှင့် ကိုယ်စိတ်အနှောင့်အယှက်ဖြစ်စေခြင်းများ

သင့်အနေနှင့် ပုဂ္ဂိုလ်ရေး (သို့မဟုတ်) လျှို့ဝှက်သောအချက်အလက်အချို့ကို ဖွင့်ပြောရခြင်း သို့မဟုတ် အချို့သောအကြောင်းအရာများကို ပြောရသည့်အတွက် စိတ်မသက်မသာ ခံစားရခြင်းများ ရှိနိုင်ပါသည်။

ကျွန်ုပ်တို့သည် ဤကဲ့သို့မဖြစ်စေလိုပါ။ ပုဂ္ဂိုလ်ရေး ဆန်လွန်းသော သို့မဟုတ် ပြောရသည့်အတွက် စိတ်မသက်မသာ ခံစားရသော မေးခွန်းများကို မဖြေလိုပါက မဖြေလျှင်လည်းဖြစ်ပါသည်။

သင့်ကလေးသည် အကြီးစားလှုပ်ရှားမှုစွမ်းရည်စမ်းသပ်စစ်ဆေးစဉ်မောပန်းနိုင်ပ်သည်။ ကလေးမှ မောပန်းသည်ဟု ပြောလာလျှင် သို့မဟုတ် ကလေးသည်နေမကောင်းပုံပေါ်လျှင် စမ်းသပ်စစ်ဆေးမှုကို ချက်ချင်းရပ်ဆိုင်းပါမည်။

အကျိုးကျေးဇူးများ

သင့်ကလေးငယ်၏ အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှုကို တိတိကျကျသိရှိနိုင်သော အထူးကောင်းကျိုး ရရှိမည်ဖြစ်ပါသည်။ အကယ်၍သင့်ကလေး၏ရလဒ်မကောင်းပါက အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှုကို ရစေသောလေ့ကျင့်ခြင်း နှင့် ဆရာဝန်ဆီသို့လွှဲပြောင်းခြင်း တို့ကို လိုအပ်သလိုပေးနိုင်ပါလိမ့်မည်။ သင်၏ ပါဝင်မှုသည် မြန်မာနိုင်ငံရှိ သူငယ်တန်းကလေးငယ်များ၏ အကြီးစားလှုပ်ရှားမှုစွမ်းရည်ဖွံ့ဖြိုးတက်မှုနှင့် လူမှုလူဦးရေဆိုင်ရာ အချက်များ ဆက်စပ်မှုကို ပိုမိုရှာဖွေဖော်ထုတ်ပေးနိုင်ပါလိမ့်မည်။

ကျေးဇူးတုန့်ပြန်မှု

သင်သည် ဤသုတေသနတွင် ပါဝင်ခြင်းကြောင့် မည်သည့် ကျေးဇူးတုန့်ပြန်မှု မျှ ရရှိမည် မဟုတ်ပါ။

အချက်အလက်များကိုလျှို့ဝှက်ထားရှိမှု

သင်၏အချက်အလက်များကို သုတေသနအဖွဲ့ပြင်ပမှ ပုဂ္ဂိုလ်များကို ဖွင့်ပြောမည်မဟုတ်ပါ။ သင်နှင့်ပတ်သက်သော အချက်အလက်များကို လျှို့ဝှက်ထားပါမည်။ သင်နှင့် သင့်ကလေး၏ နာမည်များအစား နံပါတ်စနစ်ဖြင့် အချက်အလက်များကို သိမ်းဆည်းထားပါမည်။ သုတေသနပြုလုပ်သူများသာလျှင် သင်၏နံပါတ်ကို သိရှိပြီး သေချာစွာ သော့ခတ်သိမ်းဆည်းထားမည် ဖြစ်ပါသည်။ မည်သူ့ကိုမျှ ဖွင့်ပြောခြင်း ပေးခြင်း ပြုမည် မဟုတ်ပါ။

သုတေသနရလဒ်များကိုဖြန့်ဝေမှု

ဤသုတေသနမှ ရရှိသော အသိပညာများကို အပြည်ပြည်ဆိုင်ရာကျန်းမာရေးနှင့်ပြုစုစောင့်ရှောက်ရေးတက္ကသိုလ်၏ ပါရဂူဘွဲ့ယူကျမ်းအဖြစ်ရေးသားခြင်း နှင့် အခြားစိတ်ဝင်စားသူများ လေ့လာနိုင်ရန်အလို့ငှာ ဆေးသုတေသနဂျာနယ်များတွင် ပုံနှိပ်ထုတ်ဝေခြင်း ဖြင့် သုတေသနရလဒ်များကိုဖြန့်ဝေသွားပါမည်။ သုတေသနတွင် ပါဝင်သောသူများ၏ အမည်နှင့် အခြားပုဂ္ဂိုလ်ရေးဆိုင်ရာ အသေးစိတ်အချက်များကို မည်သည့်ပုံနှိပ်ထုတ်ဝေခြင်းတွင်မျှ ထုတ်ဖော်ပြသမည် မဟုတ်ပါ။

ဆက်သွယ်နိုင်မည့်ပုဂ္ဂိုလ်များ

အကယ်၍ သင့်၌ မေးစရာမေးခွန်းများရှိပါက ကျွန်ုပ်အား ယခု သို့မဟုတ် နောင်သောအခါ မေးမြန်းနိုင်ပါသည်။ အကယ်၍ သင်သည် နောင်သောအခါ မေးမြန်းလိုပါက အောက်ဖော်ပြပါပုဂ္ဂိုလ်များထံ ဆက်သွယ်မေးမြန်းနိုင်ပါသည်။

သုတေသီ	သန္တာအေး
လက်ကိုင်ဖုန်း	၀၉-၅၀၄၈၆၅၂၊ ၀၉-၇၉၉၈၅၄၄၂၄၊ +၈၁-၇၀-၂၇၉၇-၁၁၁၆ (ဂျပန်နိုင်ငံဖုန်း)
အီးမေးလ်	15s3027@g.iuhw.ac.jp, jinhua06@gmail.com
လိပ်စာ	ဆေးဘက်ဆိုင်ရာခန္ဓာသန်စွမ်းမှုနည်းပညာဌာန၊ ဆေးဘက်ဆိုင်ရာနည်းပညာတက္ကသိုလ်၊ ရန်ကုန်
တွဲဖက်ကြီးကြပ်သူ-၁ (ပြည်တွင်း)	ပါမောက္ခ ဒေါက်တာခင်စောဦး (ပါမောက္ခ / ဌာနမှူး)
လက်ကိုင်ဖုန်း	၀၉-၅၀၂၁၇၀၂
အီးမေးလ်	khinsawoorehab@gmail.com
လိပ်စာ	ကိုယ်အင်္ဂါပြန်လည်သန်စွမ်းရေးဆေးပညာဌာန၊ ဆေးတက္ကသိုလ် (၂) မြောက်ဥက္ကလာပပြည်သူ့ဆေးရုံကြီး၊ ရန်ကုန်

တွဲဖက်ကြီးကြပ်သူ-၂ (ပြည်တွင်း)	တွဲဖက်ပါမောက္ခ ဒေါက်တာမျိုးသူဇာခင် (ဌာနမှူး)
လက်ကိုင်ဖုန်း	၀၉-၂၅၀၂၈၇၆၄၄
အီးမေးလ်	myothuzarkhin@gmail.com
လိပ်စာ	ဆေးဘက်ဆိုင်ရာခန္ဓာသန်စွမ်းမှုနည်းပညာဌာန၊ ဆေးဘက်ဆိုင်ရာနည်းပညာတက္ကသိုလ်၊ ရန်ကုန်
ကြီးကြပ်သူ	ပါမောက္ခ ဒေါက်တာဟိတိုးရှိမာရူယာမ
လက်ကိုင်ဖုန်း	+ ၈၁-၉၀-၆၄၈၈-၆၄၆၀
အီးမေးလ်	hmaru@iuhw.ac.jp

ဒု-ကြီးကြပ်သူ	တွဲဖက်ပါမောက္ခ ဆုငုမိခုရမိုတို အဟူဂျာ
လက်ကိုင်ဖုန်း	+ ၈၁-၉၀-၆၅၀၁-၈၆၈၅
အီးမေးလ်	tsugumika@yahoo.co.jp, tkuramoto@iuhw.ac.jp
လိပ်စာ	Physical Therapy Department, Graduate School of Health and welfare Sciences, International University of Health and Welfare, Ohtawara campus 2600-1 Kitakanemaru, Ohtawara-city, Tochigi-prefecture, Japan, Post code: 324-8501 ဆေးဘက်ဆိုင်ရာခန္ဓာသန်စွမ်းမှုနည်းပညာဌာန ကျန်းမာရေးနှင့်ပြုစုစောင့်ရှောက်ရေးဘွဲ့လွန်ကျောင်း အပြည်ပြည်ဆိုင်ရာကျန်းမာရေးနှင့်ပြုစုစောင့်ရှောက်ရေးတက္ကသိုလ် အိုးတပါရတက္ကသိုလ်ပရိဝဏ် အမှတ် ၂၆၀၀-၁၊ ခိတ ခါနဲ့ မာရူ အိုးတပါရမြို့၊ တိုချိုင် စီရင်စု စာတိုက်နံပါတ် ၃၂၄-၈၅၀၁ ဂျပန်နိုင်ငံ

အပိုင်း (၂) သဘောတူညီချက်

ကျွန်ုပ်သည် မြန်မာနိုင်ငံရှိ အစိုးရနှင့်ပုဂ္ဂလိကကျောင်းများရှိမူလတန်းကလေးငယ်များ၏ အကြီးစား လှုပ်ရှားမှုစွမ်းရည် ဖွံ့ဖြိုးတက်မှုနှင့် လူမှုလူဦးရေဆိုင်ရာအချက်များ ဆက်စပ်မှုကိုရှာဖွေခြင်း သုတေသနတွင်ပါဝင်ရန် ကျွန်ုပ်၏ကလေး နှင့် အတူ ဖိတ်ခေါ်ခြင်း ခံရပါသည်။

ဤသုတေသနတွင် ပါဝင်ပါက ကျွန်ုပ်သည် မေးခွန်းလွှာကို ဖြည့်စွက်ရမည် ဖြစ်ပြီး ကျွန်ုပ်၏ကလေးသည် လှုပ်ရှားသွားလာမှုခြောက်မျိုး နှင့် ပစ္စည်းထိန်းကိုင်မှုခြောက်မျိုး တို့ကို ဆယ်မိနစ်ခန့် ပြုလုပ်ရမည် ဖြစ်ကြောင်း သိရှိပြီး ဖြစ်ပါသည်။ ဤသုတေသနသည် ဘေးအန္တရာယ်မရှိကြောင်းလည်း သိရှိပြီး ဖြစ်ပါသည်။ ကျွန်ုပ်သည် သုတေသီ နှင့် ကြီးကြပ်သူများ၏ ဆက်သွယ်ရန် လိပ်စာ ဖုန်းနံပါတ်များကို လည်း သိရှိပြီး ဖြစ်ပါသည်။

ကျွန်ုပ်သည် ရှေ့မှ အချက်အလက်များကို ဖတ်ရှုပြီး ဖြစ်ပါသည်။ ကျွန်ုပ်တွင် မေးခွန်းမေးပိုင်ခွင့်ရှိပြီး နှင့် ထိုမေးခွန်းများကို ကျွန်ုပ်ကျေနပ်သည်အထိ ဖြေကြားပြီး ဖြစ်ပါသည်။ ကျွန်ုပ်သည် မိမိ၏စိတ်ဆန္ဒအလျောက် ကျွန်ုပ် နှင့် ကျွန်ုပ်၏ကလေး တို့သုတေသနတွင်ပါဝင်ရန်သဘောတူပါသည်။ ဤသုတေသနမှ အချိန်မရွေးနှုတ်ထွက်ခွင့်ရှိပြီး ယင်းသို့ နှုတ်ထွက်ခြင်းကြောင့် ကျွန်ုပ် နှင့် ကျွန်ုပ်၏ကလေး တို့ နှင့် ကလေးတက်နေသောကျောင်းတို့ကြား ဆက်ဆံရေးကို ထိခိုက်လိမ့်မည်မဟုတ်ကြောင်း နားလည်ပြီး ဖြစ်ပါသည်။

မိဘ/ အုပ်ထိန်းသူ

လက်မှတ် ----------

အမည် ----------

ကလေးနှင့်တော်စပ်ပုံ ----------

ရက်စွဲ ---------- (ရက်/လ/နှစ်)

သုတေသီလက်မှတ် ----------

သုတေသီအမည် ----------

ရက်စွဲ ---------- (ရက်/လ/နှစ်)

ဤသဘောတူခွင့်ပြုလွှာမိတ္တူတစ်စောင်ကို သုတေသနတွင် ပါဝင်မည့်သူ----------အား ပေးအပ်ပြီးဖြစ်သည်။

Appendix 5

Certificate from Ethics Review Committee of

International University of Health and Welfare, Japan

国際医療福祉大学
研究倫理審査結果通知書

平成28年3月10日

研究実施申請者
THANDA A' 殿

学長 北 島 政 樹 印

承認番号 15-Io-115

研究課題名	Relation between gross motor skill development and socio-demographic factors among public and private primary school children in Myanmar
研究実施・責任者(申請者)	THANDA AYE
所属	保健医療学専攻博士課程
職名 (学籍番号)	15S3027

先に申請のあった上記研究課題に係る研究計画を、
倫理審査委員会で審査し、下記のとおり判定しましたので、通知します。

記

判定	承 認する。　　承認しない。 条件付で承認する。　　該当しない。
判定の理由など	本研究は倫理的に問題ないものと考える。

※研究の実施にあたっては、研究を行う施設長(病院長等)の承諾書を取得すること。
また、当該施設の倫理審査にかけられる場合があるので、その場合は当該施設の指示に従ってください。

Appendix 6

Certificate from Ethics Review Committee of

University of Medical Technology, Yangon, Myanmar

The Republic of the Union of Myanmar

Ministry of Health and Sports

Department of Health Professional Resource Development and Management

University of Medical Technology, Yangon

Lower Mingalardon Road,AungSan,P.O,Insein,Yangon

Rector – 95-1- 645742
95-1- 645743
Registrar –95-1- 645753
95-1- 645746
Fax – 95-1- 645764
Web Site: www.umty.gov.mm

ERC No, 3/2016

11th. July. 2016

Letter of ethical approval for the study of "Relation Between Gross Motor Skill Development And Socio-Demographic Factors Among Public And Private Primary School Children in Myanmar & Effects of Medical Stretching on Hamstrings Flexibility Among Children With Spastic Cerebral Palsy in Myanmar"

Dear Ms. Thanda Aye

As you have presented the protocol of the study of "Relation Between Gross Motor Skill Development and Socio-Demographic Factors among Public and Private Primary School Children in Myanmar & Effects of Medical Stretching on Hamstrings Flexibility among Children with Spastic Cerebral Palsy in Myanmar" for the approval of the Ethical Review Committee of University of Medical Technology, Yangon (ERC-UMT,Y) the committee had considered that your study can be approved.

The committee asks you to follow the regulation of the ERC-UMT,Y as follow:

(1) Use only the copy of participant information sheet and informed consent form with the UMT,Y logo.

(2) Any further changes of the protocol in the future must be reported to the ERC-UMT,Y.

Prof. Dr. Shwe Toe
Chair Person
Ethical Review Committee
University of Medical Technology,
Yangon

Prof. Dr. Aye Aye Khin
Board Member

Assoc. Prof. Dr.Yu Yu
Board Member

Assoc. Prof. Dr.Myo Thuzar Khin
Board Member

Dr. Chaw Chaw Su
Secretary