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Biomotor Dimensions: Analysis Of Basketball Skills In Students

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ABSTRACT

The study aimed to analyze biomotor components in relation to basketball skills among students at Mardi Rahayu Ungaran Junior High School. A quantitative approach with descriptive analysis was applied to 120 seventh and eighth grade students selected through purposive sampling. Measurements included biomotor tests such as ball throwing and catching, push-ups, beep tests, and basketball skills measured by dribbling, passing, and shooting tests. The data were analyzed descriptively. The results of the analysis showed that the average score for throwing and catching was 7.48±6.89, the average for push-ups was 14.48±4.66, an average beep test score of 24.76±1.45, an average dribbling skill score of 17.50±7.50, a passing skill score of 16.12±6.74, and a shooting skill score of 0.83±1.35. The results showed that the majority of biomotor components were in the adequate to poor category, while basic basketball skills were generally in the poor to very poor category, especially shooting skills, which were very low. The findings show a close relationship between suboptimal biomotor conditions and poor mastery of basic basketball techniques. The conclusion of this study emphasizes the need for a programmed PE learning intervention to improve biomotor components as the basis for improving basketball skills.

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INTRODUCTION

Physical activity is introduced to students in school through physical education (Riyanto, 2020). The culture of physical activity applied through physical education is an active indicator for improving students' physical fitness (Prakosa & Yuli Hartati, 2022). The body's ability to perform constant movements without experiencing fatigue is known as physical fitness (Rohmah & Muhammad, 2021). Students' physical fitness has a linear impact on mental health, where each student bears a different workload every day. Individuals with good physical fitness can perform all activities to the maximum, avoid the possibility of injury, and the risk of contracting chronic diseases. Physical activities that involve students in a sport can improve physical fitness (Lagarinda & Nurhayati, 2024). Each sport has its own characteristics in terms of skill and movement mastery, one of which is basketball. Basketball is a type of ball sport played by five people on an

indoor or outdoor court with the aim of scoring as many points as possible against the opponent in four ten-minute periods (Kusumawati & Muhamad, 2020).

Basketball is a popular game among various groups, especially students. In practice, this game pits individual skills against each other, combined with teamwork (Abrar & Fitroni, 2021). Sports are divided into two categories: team sports and individual sports. Each type of sport has specific characteristics that influence the dominant components of the sport. Dominant factors originate from within the body (intrinsic) and outside the body (extrinsic) (Fallo et al., 2024). Intrinsic factors involve the psychological state and physical health of children. At the same time, children must have technical mastery, biomotor abilities, and a winning spirit. Extrinsic factors include professional coaches, adequate budgets, adequate facilities and infrastructure, a structured organizational structure, and a sporting environment. In addition to intrinsic and extrinsic factors, there are elements that support achievement because they are interrelated, such as physical condition, technique, tactics, and mentality. A crucial element in sports is the biomotor component (Dwihandaka et al., 2021). The movements produced require motor skills, which are influenced by the biomotor component (Kusuma et al., 2019).

Biomotor is the body's ability to move with the adaptation of the metabolic system, bones, joints, muscles, and cardiovascular system. The basic components of biomotor include strength, endurance, speed, coordination, and flexibility. Other components consist of combinations of several components, for example, power is a combination of strength and speed, and agility is a combination of speed and coordination (Hulfian et al., 2018). Therefore, biomotor components form physical condition. Since almost all movement activities require strength, endurance, speed, coordination, and flexibility, the beginning of each activity requires extensive joint movement (Prasetyo & Suhartini, 2015). The preparation of physical, physiological, psychological, and biomotor abilities supports the performance of athletes in a sport because it has an impact on improving athlete performance (Dasriandi et al., 2023). Determining the dominant biomotor components in a sport helps in developing a training program that suits the needs of athletes as a support for improving performance. Individuals who are planned to become athletes are designed to train with systematic, programmed progress and have training interventions with increased loads as the training progresses according to training principles. The main objective is to improve their biomotor abilities. This has the same meaning as improving physical condition, which means improving the ability of human organs and systems to perform movements more efficiently and effectively, thereby reducing athlete fatigue and injuries during competitions (Adi et al., 2025).

Judging from the implementation of basketball, this game requires excellent physical condition and technique. Basketball is a game that predominantly uses strength, speed, accuracy, and endurance. Meanwhile, each player is required to master the techniques of passing, dribbling, and shooting (Muhammad & Wismanadi, 2020). Every basketball team uses dribbling, passing, and shooting to attack and score points to win (Irawan et al., 2021). An important skill in basketball is the ability to shoot the ball into the basket or ring (Prastiwi & Irawan, 2022). In essence, shooting plays an important role in basketball because the

number of balls thrown into the basket determines the points in a game (Rahmadani et al., 2021). Previous research states that the biomotor factors that contribute to the ability to perform a front kick in pencak silat are leg muscle power, flexibility, and abdominal muscle power (Yusuf Panjiantariksa & Tri Aprilijanto Utomo, 2020). One of the biomotor components that determine the ability to perform a forehand groundstroke in tennis is speed (Putra et al., 2017). Thus, during a match, players with good biomotor abilities will greatly support their best performance, while players with poor biomotor abilities will greatly interfere with their performance (Dasriandi et al., 2023).

Based on observations at Mardi Rahayu Ungaran Junior High School, the physical education teacher explained that when teachers gave instructions on basic basketball techniques, the students understood, but most of them still had difficulty applying the techniques. During the game, students tireD more quickly when playing basketball and tend to be passive during learning activities. This study aims to analyze the biomotor components of the basketball skills of students at Mardi Rahayu Ungaran Junior High School. It is hoped that this research can contribute to improving students' basketball skills and can be used as a reference in learning and creating training programs through the results of biomotor analysis.

METHODS

This study was conducted using a quantitative approach with descriptive analysis methods. A quantitative approach is a process of knowledge based on numerical data as research analysis material (Aziza, 2023). The population in this study consisted of 312 seventh and eighth grade students at Mardi Rahayu Ungaran Junior High School. The sample in this study consisted of 120 students from grades VII and VIII at Mardi Rahayu Ungaran Junior High School. The sampling technique used was purposive sampling, because the respondents selected met the specific characteristics of the study and participated in data collection until the end (Subhaktiyasa, 2024). All samples agreed to participate and consented to the research procedure by signing a consent form until the end of this study. This research was conducted at Mardi Rahayu Ungaran Junior High School on May 19, 2025, and May 22, 2025.

The instruments used in this study were biomotor measurements and basketball skills. Biomotor measurements included cardiovascular endurance (Beep test), muscle strength (Push-ups), speed, and eye-foot coordination (Ball throwing and catching). Basketball skill measurements included Passing (Chest Pass, Bounce Pass, Overhead Pass), dribbling, and shooting. Data analysis techniques used Excel calculations to find statistical data on means and standard deviations.

RESULTS AND DISCUSSION

This The results of the biomotor analysis of students at Mardi Rahayu Ungaran Junior High School, which included several components of eye-hand coordination, strength, and endurance tests, are presented in the following table:

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Table 1.
Student Biomotor Data Results

Category	Mean ± SD	Min	Max
Ball throw and catch (REP)	7,48±6,89	0	24
Push Up (REP)	14,48±4,66	5	32
Beep test (ml/kg/minutes)	24,76±1,45	9	1

Referring to Table 1, which presents the results of the analysis of the biomotor components of students at Marda Rahayu Ungaran Junior High School, the coordination test results had an average of 48 with a standard deviation of 6.89, indicating less variation in the students' coordination abilities, with a minimum score of 0 and a maximum score of 24. The strength test results had an average of 1448 with a standard deviation of 4.66, with the highest score being 32 and the lowest being 5. The endurance test results had an average of 24.76 with a standard deviation of 1 43, accompanied by a minimum score of 1 and a maximum score of 9.

The results of the psychomotor analysis of students at Mardi Rahayu Ungaran Junior High School, which included several components of agility and reaction time tests, are presented in the following table:

Table 2.
Data Results Basketball Skills of Students

Basketball Skill	Mean ± SD	Min	Max
Dribble (s)	17,5±7,5	8,93	32,38
Passing (REP)	16,12±6,74	7	40
Shooting (REP)	0.83±1,35	0	6

Referring to Table 2, which presents data on students' basic skills in basketball, consisting of three main elements: dribbling, passing, and shooting. The average dribbling ability was 17.5 with a standard deviation of 7.5, a minimum score of 8.93, and a maximum score of 32.38, indicating significant variation in dribbling technique mastery. The average passing score is 16.12 with a standard deviation of 6.74, with a minimum score of 7 and a maximum score of 40, indicating that some students still have good passing skills. For shooting ability, the average score was very low, at 0.83 with a standard deviation of 1.35; the minimum score was only 0, and the maximum score was only 6, indicating that shooting was the weakest skill aspect of all the components tested.

Discussion

Biomotor analysis of basketball skills is divided into three test components. The eye-hand coordination test component in this study was measured using ball throwing and catching. This component shows how well students can synchronize visual stimuli with quick and accurate motor responses. Basic technical skills such as dribbling, passing, and shooting are directly influenced by this aspect. This study used a ball throwing and catching test to assess coordination elements. Students were asked to catch and throw the ball within 30 seconds to assess the speed, accuracy, and synchronization of their hand movements with the visual stimuli they received.

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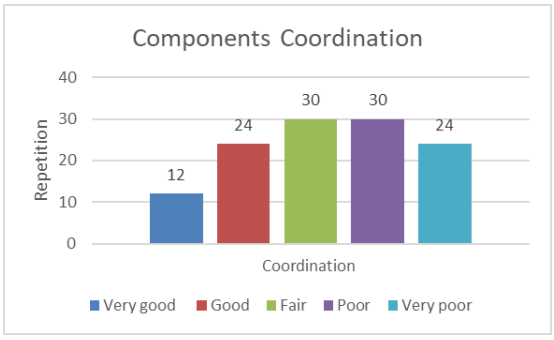

Figure 1.
Biomotor Data on Ball Throwing and Catching Coordination

The analysis results in Figure 1 show that the highest standard results for eye-hand coordination were in the fair and poor categories, with an equal number of students (30) in each category. This indicates that some students experienced significant difficulties with coordination, while only 12 students were classified as excellent. This explains that students' coordination abilities vary greatly, which affects how well they play basketball.

In basketball, hand-eye coordination plays an important role in the game. Activities such as catching passes from teammates, making accurate passes, dribbling while reading the movements of opponents and teammates, and shooting the ball into the basket all depend on good visual-motor coordination. Relevant to the study, (Tamtica et al., 2024) found that hand-eye coordination affects the dribbling ability of students at State High School 5 in Jambi City. With a Pearson correlation value of 0.850 (p=0.000), hand-eye coordination contributes 72.2% to the variation in dribbling ability. This indicates that the two variables are closely related. In other words, a player's dribbling ability is positively correlated with their eye-hand coordination.

In basketball, an athlete's ability is directly influenced by muscle strength, which is one of the biomotor components. In this study, the push-up test was used to measure upper body strength. The following is a breakdown of the biomotor data on the strength component.

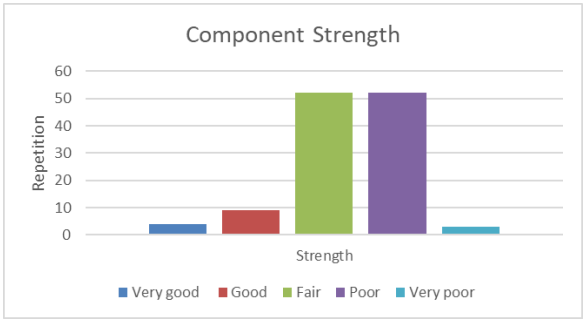

Figure 2.
Push-Up Strength Biomotor Data

The findings of the analysis of the biomotor component refer to Figure 2, which shows that the adequate and inadequate categories received balanced scores, with 52 students achieving the same push-up results in 30 seconds. There were 4 students who were categorized as very good, 9 students in the good category, and 3 students in the

poor category. These figures indicate the ability of the students' upper body muscles to generate power and maintain repeated muscle contractions in a relatively short time.

Upper body muscle strength is very important for performing basic techniques such as passing and shooting in basketball. These techniques require shoulder and arm muscle strength to lift the ball and provide consistent thrust towards the basket. Passing, which is divided into 3 basic techniques, requires strength to direct the ball with sufficient speed and accuracy so that it can be received by teammates. For players with low muscle strength, it will be difficult to maintain shooting accuracy and passing power, especially under game pressure. Muscle strength has a positive impact on defense. Basketball is a contact sport, and players who are strong in their upper body are better able to withstand opponents' pushes and are better at screening or box-outs during rebounds. Sufficient strength helps players maintain the intensity of a game like basketball without quickly experiencing muscle fatigue.

In line with the results of the study, the results of the study (Trisno et al., 2022) show that there is a significant correlation between arm muscle strength measured through push-up tests and the ability of students at SMAN 15 Bombana to perform shoulder pairs in basketball games. Here, the statistical results show that rxy = 0.85 is greater than the table r of 0.444. Another study found that in female basketball athletes aged 17–20 years from Perbasi Kabupaten Ngawi, there was a significant correlation between arm strength measured through push-up tests and three-point shooting accuracy. The correlation analysis results show that the coefficient value r = 0.455 ($p < 0.05$), which is greater than the critical table value r (0.404). This indicates that a player's arm strength is related to three-point shooting accuracy (Friskawati, 2025).

Endurance is fundamental to biomotor skills, especially in sports with high intensity and long playing times such as basketball. In this study, students' endurance was measured using the beep test, which is a three-stage physical fitness test that assesses a person's aerobic capacity through back-and-forth running at gradually increasing intensities until they reach their maximum capacity.

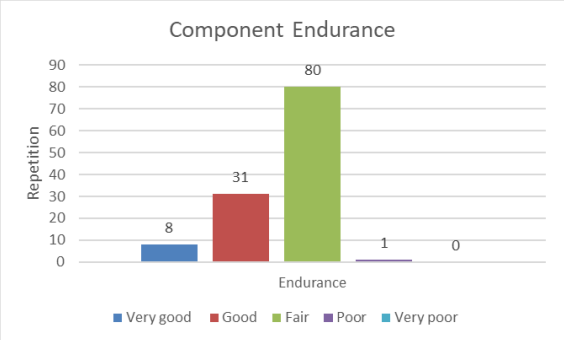

Figure 3.
Biomotor Data Endurance Beep test

During a dynamic, fast-paced basketball game consisting of two halves, poor endurance can interfere with consistent performance. Referring to Figure 3, the category with the highest score was "fair." At the junior high school level, 8 students were in the "very good" category, and 31 students were in the "good" category, meaning that during the game,

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the students had the potential to minimize fatigue. This is in line with the stigma attached to the basketball medals won by Mardi Rahayu Ungaran Junior High School.

Basketball games consist of high-intensity repetitive exercises in which the aerobic energy system functions to accelerate recovery after performing quick maneuvers such as sprints and jumps. As a result, players with a good cardiorespiratory system can recover more quickly from intensive training and remain fit throughout the game. Supported by research (Wicaksono & Kusuma, 2021), the female athletes of KU 14 CLS Surabaya have excellent aerobic endurance, with an average bleep test (VO2 max) of 43.80 ml/kgBW/minute. The results show that all athletes (100%) have excellent aerobic endurance, with 10 athletes (55.56%) in the "very good" category and 8 athletes (44.44%) in the "good" category. The bleep test measures cardiorespiratory capacity (VO2max).

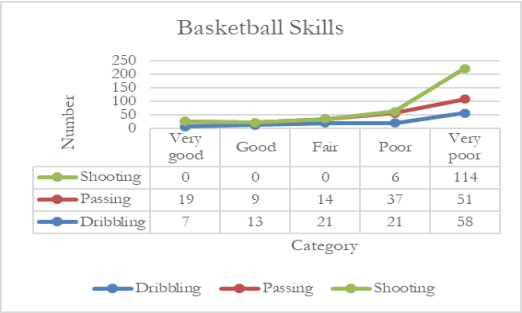

Figure 4.
Basketball Skill Data

Basketball skills depend not only on technical abilities, such as dribbling, passing, and shooting, but also on biomotor and psychomotor abilities. Figure 4 shows the categories of student skills in terms of dribbling, passing, and shooting, indicating that most students are still in the "poor" and "very poor" categories. A total of 58 students were in the "very poor" category for basic dribbling techniques, 51 students were in the same category for passing, and 114 students were clearly in the very poor category for basic shooting techniques. This shows that students' basic basketball skills are generally not optimal. Referring to Figure 4, the findings on biomotor skills are a determining factor in students' basketball playing ability, as evidenced by the results of their basketball playing skills. It was found that in the biomotor test component, students were still in the adequate and poor categories, which directly affected their basketball playing.

In line with previous studies analyzing important biomotor factors in determining groundstroke ability, the results of this study show that biomotor factors, especially speed, have the highest factor component value of 0.91. Players who have speed can react quickly to the ball and hit it quickly. In addition, leg muscle strength (0.82%) and cardiovascular endurance (79.9%) also contribute significantly to movement stability and performance consistency during matches. Hand-eye coordination (0.50) also affects stroke accuracy, but less so than biomotor factors (Putra et al., 2017).

Students' basic basketball skills, which include dribbling, passing, and shooting, are generally in the poor to very poor category. These findings indicate that students' basic basketball technical abilities are still below the optimal standards expected in physical education learning. In addition, a close relationship was found between biomotor

conditions and low basketball skills among students. Biomotor factors such as endurance, muscle strength, and coordination were found to influence students' ability to perform basic basketball techniques. Low physical capacity and agility caused students to be less able to control the ball effectively when dribbling, less accurate in passing, and have difficulty maintaining stability and accuracy in shooting.

Biomotor aspects were measured during physical education classes, and this was the first time most students had undergone such measurements. This suggests that limited experience in structured training and a lack of adequate physical stimulus contributed to low skill levels. Thus, the findings of this study emphasize the importance of developing biomotor components as the basis for improving students' basic basketball skills in the physical education learning process.

CONCLUSION

The results of this study found that the biomotor components of coordination, strength, and endurance of the majority of students were in the adequate to poor category. The results of students' basketball skills, such as dribbling, passing, and shooting, were generally in the poor to very poor category. These findings indicate a relationship between low biomotor capacity and poor mastery of basic techniques. The primary limitation of this study is the tests used refer more to the measurement of individual abilities rather than group abilities. Another limitation is that previous studies have been limited in their discussion of biomotor skills in basketball.Considering that basketball is a team sport, future studies could add team measurements as indicators of basketball skills in students.

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