



## The Effect of Overweight on Gross Motor Development in Early Childhood

Luluk Laelatul Muniroh<sup>1✉</sup>, Cahniyo Wijaya Kuswanto<sup>2</sup>

Universitas Islam Negeri Raden Intan Lampung, Bandar Lampung, Indonesia

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✉ Corresponding author:

[[luluklailatulmuniroh@gmail.com](mailto:luluklailatulmuniroh@gmail.com)]

### Article Info

### Abstrak

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Overweight in children is increasingly recognized as a risk factor for developmental delay, particularly in gross motor skills. This study investigated the correlation between obesity and gross motor development in 5–6-year-old children using a quantitative correlational approach. Data were collected from 15 children selected through purposive sampling of two kindergartens in Bandar Lampung, Indonesia. Gross motor development was assessed using an observational checklist adapted from the Denver II scale. The analysis revealed a very strong positive correlation between overweight and gross motor skill impairment (Pearson  $r = 0.911$ ,  $p < 0.001$ ). Regression analysis further confirmed that overweight significantly predicted gross motor developmental delay ( $F = 14.849$ ,  $p < 0.001$ ). This finding suggests that overweight significantly impairs children's physical mobility. This study contributes current local data to the growing global concern about pediatric obesity and its developmental consequences. Practical implications include the need for integrated school-based interventions and awareness programs for parents to reduce overweight-related motor deficits in children aged religious

### 1. INTRODUCTION

Obesity/Overweight still exists in Indonesia and is a problem, especially in children (Okfiani et al., 2022). According to Myers (2004), a person is said to be overweight if their body's fat cells increase or enlarge (Arhandika, 2022). Obesity occurs when a child is overweight, namely a weight that is disproportionate to their age. Overweight itself can be interpreted as the accumulation of abnormal fat or excess fat that is at risk of causing health problems (Arimbawa, 2019; Oktavia, 2021). Overweight often occurs in children aged 4-10 years. WHO (World Health Organization) states obesity/Overweight as a global problem that impacts children's health. Excess weight in children can make it difficult for them to move because their physical movement space is limited (Nurchahyo, 2011; Zahari et al., 2022). According to guidelines from the World Health Organization (WHO), a child is considered obese if their BMI is above the 95th percentile for their age and gender. For boys and girls aged 6 years, the weight that indicates obesity is 15.9 kg - 23.5 kg for boys and 15.3 kg - 23.5 kg for girls (Lestari & Solikah, 2020). The problem of being overweight is currently a real problem, the wrong diet is the main cause of

nutritional problems in children (Indanah et al., 2021; Irdianty & Sani, 2018; Saprudin et al., 2023). Factors causing overweight based on H.L. Belam's theory, which consist of environmental factors, namely physical activity and diverse food choices, health service factors, namely the influence of counseling, genetic factors, namely age, gender, parental obesity, gene mutations, and behavioral factors, namely diet and lack of physical activity (Syafitri et al., 2020; Warsid et al., 2023). Overweight in children is caused by eating habits, fast food can be one of the causes. Excess weight can affect a child's growth and development. The impact of being overweight can also increase the risk of various diseases that cause death such as heart disease, diabetes, bone and muscle disorders (Batara et al., 2016; Indanah et al., 2021; Nurwanti et al., 2016). Other impacts of being overweight in children include the emergence of degenerative diseases and negative impacts on social life such as loss of self-confidence and slow activity (Irawan et al., 2020; Mugianti et al., 2018; Syafitri et al., 2023). One way to prevent being overweight is to reduce the use of gadgets, control eating patterns while watching, consume lots of fiber from vegetables and fruits, be active outdoors, always have breakfast with nutritious foods, and bring healthy food and water from home (Zahari et al., 2021; Ramadhani et al., 2018). Being overweight occurs not only because of consuming too much food but also because of lack of physical activity (Agustina et al., 2019; Batara et al., 2016). Being overweight not only has an impact on long-term physical health, but can also inhibit the development of children's gross motor skills.

According to Papalia (2009), gross motor skills are physical abilities that involve large muscles. Gross motor skills are skills that include large muscle activity, such as moving the arms and walking (Widiyanti, 2018). Gross motor development is a development related to aspects of a child's ability to perform movements and body postures that involve large muscles such as lying down, sitting, walking and so on (M.R. Siregar, Juwita, 2023; Saripudin, 2019; Tanjung & Novitri, 2024). Meggitt explains that the term motor development refers to the concept of physical development, where this development means that the child has achieved a number of abilities in self-control. Gross motor skills are abilities that require important muscle movement and coordination (Kuswanto et al., 2023). Physical activity in childhood has many health benefits such as improving physical fitness, bone health, cognitive and mental health (Adolph & Hoch, 2019; Aliriad et al., 2023; Sebert, 2024). Lack of physical activity will have an impact on being overweight from an early age.

Being overweight in early childhood can cause physical and emotional problems. According to Masrul (2018), obesity/overweight can cause physical problems such as lower back pain, slow movement, difficulty walking, and leg injuries. This happens because the body has to support a heavy load, so it can interfere with gross motor development. This involves gross muscles and physical movement. Overweight children usually lose in games that require physical strength, because they tend to move slower than their peers. In early childhood, being overweight can affect various aspects of their physical growth and motor skills, both in the short and long term (Zahari et al., 2021). Overweight children can also have difficulty in doing daily physical activities, such as standing, running, and jumping (Mugianti et al., 2018). Overweight children often have difficulty developing gross movements, such as walking, running, jumping, and climbing. Being overweight can make children tired quickly, less active, and hinder their ability to practice gross motor skills (Maria et al., 2022; Suryadinata & Sukarno, 2019).

There are several studies on obesity/overweight in early childhood (Chen et al., 2024; Hermilasari et al., 2021; Honea et al., 2023; Irawan et al., 2020; Mansker et al., 2023; Maulida et al., 2017; Ni et al., 2023; Pearce et al., 2016; Permanasari & Aditianti, 2018; Suryadinata, 2019; Srinag et al., 2020). This study discusses the impact of obesity in early childhood. Several researchers agree that obesity in children has a negative impact on their physical, motoric, and cognitive development. These studies emphasize the need for greater attention to the problem of obesity and the factors that influence it to improve children's health and quality of life. One researcher stated that being overweight can interfere with cognitive and motor functions, potentially leading to social exclusion and decreased achievement (Irawan et al., 2020b).

There are studies that emphasize the importance of paying attention to the motor development of obese/overweight children. Excess weight is more vulnerable in terms of physical health and well-being. Several researchers also agree on the need for early intervention to prevent excess and support child growth and development. Researchers show that health education and promotion of physical activity should start at an early age to address risk factors for overweight (Fajzrina, 2022; Sartika, 2011; Mugianti et al., 2018). There are things that have not been touched on in some of the articles above, so researchers will create articles that are more touched on. Other articles discuss the same topic

regarding excess weight in early childhood on motor skills, but researchers will provide broader and more detailed insights. Researchers will present more up-to-date and relevant information, thus providing a different experience from other articles. From this study, there is no way to address inactive lifestyle habits that play a role in worsening the impact of excess weight on gross motor skills. While several studies have discussed the psychosocial impacts of obesity/overweight, there is still a lack of understanding of how excess weight affects motor skills and overall quality of life. Further research is needed to explore this relationship in depth. There is a gap in research on how these factors influence children's diet and physical activity. This research is needed to understand the negative impacts of being overweight. The gap analysis shows that although there is a lot of research on the topic of obesity/overweight, little has focused on factors such as diet, physical activity, home activities, and how to prevent them, which requires further attention.

In contrast to previous studies that primarily examined psychosocial or nutritional aspects of childhood overweight, this study offers a novel contribution by quantitatively analyzing the direct relationship between overweight and gross motor skill impairment in children aged 5–6 years in the Indonesian context. The use of correlation and regression analyses in this specific age group provides new empirical evidence from a developing country perspective.

## 2. METHODS

The approach used in this research is a quantitative method approach. Research with a quantitative approach emphasizing analysis on numerical data or numbers processed using statistical methods (Azwar, 2009). The type of research used in this study is correlational research. The research method used in this study will use a type of survey research that uses tests and questionnaires as data collection instruments, with the aim of collecting information from a number of respondents representing a certain population and analyzing the data statistically to test the proposed hypothesis. This research was conducted in January-February 2025.

Children's gross motor development was measured using an adapted version of the Denver II Developmental Screening Test, widely recognized for assessing motor milestones in early childhood. The instrument was validated through expert assessment and pilot tested for reliability, yielding a Cronbach's Alpha of 0.82.

The small sample size ( $N = 15$ ) was due to ethical considerations and limited access during the study period. While this limits generalizability, the study focused on in-depth and context-specific data collection. Sampling was purposively selected to target children with varying levels of BMI in two different schools, to ensure variability in overweight status. Data collection involved direct observation and consultation with classroom teachers and parents to ensure accuracy.

The population is children aged 5-6 years in Bangsa Ratu Sukabumi Kindergarten and Toyyibah Bandar Lampung Kindergarten. The sample is part of the number or characteristics possessed by the population. If the number of respondents is less than 100, then all samples are taken so that this study is a population study (Arikunto, 2002). The sampling technique used in this study is purposive sampling, namely each individual in the population of each class must have a known probability to be determined as a sample in a study. (Azwar, 2011). So the sample in this study was 10 children in Bangsa Ratu Sukabumi Kindergarten and 5 children in Toyyibah Bandar Lampung Kindergarten so that the total number is 15 people. The purpose of this study was to determine the relationship between overweight ( $X$ ) and gross motor development in early childhood.

## 3. RESULT AND DISCUSSION

The results of the study showed that being overweight has a significant impact on the gross motor development of early childhood. The development of children's physical motor skills is disrupted and slower than children of the same age. Children will have difficulty in making movements and their gross motor skills will not develop properly.

Based on the table 1, the overweight variable ( $X$ ) obtained a significant value of 0.000 which is smaller than 0.05 ( $0.000 < 0.05$ ) so that this variable is declared significant and acceptable. It can be concluded that there is a relationship between variable  $X$  and variable  $Y$  with a strong level of relationship. Based on this theory, motor development is the result of interaction between the nervous system, muscles and environmental experience. Gross motor development itself is a development related to aspects of a child's ability to perform movements and body postures that involve large muscles such as

lying on their stomachs, sitting, walking and so on. In obese children, being overweight can limit muscle movement and flexibility so that they tend to experience delays in gross motor skills such as running, jumping or climbing.

**Table 1. Relationship between overweight and children's gross motor skills**

Correlations		Overweig ht	Gross Motor Development
Overweight	Pearson Correlation	1	.911**
	Sig. (2-tailed)		.000
	N	15	15
Gross Development	Pearson Correlation	.911**	1
	Sig. (2-tailed)	.000	
	N	15	15

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The results of this study also strengthen scientific evidence regarding the impact of overweight on optimal child motor development. With a deeper understanding of the relationship, educators, parents, and health workers can design more effective strategies to address the problem of overweight in early childhood and prevent delays in gross motor development. The correlation results in this study indicate that there is a strong relationship between overweight and gross motor development, with a Pearson correlation value of 0.911 and a significance of 0.000 ( $p < 0.05$ ). This finding is in line with research conducted by Winner et al., (2023) which found that there was a significant relationship between overweight and gross motor development in children aged 6-10 years, with a Spearman correlation value of -0.777 ( $p < 0.05$ ). This means that the higher the child's body mass index (BMI), the lower their gross motor skills. In addition, the results of the linear regression in this study showed that overweight contributed significantly to gross motor development, with a significance value of 0.000  $< 0.05$ . This confirms that being overweight is one of the main risk factors for delayed gross motor development. This finding is in accordance with research (Diyono, 2019). which revealed that children with low BMI tend to have better motor skills compared to obese children. Research conducted by (Fajzrina, 2022) also highlights that obesity can slow down gross motor development in children aged 5 years, with symptoms such as difficulty moving, getting tired quickly, and low body coordination. Research (Zahari et al., 2021) states that 25.7% of obese/overweight children experience gross motor development deviations compared to children with normal weight. Being overweight is also often associated with a less active lifestyle, where people tend to spend more time doing activities such as watching TV or playing gadgets, so they have less opportunity to practice gross motor skills. This condition creates a vicious circle where being overweight makes children less active, which then worsens the condition of obesity and motor development.

The biological mechanisms behind this correlation may be related to reduced muscle efficiency, altered joint mechanics, and metabolic limitations associated with obesity (Chen et al., 2024; Maria et al., 2022). Psychosocially, overweight children often experience decreased self-esteem and social withdrawal, which further limits physical engagement (Mansker et al., 2023). Furthermore, children with higher BMI often avoid structured physical activity due to discomfort or peer teasing, which exacerbates developmental gaps. Interventions such as structured physical play programs and family-based lifestyle modifications have shown promise in counteracting these effects (Honea et al., 2023; Maria et al., 2022).

This study has several limitations that need to be considered in interpreting the results. One of the main limitations is the small number of respondents who were able to participate in this study. The limited sample size can affect the statistical power and generalizability of the study findings. In addition, the limited research time is also a factor that affects the depth of analysis and long-term observation of gross motor development in overweight children. Based on the findings of this study, it is recommended that parents pay more attention to their children's diet and physical activity in order to prevent excess weight and support optimal gross motor development. For educators and schools, it is important to develop learning programs that encourage physical activity and appropriate interventions for overweight children accompanied by education for families, while further researchers are expected to conduct

research with larger samples, for a longer period, and examine the effectiveness of various interventions in improving gross motor skills in obese/overweight children.

#### 4. CONCLUSION

This study concluded that overweight significantly impaired gross motor development in children aged 5–6 years, as evidenced by a strong positive correlation ( $r = 0.911$ ) and significant regression results ( $F = 14.849$ ,  $p < 0.001$ ). These findings emphasize the need for early screening and targeted interventions in educational settings. This study is limited by its small sample size and cross-sectional design, which precludes causal inference. Nonetheless, the results provide important baseline data for further large-scale research. Future research should explore longitudinal designs and assess the effectiveness of intervention programs. For educators and policymakers, these findings highlight the urgency of integrating physical activity into early childhood curricula and promoting healthy lifestyle habits at home.

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