

# Developing a Motor Skill-Based Curriculum for Preschools and Kindergartens as a Preventive Plan of Children Obesity in Indonesia

Syahrial Bakhtiar\*, Ruri Famelia

Faculty of Sport Sciences,  
Universitas Negeri Padang,  
Padang, Indonesia  
\*syal\_fik@yahoo.com

Jacqueline D Goodway

Department of Human Sciences  
The Ohio State University  
Ohio, USA

**Abstract**—Indonesia has faced malnutrition and non-communicable issues for years, yet currently Indonesia just joined the ranks of the top ten most obese countries in the world. The trajectory of the rate of obesity is increasing from childhood to adolescence. Physical inactivity is a factor that contributes to this obesity crisis. Therefore, a preventive action should be comprehensively planned in Indonesia, started from the early age. Fundamental motor skills (FMS) have shown a contribution to the likelihood to be physically active. Therefore, the purpose of this study was to develop a structured physical activity program to promote motor skill competence for early childhood to be implemented at preschools and kindergartens. This study reports a preliminary data of pre-schoolers/kindergarteners competence on FMS and a design of motor skill program that has been piloted in Padang, West Sumatera. The initial analysis of over 100 young children showed that young children in Indonesia have low motor skill competence. Therefore, a motor skill program has been designed and piloted. If the results showed the effectiveness of this program to promote children competence on motor skills, it will be implemented in state-wide in West Sumatera.

**Keywords:** *motor skill, obesity, preschool*

## I. INTRODUCTION

Obesity has been a global concern as the obesity rates in many countries across the world have increased, and nearly doubled since 1980 [1]. This concern becomes more serious because around 43 million children across the globe under the age of five were overweight in 2010, and they are on a trajectory for obesity and hypokinetic disease [1]. On top of this, physical inactivity is now identified as the fourth leading risk factor for global mortality [2]. As a result, the world's agenda has turned to the importance of promoting physical activity in an attempt to reduce obesity and chronic disease. Indonesia is also facing this obesity issue as Indonesia has just joined the ranks of the top 10 most obese countries in the world [3]. The obesity in Indonesia is a part of double burden problem, in which underweight and overweight problems are coexisting [4]. For years, Indonesia has faced non-communicable disease and malnutrition issue due to poverty, which led to stunted growth on children [4,5]. Then, the increasing in economic sectors and urbanization in Indonesia

has led to an easier access for Indonesian children to get adequate energy intake. Unfortunately, this would increase the possibility of children who were stunted when they were poor to be obese when they receive more nutrition [5,6]. Besides the changes in food intake, the increase in sedentary behaviour also contributes to the increasing of obesity rate in Indonesian children. In many cases, time spent in physical activity has been replaced by screen activities [7]. On average, Indonesian children spent about 5.5 hours watching television and spent 3.4 hours on playing electronic game and internet per day on school days and around 7.4 hours on watching television and 5.9 hours on playing electronic game and internet on holiday [8]. This data has raised awareness of Indonesian scholars that Indonesia must respond quickly and highlight the importance of diet and physical activity programs starting in the early childhood years [9-11].

Given these points, Indonesia needs to start creating a strategic plan to prevent the increasing the obesity rate with population approach in order to achieve a wide-scale impact. School could be a place to start implementing a population based approach program. Since preschools enrolment rates have been increasing in Indonesia [12], it can provide an appropriate access for a preventive action plan. However, in Indonesia there has been a shift from a play-based curriculum to a heavy focus on academic content, such as reading, writing and arithmetic. This curriculum has been criticized as not being appropriate for younger children [13]. This situation could be worse because there are no national physical activity guidelines for preschools. Moreover, Indonesia has little data about appropriate physical activity programs for pre-schoolers to help guide the development of these national guidelines. Thus, there is a critical need for evidence-based physical activity data that can be used to develop the physical activity program guideline for preschools.

As physical activity has been recognized as an important factor to prevent the increasing of the obesity rate, some countries have developed physical activity guidelines. For instance, the USA and UK recommend 60 minutes of moderate-to-vigorous physical activity (MVPA) per day to maintain a healthy cardiorespiratory and metabolic risk profile [2]. The World Health Organization (WHO) also recommends

that children and youth aged 5-17 years should accumulate at least 60 minutes of MVPA daily to get the health benefits [2]. However, Indonesia does not currently have national physical activity guidelines. Yet, the World Health Organization (WHO) recommends that all private and public sectors “have vital roles to play in shaping healthy environments and contributing to the promotion of physical activity” [2] and that member states need to “identify potential solutions” and “develop strategies” that have promise and the possibility of wide-scale impact [14].

In order to be able to develop an appropriate physical activity program for pre-schoolers, we need to understand what factors influence children to be physically active. A conceptual model proposed by US scholars, Stodden and colleagues, suggests that motor competence has a bi-directional relationship with physical activity. This relationship is mediated by perceived motor competence and physical fitness, and it becomes stronger along with the age from early childhood to later childhood [14]. This model has been supported by empirical evidences [15-17]. Therefore, this model emphasize that it is important to develop children motor skill competence in young age in order to support them to be physically active in the later age. Some limited data in Indonesia also suggest that this model has value in Indonesia. A study conducted by Sularyo and Akhib in Lombok, Indonesia, demonstrated that most children were delayed in their gross-motor skills, social, language and fine motor development, with these delays increasing across age [13]. Along with this data, some studies in elementary school students in West Sumatera found that elementary school students were delayed on their low motor competence [18,19]. Such data may contribute to increasing sedentary lifestyles among adolescence that leads to an increase in overweight and obesity. However, up to date, there is no data of children motor skills of Indonesian pre-schoolers to inform a physical activity program. Thus, there is a need to collect motor skill competence data of Indonesian pre-schooler to guide us in designing an evidence-based physical activity program to be implemented at preschool [20]. Therefore, the primary purpose of this study was to evaluate pre-schoolers’ motor skill competence to guide the authors to develop a structured physical activity program to promote motor skill competence for early childhood. The secondary purpose of this study was to introduce the preliminary design of physical activity program for pre-schoolers to promote their motor skill competence. We hypothesized that Indonesian pre-schoolers have low motor skill competence and therefore an appropriate program to improve their motor skill competence is needed. This study is a part of a three-year plan project from 2017 to 2019. To date, this study reported preliminary data from initial phase of the first year out of three-year plan. Therefore, results reported in this study were analysed from an ongoing research to inform the authors to design an appropriate structured physical activity program for pre-schoolers to promote their motor skill competence.

## II. RESEARCH METHOD

### A. Research Settings and Participant

This study was conducted in Padang, West Sumatera, Indonesia. One hundred and two of pre-schoolers (aged 4-6 years,  $M_{age}=60.72$  mo.,  $SD=7.59$ ) participated in this study. Fifty-three pre-schoolers (26 boys, 27 girls) were recruited from three preschools in urban area and forty-nine pre-schoolers (26 boys, 23 girls) were recruited from three preschools in rural area. None of the participants were identified having any forms of disabilities.

### B. Instruments

This study investigated the motor skill competence of Indonesian pre-schoolers. The Test of Gross Motor Development 3<sup>rd</sup> edition (TGMD-3) was used to collect participants motor skill competence [21]. TGMD-3 is a criterion-referenced assessment of FMS for children ages 3-10 years that consists of 2 subscales, locomotor and ball skills. The locomotor subscale measures running, skipping, hopping, sliding, galloping, and horizontal-jumping skills with the range of total score is 0 to 46 points. The ball skills subscale assesses two-hand striking, one-hand striking, catching, dribbling, overhand throwing, kicking, and underhand throwing with the range of total score is 0 to 54 points.

### C. Data Analysis

All statistical analysis were conducted in IBM SPSS Statistics 23 package and statistical significance was set as  $p<.05$ . Descriptive statistics (means and standard deviation) were conducted. These data were checked for Analysis of Variance (ANOVA) assumption. Two separate 2 gender (girl, boy) X 2 location (urban, rural) ANOVAs were conducted on locomotor skills and ball skills. Then, the result of these analyses was used to design a structured physical activity program for pre-schoolers to promote their motor skill competence.

## III. RESULTS AND DISCUSSION

### A. Description of Preschooler Motor Skill Competence.

The descriptive analysis of TGMD-3 scores on both locomotor and ball skills showed that overall, participants scored less than half of the total score. This finding indicated that on average, Indonesian children have low competence in both locomotor and object control skills. Table 1 shows the detail of description analysis for both locomotor and ball skills.

**TABLE I. DESCRIPTIVE ANALYSIS OF MOTOR SKILL COMPETENCE OF PRESCHOOLERS (N=102)**

Variables	Urban (N=53)			Rural (N=49)			Total		
	Boys Mean (SD)	Girls Mean (SD)	Total Mean (SD)	Boys Mean (SD)	Girls Mean (SD)	Total Mean (SD)	Boys Mean (SD)	Girls Mean (SD)	Total Mean (SD)
Locomotor skills (0-46)	18.38 (6.13)	19.85 (5.74)	19.13 (5.92)	16.69 (4.78)	18.30 (5.46)	17.45 (5.12)	17.54 (5.51)	19.14 (5.60)	18.32 (5.59)
Ball skills (0-54)	17.31 (3.71)	15.96 (3.11)	16.62 (3.45)	17.96 (5.16)	14.43 (4.24)	16.31 (5.03)	17.63 (4.46)	15.26 (3.71)	16.47 (4.26)

In comparison to other studies, Indonesian pre-schoolers have lower competence on both locomotor and object control skills compared to Brazilian pre-schoolers [22]. Brazilian boys had 28.8 scores and girls had 27.8 scores on the locomotor skills, while Indonesian and boys had 31.1 scores and girls had 24 scores in object control skills. Similarly Indonesian children performed less competent on locomotor skills and object control skills than western children [23,24]. Clearly, the finding in this study warns us that in comparison with another developing and developed countries, Indonesian pre-schoolers have lower competence in their motor skill compared to their peers.

#### *B. Gender and Location Differences on Motor Competence Skills*

A two way (2 Gender x 2 Location) ANOVA analysis on locomotor skill analysis showed that there was no main effects of Gender ( $p=.17$ ) and no main effects of Location ( $p=.14$ ) on locomotor skills. Furthermore, another two way (2 Gender x 2 Location) ANOVA analysis was conducted on ball skill scores. It was found that there was main effect of Gender ( $F_{[1,98]}=8.91$ ,  $p=.004$ ) on ball skills, in which boys ( $M=17.85$ ) performed better than girls ( $M=15.91$ ), but there was no main effects of Location ( $p=.47$ ) on ball skills. Yet, there was no main effects of Location ( $p=.59$ ) on ball skills. Further analysis showed that there were no significant Gender X Location interactions for any of the analyses.

The findings for Indonesian pre-schoolers showed similar gender trends relative to motor skill competence as the Western literature [25-27] and Brazilian literature [22]. Like these Western studies and Brazilian study, Indonesian preschool boys performed better than girls in ball skills. Cultural differences might contribute to these findings, in which young boys in Indonesia are more likely to play outside after school than girls. This is true also for boys in urban and rural areas. That is why we did not find location differences on both children's locomotor and object control skills. Another possible explanation about this gender differences on object control skills is the society values on sports, which is more associated with boys than girls. Therefore, boys may have higher motivation to participate in ball skills than girls.

#### *C. Designing a Structured Physical Activity Program to Promote Motor Skill Competence of Indonesian Preschoolers*

Within the USA, an evidenced-based motor skill program called *SKIP* (Successful Kinaesthetic Instruction for Pre-

schoolers) has been developed by Goodway and colleagues reporting strong data showing significant improvements in motor competence and perceptions of motor competence with high effect sizes [27-30]. This program has been reported significantly effective to promote children motor development delayed [27,28]. This program includes intervention for children's motor competence, and has been delivered with a dose of 30-45 mins, two times per week for 9 to 12 weeks. Since motor skill competence of Indonesian children is considered delayed, *SKIP* program could be used as a guide to design an appropriate physical activity program for children motor skill development. However, some modification is needed to suit the program to Indonesian culture and preschool situation. Therefore, we call this structured physical activity program as *INDO-SKIP* program.

The *INDO-SKIP* program is designed based on Dynamic Systems Theory [31] and Newell's Constraints perspective [33]. The Dynamic Systems Theory captures that the development change is dynamic. It means that the change is not linear [31,33], which allows individual to experience different pathways to produce the same results. This point is very important because every child is unique. Each individual has different pathways to grow and develop [32]. This concept is essential in designing motor skill intervention, because one approach does not fit for all. Different children may need different approach to get the same result to promote their motor development. Newell's Constraints perspective [33] is part of dynamic systems theory and suggests that motor skills do not naturally emerge, but rather are the result of the interactions of subsystems between the learner, environment and task. Manipulation of task and environmental constraints, including factors such as ball size, distance thrown etc. will occur to design the developmentally appropriate and motivating tasks for the *INDO-SKIP* intervention.

The *INDO-SKIP* program is designed based on five task principles, which are: 1) the lessons should be developmentally appropriate based upon the stage of children at their motor development sequences [10,17]. Therefore, the lessons are not based on the age of the children but their competence on the skill. It is common that two children in the same age and gender will show different competence on motor skills. 2) The lessons are designed by the task analysis. Therefore, some activities can be designed from simpler to more complex through extension, refinement, and application [34]. For instance, in catching activities, the tasks are designed by modifying the size and the weight of the ball from the easier to catch to more difficult to catch [27-30]. 3) The task are

individualized, but are still accommodated by a teacher when she/he teaching the lessons in class. 4) The learning experience is developed to provide maximum opportunity for children to practice each skill. Therefore, equipment is provided for each child to do the tasks [27,28]. 5) Repetitive cycles of skills. This means that the skills and tasks will be taught as an overall block plan. The first cycle would be more toward introducing skills to children through simpler tasks, the second cycle would be practicing the more advance tasks for each skills, then the next cycles.

As each skill in locomotor skills and object control skills has three to five developmental stages, the time allotment for each skill will be vary. For instance, catching a ball has five developmental stages. Therefore, tasks related to catching skills will be taught more often than gallop, which has three developmental stages. Since this study reported the initial steps of three-year research plan, and the *INDO-SKIP* has just been designed and pre-piloted, the initial data of the *INDO-SKIP* feasibility and efficacy data has not enabled to be reported in this study yet.

#### IV. CONCLUSION

Overall, this study has provided preliminary data to inform the authors to design an appropriate physical activity program to promote pre-schoolers' motor competence. It was found that Indonesian pre-schoolers had poor competence in their locomotor skills and object control skill. This findings highlighted the need for Indonesia to design a program for pre-schoolers to support their motor development. Therefore, the *INDO-SKIP* program has been design by authors. As this study was a part of a larger study, the next step of this study is piloting the *INDO-SKIP* curriculum to examine the feasibility of *INDO-SKIP* program to promote children's motor competence. Furthermore, future research would also investigate factors associated with children's motor skill development, as other benefits of *INDO-SKIP* program.

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