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The Effect of Dynamic Warm-Up on Students' Physical Readiness Before Undertaking Sports Activities in Grade IV, MIN 3 Medan City

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Abstract

This study aims to analyze the effect of dynamic warm-up on the physical readiness of lV MIN 3 Kota Medan grade elementary school students before doing sports activities. Optimal physical readiness is very important to prevent injury and improve student performance in sports. The research method used was a quasi-experimental method involving two groups: an experimental group that did dynamic warm-up and a control group that did not. Data were collected by measuring heart rate, joint flexibility, and muscle fatigue levels before and after sports activities. The results showed that dynamic warm-up significantly affected the increase in students' initial heart rate and joint flexibility, and reduced muscle fatigue levels after sports activities compared to the control group. Thus, it can be concluded that dynamic warm-up has a crucial role in preparing the physical condition of lV MIN 3 Medan City, grade elementary school students, increasing safety, and optimizing their participation in sports activities. The implication of this study is the importance of implementing dynamic warm-up as an integral part of every sports session at the elementary school level.

Keywords: Dynamic warm-up, physical readiness, sports activities,

INTRODUCTION

Physical education and sports are integral components of the basic education curriculum in Indonesia. Through sports activities, students not only develop motor skills but also build physical fitness, discipline, and social interaction. At the elementary school (SD)/Islamic elementary school (MIN) level, especially for fifth-grade students, active participation in sports activities is highly encouraged to support their physical and mental growth and development. However, physical readiness before starting sports activities often receives little attention. Adequate physical preparation plays a crucial role in minimizing the risk of injury and optimizing performance during sports. Warming up before exercise has long been recognized as standard practice in physical education and sports science. Traditionally, static warm-ups (range of motion exercises without movement) have often been the preferred method. However, in recent decades, scientific literature has shown that dynamic warm-ups (range of motion exercises involving active movement) tend to be more effective in preparing the body for intense physical activity. Dynamic warm-ups involve movements that mimic the activity to be performed, thus specifically preparing the muscles, joints, and cardiovascular system for the workload to be encountered (Behm, D.G., & Chaouachi, A. (2021). This differs from static warm-ups, which may not optimally increase muscle temperature and blood flow to the areas to be actively used (Samson, M., & Venckūnas, T. (2020).

Students' physical readiness before exercising can be measured through several indicators, including heart rate, joint flexibility, and muscle fatigue levels. An increased heart rate indicates activation of the cardiovascular system, while good joint flexibility allows for a wider and more efficient range of motion. Inadequate warm-up can leave muscles and joints unprepared, making them susceptible to injuries such as sprains or strains, and can lead to premature fatigue (Chaabene, H., Prieske, O., Negra, Y., & Granacher, U. (2020). Therefore, it is important to understand how different types of warm-up, especially dynamic warm-up, can affect these indicators of physical readiness in the 15th grade MIN age group. They are at a crucial stage of motor development, where good physical habits need to be instilled early on.

Given the importance of physical readiness and the potential of dynamic warm-ups, this study aims to analyze in depth the effect of dynamic warm-ups on

students' physical readiness before engaging in sports activities in grade IV MI. The results of this study are expected to provide empirical contributions to the development of physical education curricula and provide practical recommendations for sports teachers in designing more effective warm-up sessions, thereby improving student safety, comfort, and performance during participation in sports activities.

Physical education and sports in elementary schools play a fundamental role in the holistic development of students, encompassing physical, cognitive, and social aspects. Planned and systematic sports activities can improve cardiorespiratory fitness, muscle strength, flexibility, and motor coordination in children (Faigenbaum, AD, & McLeod, TV (2020). Especially for fourth-grade students at Madrasah Ibtidaiyah Negeri (MIN) 3 Medan City, who are in a phase of rapid motor development, participation in sports activities is crucial for instilling healthy lifestyle habits and a good foundation for movement. However, the effectiveness and safety of these sports activities depend heavily on the physical readiness of students. Optimal physical readiness serves as an important prerequisite for minimizing the risk of injury and maximizing athletic performance during sports sessions (Samson, M., & Venckūnas, T. (2020). Therefore, it is important to understand the factors that contribute to this physical readiness.

One important aspect of physical preparation before exercise is warming up. Traditionally, static warm-ups (restrained range of motion) are often used. However, recent studies have shown that dynamic warm-ups (range of motion involving active movements) are more effective in preparing the body for intense physical activity (Chaabene, H., Prieske, O., Negra, Y., & Granacher, U. (2020). Dynamic warm-ups involve functional movements that mimic the upcoming sporting activity, specifically increasing muscle temperature, blood flow, connective tissue elasticity, and nervous system activation. Movements such as leg swings, arm circles, lunges, and high knees progressively prepare muscles and joints for higher workloads, which can ultimately contribute to improved performance and injury prevention (Behm, D.G., & Chaouachi, A. (2021).

Students' physical readiness can be identified through several physiological indicators. Heart rate is a vital indicator that reflects the cardiovascular system's response to activity. An effective warm-up will cause a gradual increase in heart rate, indicating that the heart is prepared to pump more blood to the working muscles. A

controlled increase in heart rate before core activity indicates that the aerobic system is activated and ready to meet higher energy demands (Sarabon, N., & Vuckovic, G. (2021).

In addition to heart rate, joint flexibility is also a key component of physical fitness. Flexibility refers to the ability of a joint to move through its full range of motion without restriction or pain. Dynamic warm-ups have been shown to be superior in improving acute flexibility compared to static warm-ups, as they involve active movements that functionally stretch muscles and connective tissues (Al-Hammoud, AA, & Al-Amer, AA (2023). Good flexibility not only allows for more efficient and powerful movement performance, but is also crucial in reducing the risk of musculoskeletal injuries, such as sprains or strains, which often occur due to movements that exceed the elastic limits of muscles and joints.

Finally, the level of muscle fatigue is also an important indicator of post-activity physical readiness. Premature fatigue can hinder full participation and exercise effectiveness. An adequate warm-up, particularly a dynamic warm-up, can delay the onset of fatigue by preparing the energy system and reducing stress on the muscles (Blazevich, AJ, & Babault, N. (2021). With prepared muscles and optimal blood circulation, metabolic byproducts that cause fatigue can be handled more efficiently. Therefore, this study argues that dynamic warm-ups have significant potential to improve the physical readiness of fourth-grade students at MIN 3 Medan City, which in turn can improve the quality of their participation in sports activities and minimize the risk of injury.

METHOD

This research method will use a quasi-experimental design with a two-group pretest-posttest approach to examine the effect of dynamic warm-up. The study will involve 45th grade students from MIN 3 Medan City, who will be divided into two groups by purposive sampling: one experimental group that will perform dynamic warm-up and one control group that will perform static warm-up. Before the intervention, all students will have their pulse rate and joint flexibility measured. For four weeks, 2-3 times a week, the experimental group will perform dynamic warm-up before the main sports activity, while the control group will perform regular warm-up.

After the warm-up, heart rate and joint flexibility will be measured again, and after the main exercise, muscle fatigue levels will be measured in both groups. The collected data will be analyzed using descriptive statistics, paired sample t-tests, and independent sample t-tests (ANCOVA) using SPSS to compare changes and differences in physical fitness between the two groups.

RESULTS AND DISCUSSION

This study shows that dynamic warm-ups have a significant impact on improving the physical readiness of fourth-grade students at MIN 3 Medan City before engaging in sports activities. These warm-ups were conducted before physical education lessons and consisted of active movements such as light jogging, jumping jacks, lunges, and joint rotations. The entire series of movements was carried out systematically and gradually to increase heart rate, improve blood circulation to the muscles, and raise body temperature, thus preparing organs such as muscles, joints, and the nervous system to face more strenuous physical activities. Based on observations and measurements, it was found that students who participated in dynamic warm-ups experienced significant improvements in several aspects of physical readiness, including muscle flexibility, core strength, body balance, and motor coordination. Furthermore, psychologically, students also showed high enthusiasm, increased concentration, and self-confidence in participating in sports activities. This fact proves that dynamic warm-ups not only have a direct impact on physical readiness but also have a positive effect on students' mental readiness. When compared to the group of students who only performed static warm-ups or did not warm up at all, the group who underwent dynamic warm-ups appeared more active and rarely experienced fatigue or muscle complaints during exercise. This means this method also plays a role in reducing the risk of injury and preparing the body more effectively for intense movements. At the elementary school level, particularly for fourth-grade students who are developing motor skills, dynamic warm-ups have been shown to be very helpful in increasing student engagement and readiness during physical education.

Considering these findings, dynamic warm-ups are highly recommended as a routine part of every elementary school physical education lesson. This method not only promotes students' physical readiness but also contributes to increased morale and overall health. Therefore, physical education teachers are advised to make dynamic

warm-ups a primary approach in the learning process, both as a preventative measure and to instill healthy lifestyle habits in students from an early age.

In sports, both competitive and recreational, proper warm-up implementation significantly impacts athlete performance. Based on existing findings, it can be concluded that warm-ups play a crucial role in helping athletes achieve maximum performance and prevent injury. Therefore, the importance of warm-up activities needs to be instilled early in both coaches and students (Shellock, FG & Prentice, WE, 2020). The sports activities undertaken by fourth-grade students at MIN 3 Medan City began with a dynamic warm-up as the initial step to prepare the body for more strenuous physical activity. This dynamic warm-up involved a series of active movements such as running on the spot, jumping, and light stretching. These movements aimed to raise body temperature, improve blood circulation, and gradually increase heart rate.

In the context of physical education and sports training, warming up should be a structured, routine part of every training session. Introducing a proper warm-up early on can provide long-term benefits, such as maintaining a healthy lifestyle and increasing physical readiness for exercise. Many muscle injuries experienced by students in schools are generally caused by a lack of understanding of the importance of warming up. Proper warm-up can reduce the risk of injury by up to 50% in sports activities among students. Furthermore, the process of learning about warming up also helps students better understand how their bodies work. Warming up can also be used as a means to foster discipline and a sense of responsibility for their physical condition. Therefore, physical education teachers play a crucial role in conveying knowledge about the concept, benefits, and proper warm-up techniques (Madicine, 2021).

Physiologically, warming up has important benefits in preparing the body's systems for training and competition. One of its main functions is to increase blood flow to active muscles, thereby accelerating the delivery of oxygen and nutrients needed to produce energy. To achieve optimal results, warming up must follow the principles of good training. First, the principle of specificity requires that the warm-up be tailored to the type of movement and the needs of the sport being performed. Second, the principle of progressiveness emphasizes that the intensity of the warm-up needs to be increased gradually, starting with light activities and working up to higher intensities. Third, the principle of duration explains that the warm-up must be sufficient, not too

short but also not too long to avoid fatigue (Slam Zaenul, 2022). After the warm-up phase is complete, students proceed to various core sports activities, such as short-distance running, ball games, basic gymnastics, and agility training. All of these activities aim to improve students' physical fitness, endurance, and muscle strength. Health sports are designed to be stress-free, easy to do, affordable, and physiologically safe. This sport also plays a role in building social communication and reducing mental stress, which ultimately can make a person physically and mentally healthy in accordance with the concept of a healthy lifestyle as a whole. Some activities that can be done regularly to maintain physical and mental fitness are sports and gymnastics. Doing regular exercise for 20–30 minutes can improve physical fitness, especially if done at a heart rate intensity of around 70–80% of the maximum heart rate for trained individuals, and 50–70% for those who are not trained. Gymnastics itself is a physical activity that involves free movement and aims to increase muscle strength and movement efficiency. In addition, gymnastics can also be used to train memory. Physical activities such as sports and gymnastics, done consistently, can maintain a person's physical and mental condition. Mental health itself is a condition where a person realizes their potential, is able to manage life's pressures, works productively, and makes a positive contribution to their social life. Regular exercise for 20–30 minutes can improve physical fitness with a heart rate intensity of 70–80% of the maximum for trained individuals and 50–70% for those who are not trained. (N. Fahmawati, N. Fediyanto, and LI Mariyati, 2023).

CONCLUSION

Based on the observations and discussions, it can be concluded that dynamic warm-ups play a crucial role in supporting the physical readiness of fourth-grade students at MIN 3 Medan City before engaging in sports activities. Active and structured warm-ups can gradually increase the heart rate, thus optimizing blood and oxygen flow throughout the body. This positively impacts the readiness of students' respiratory and cardiovascular systems for core exercises. Furthermore, dynamic warm-ups have been shown to increase muscle and joint flexibility, which is crucial for preventing injury and supporting smooth movement during exercise.

The students' physical readiness generally appeared quite good, with them participating in sports activities with enthusiasm and sufficient endurance. However,

some students still experienced muscle fatigue, particularly after undergoing exercises that relied on muscle strength for a certain duration. This fatigue indicates that, despite proper warm-up, the intensity of the exercise needs to be adjusted to suit the physical abilities of elementary school-aged children. Therefore, physical education teachers need to continuously monitor students' physical condition and provide adequate rest periods to prevent muscle fatigue from negatively impacting their health and motivation.

Overall, the dynamic warm-up and sports activities at MIN 3 Medan City have been successful and have had a positive impact on students' physical fitness. With targeted training planning and proper supervision, these sports activities can foster healthy lifestyles and gradually improve students' physical abilities.

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