

# Early Childhood Physical Activity and Sedentary Behavior in Indonesia:

## Objectively Measure Using Accelerometer

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**Abstract**—The aims of this study were to investigate early childhood (4 years old) physical activity and sedentary behavior in rural and urban. The subject of this study are 48 early childhood, they are a member of the childcare institution representing rural and urban areas. Childcare institutions who participate in this study as many as 15 consist of 7 institutions from rural areas and 8 institutions from urban areas. Physical activity and sedentary behavior were assessed for three-day using the accelerometer (ActiGraph). Data analysis using Independent sample t-test to test the differences in physical activity and sedentary behavior of early childhood in rural and urban areas. The results showed no difference in physical activity and behavior as early as children living in rural and urban areas ( $p > .05$ ). The recommendation of this study suggests that is important to consider a program to promote physical activity in early childhood in Indonesia.

**Keywords:** *accelerometer, early childhood, objective measure, physical activity, sedentary behavior*

### I. INTRODUCTION

Physical activity has an important role in the prevention of various diseases, this is due to relationship with many chronic diseases such as cardiovascular disease, cancer, type 2 diabetes, obesity, and musculoskeletal disease [1–8]. Other than physical activity, transient behavior in the last decade has also emerged as a new risk factor affecting health [8,9]. Sedentary behavior, defined as sitting (without any activity), leaning and lying down, with low energy expenditure [10].

Sedentary behavior is the biggest health problem in society that occurred in the 21st century [11]. Around 31.1% of adults aged 15 years and over are mainly known to be physically inactive, especially in developing countries [12]. Several studies reveal that sedentary behavior and health in adulthood

[8,13-15], children and adolescents [16-19] have been widely published. Children aged 6 years spend an average of 7.7 hours per day, while adolescents and adults up to 60 years spend 60% (8.4 hours) of total waking time (14 hours) for sedentary behavior [20]. Some studies also report that there are differences in physical activity and sedentary behavior between those who live in rural and urban areas, therefore it is suggested to do the different treatments in interventions [21–23]. In winter, urban children in Cyprus are reported to be more active compared to rural areas, whereas in summer children in rural areas are more physically active compared to urban areas [24].

In Japan it is reported that the physical activity of children aged 11-12 years in rural areas is lower compared to urban areas [21]. In Belgium it is reported that urban adults are more active than rural adults [25].

Similar studies in Indonesia, especially in early childhood, are still relatively limited, and even those that objectively use accelerometer instruments are still not be done. Therefore, objective measurements are needed regarding the differences in physical activity of early childhood in rural and urban areas in Indonesia. The study of physical activity must be done from an early age, because it will determine their physical condition during adulthood [26]. Participation in physical activity in adulthood must be studied from a young age [27].

### II. METHODS

Participants. The sample was 48 early childhood (4 years) who came from rural and urban areas in West Java. Samples were taken from 15 early childhood education schools and study groups with details of 7 rural schools and 8 schools in urban areas. Students who were sampled previously had

received approval from the school and parents. Parents are asked to fill out a participation form.

**Measures.** Physical activity and sedentary behavior were measured using the ActivPAL 4 accelerometer (PAL Technologies Ltd). ActivPAL is a miniature electronic device for recording activities such as length of time sleeping, lying down, sitting, standing, stepping and cycling. ActivPAL can measure activities more objectively than using a questionnaire. An accelerometer can explore physical activity patterns objectively in terms of characteristic elements such as intensity, duration and frequency (28.29). ActivPAL is installed for five days and recording for three days. During recording, ActivPAL is not released either during sleep, bathing or in other activities such as swimming.

**Analysis.** Statistical descriptions including means and standard deviations were calculated based on demographics data. MET's data are used to test differences in physical activity, while sitting and lazing time are used to test differences in sedentary behavior in early childhood. The statistical analysis of the independent sample t-test was used to test the differences between the two data groups of the sample.

### III. RESULTS AND DISCUSSION

#### A. Results

Physical activity measured are length of standing, walking, and cycling as recorded on the ActivPAL accelerometer. Sedentary behavior measured is the amount of time sitting, lying down and being in the vehicle. The unit of time used is minutes per day which is averaged from the results of the recording for three days.

TABLE I. DESCRIPTION OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR BASED ON DEMOGRAPHIC DATA

|    |       | N  | M      | SD    |
|----|-------|----|--------|-------|
| PA | Urban | 24 | 345,67 | 71,23 |
|    | Rural | 24 | 367,50 | 75,58 |
| SB | Urban | 24 | 415,17 | 72,31 |
|    | Rural | 24 | 381,00 | 83,86 |

Table 1 showed the data description (Mean and SD) PA and SB. It is known that early childhood in urban areas spend an average of PA 345.67 minutes per day (SD = 71.23), while early childhood children in rural areas spend an average of PA 367.50 minutes per day (SD = 75.58).

TABLE II. DESCRIPTION DATA FOR PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR OF RURAL AND URBAN EARLY CHILDHOOD

|          | Area  | N  | Mean   | SD    |
|----------|-------|----|--------|-------|
| Standing | Urban | 24 | 200,25 | 38,82 |
|          | Rural | 24 | 212,08 | 66,48 |
| Stepping | Urban | 24 | 144,92 | 43,95 |
|          | Rural | 24 | 154,00 | 36,15 |

TABLE III. INDEPENDENT SAMPLE T TEST FOR PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR BASED ON DEMOGRAPHIC DATA

| t     | N  | P    |
|-------|----|------|
| 1,030 | 46 | ,308 |
| 1,512 | 46 | ,137 |

Early childhood in urban areas spend an average of 415.17 minutes per day (SD = 72.31) for sedentary behavior, while rural early children spend an average of 381 minutes per day (SD = 83.86 ). Nevertheless the results of processing with independent sample t-test revealed no significant differences in sedentary behavior and physical activity of early childhood between those who lived in rural and urban areas (P> .005).

#### B. Discussion

The results of the study showed that there is no difference in physical activity and behavior among early childhood in rural and urban. However, rural early childhood is more active than urban early childhood. Early childhood in urban areas spends more time on sedentary behavior compared to rural areas.

Previous research stated that school-age children in urban Taiwan are more active compared to rural areas [22]. In another study it was reported that in winter the urban children in Greek-Cypriot were more active than those in the countryside, and in the summer the children in the countryside were more active than the children in the city [24].

The differences in findings from previous research may be influenced by various factors, one of which is culture and environment. The social environment is predicted to influence physical activity and sedentary behavior [28].

The recommendation of this study is that physical activity must be carried out routinely from an early age, because it will determine physical condition during adulthood [26]. Participation in physical activity in adulthood must be studied from a young age [27].

### IV. CONCLUSION

The results of the study concluded that physical activity and sedentary behavior between early childhoods living in rural and urban areas in Indonesia differed significantly, where urban early childhood was more active in physical activity compared to rural areas.

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