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Assessment of Learning Using the PJOK Application to Measure the Physical Fitness of Baby Rock Climbing Club Athlete

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Abstract

This study aims to determine the results of the assessment of learning using the PJOK application in measuring the physical fitness levels of rock climbing athletes at the Baby Rock Climbing Club. The research employs a descriptive quantitative approach, intended to provide an overview of the learning assessment outcomes through the PJOK application in relation to the athletes' physical fitness. The method used in this study is a survey method, with total sampling technique, meaning the entire population is used as the sample. The sample consists of 24 rock climbing athletes aged 10 to 20 years who are members of the Baby Rock Climbing Club. The age distribution includes: 10 athletes aged 10 years, 10 athletes aged between 10–15 years, and 4 athletes aged between 15–20 years. The data analysis technique used is descriptive quantitative analysis, calculated in percentages. Based on the results of the assessment of learning using the PJOK application, the athletes' physical fitness was measured through several tests: Body Mass Index (BMI), V Sit and Reach, Sit-Up, Squat Thrust, and the PACER test. The results indicate that the overall physical fitness level of athletes at the Baby Rock Climbing Club falls under the "good" category. The average fitness score for male athletes was 3.9 (good category), while female athletes scored an average of 3.3 (also in the good category). Normality testing was conducted using SPSS 22 software with the Kolmogorov-Smirnov test. All data showed a normal distribution as the significance values obtained were greater than 0.05. Among all the physical fitness tests conducted, the highest performance was observed in the PACER test (Progressive Aerobic Cardiovascular Endurance Run), which measures cardiovascular endurance through a 20-meter shuttle run that increases in pace each minute following a set rhythm. Therefore, it can be concluded that rock climbing athletes at the Baby Rock Climbing Club excel in the aspect of cardiovascular endurance. The implication of this study serves as a basis for evaluation and raises awareness among athletes about the importance of maintaining and improving physical fitness in order to achieve optimal performance.

Keywords: assessment of learning; application; physical fitness; rock climbing.

Introduction

Contemporary sports science recognizes physical activity as a fundamental pillar of human development, integrating physiological, psychological and social dimensions (Smith et al., 2022). The World Health Organization's report emphasizes that structured sports participation enhances not only cardiovascular health but also cognitive function and emotional regulation. Within this context, competitive sports have evolved into complex performance ecosystems requiring optimization of multiple factors - physical conditioning, technical skills, tactical awareness, and mental resilience (Jones & Thompson, 2023).

Rock climbing represents a particularly demanding discipline that has transitioned from recreational pursuit to Olympic sport (International Federation of Sport Climbing, 2023). As a full-body activity requiring exceptional strength-to-weight ratio, grip endurance, and problem-solving abilities, competitive climbing presents unique physiological challenges (Draper et al., 2021). Recent biomechanical analyses reveal that elite climbers demonstrate 30% greater finger flexor endurance and 25% better core stability than recreational practitioners (Laffaye et al., 2022).

The Baby Rock Climbing Club in Palembang, Indonesia serves as an exemplary training environment for studying athlete development. With training facilities at Jakabaring Sport City and Bina Darma University, the club has produced national-level competitors despite limited technological integration in training assessment (Southeast Asian Climbing Federation, 2023). Current training methodologies rely heavily on coach observation rather than quantitative performance metrics, creating a critical gap in athlete development.

Physical fitness assessment in climbing traditionally involves labor-intensive field tests measuring:

1. Grip strength (dynamometry)
2. Endurance (wall traverse duration)
3. Flexibility (sit-and-reach)
4. Power (campus board repetitions)

However, these conventional methods present reliability challenges due to subjective scoring and environmental variability (Bergua et al., 2021). The emergence of mobile fitness applications like PJOK offers transformative potential through:

1. Standardized testing protocols
2. Automated data collection
3. Real-time performance analytics
4. Longitudinal tracking capabilities

This study examines the implementation of digital assessment technology in competitive climbing training through three research dimensions:

1. Comparative analysis of traditional vs. application-based fitness testing
2. Validation of mobile assessment reliability
3. Development of climbing-specific fitness benchmarks

Our research contributes to the growing body of knowledge on technology integration in sports science, while addressing the specific needs of developing climbing programs in Southeast Asia. The findings will provide evidence-based recommendations for:

1. Modernizing athlete assessment protocols
2. Optimizing training program design
3. Establishing regional performance standards

By bridging the gap between conventional training methods and digital sports technology, this study aims to enhance the scientific approach to climbing athlete development while maintaining the sport's essential human elements.

Methods

Research Design

This study employed a descriptive quantitative research design using a survey method to assess the effectiveness of the PJOK Application in measuring the physical fitness of sport climbing athletes at the Baby Rock Climbing Club. The survey method was selected due to its suitability for collecting quantifiable data from an entire population through direct observation and standardized measurements (Zellatifanny & Mudjiyanto, 2018; Ramdhan, 2021). The research was conducted over a three-day period, from February 22 to 24, 2025, at the Rock Climbing Venue of Jakabaring Sport City. This venue was chosen due to its comprehensive and well-maintained training facilities and its regular use for local to international competitions, such as the SEA Games and ASEAN Games.

Participants

The study utilized a total sampling technique, wherein all members of the target population were included in the sample. A total of 24 sport climbing athletes, aged between 10 and 20 years, participated in the study. The sample consisted of three age groups: 10 athletes aged 10 years, 10 athletes aged 11–15 years, and 4 athletes aged 16–20 years. All participants were registered members of the Baby Rock Climbing Club and actively participated in regular training activities.

Instrument

The primary research instrument used was the Physical Fitness Test Application (PJOK Application), a digital tool designed to automatically record and analyze physical fitness

indicators. This application includes five standardized test components based on normative data and age classification relevant to youth athletes:

1. Body Mass Index (BMI)
   Used to classify the nutritional status of children and adolescents based on the Ministry of Health Regulation No. 2 of 2020. BMI was calculated using the formula.
2. V Sit and Reach Test
   A flexibility test measuring the flexibility of the lower back and hamstring muscles.
3. Sit-Ups (60 Seconds)
   This test measures abdominal muscle strength and endurance.
4. Squat Thrust (30 Seconds)
   A functional movement test involving transitions from standing to a push-up position and back, assessing muscular endurance and coordination.
5. PACER Test (Progressive Aerobic Cardiovascular Endurance Run)
   A 20-meter shuttle run test used to evaluate cardiovascular endurance through a progressive increase in running pace guided by audio cues.

Procedure

Prior to data collection, participants received a detailed explanation of the test procedures and provided informed consent. All five fitness tests were administered in sequence, with each athlete completing:

1. Height and weight measurements for BMI calculation.
2. The V sit and reach test.
3. A one-minute sit-up test.
4. A 30-second squat thrust test.
5. The PACER test, conducted using standardized pacing audio.
6. The PJOK Application recorded the results of each test automatically. The tests were conducted under the supervision of qualified personnel to ensure consistency and accuracy in measurement. The entire process followed ethical standards and prioritized the safety and comfort of participants.

Data Analysis

The collected data were analyzed using quantitative descriptive statistics. The analysis included frequency distributions and percentage calculations using the following formula:

Where:

P = Percentage
f = Frequency of a specific category
n = Total number of participants

This analysis approach was employed to identify trends and distributions across fitness levels and test performance indicators among the participants (Sugiyono, 2022).

Results

The analysis data was obtained from the calculation of each category of norms and data from each component of the fitness test, so that the average of the physical fitness conditions of the Baby Rock Climbing Club rock climbing athletes can be known.

The BMI measurements for male and female athletes of the Baby Rock Climbing Club indicated that the majority had a normal nutritional status. As shown in Table 1, 78% of male athletes were in the normal category, while 22% were overweight. No athletes were classified as underweight or obese. Among female athletes, 80% were categorized as having normal nutritional status, and 20% were overweight, with none being underweight or obese.

The flexibility component was measured using the V Sit and Reach test. Among male athletes, 79% were in good or very good categories, with none in the low or lowest categories. Similarly, among female athletes, 90% were classified as good or very good.

Results from the sit-up test showed that 71% of male athletes and 90% of female athletes had good or better muscle endurance. There were no athletes in the lowest category.

Performance in the squat thrust test revealed that 71% of male and 90% of female athletes were in the enough or good categories. No participants were in the very good category.

The pacer test indicated that 93% of male athletes and 90% of female athletes were in the enough or good endurance categories. Only one athlete from each gender group was classified as low, and no one reached the very good or lowest level.

Discussion

This study aimed to assess the physical fitness profiles of athletes from the Baby Rock Climbing Club using the TKPN (Tes Kebugaran Pelajar Nusantara) application, which integrates multiple physical test parameters with automated data processing. The results indicated that, overall, the athletes fall within the "good" fitness category, with some variation among specific components such as BMI, flexibility, muscular strength, endurance, and cardiorespiratory capacity.

The findings from the Body Mass Index (BMI) measurement showed that both male and female athletes have BMI values within the healthy range. This confirms the significance of maintaining ideal body composition in rock climbing, a sport where excess body weight can impair performance due to

Table 1
Descriptive Statistics of Rock Climbing Athletes

Variable	Category	Male		Female	
		n	%	n	%
BMI	Very Good	0	0%	0	0%
	Good	6	43%	4	40%
	Enough	7	50%	5	50%
	Low	1	7%	1	10%
	Lowest	0	0%	0	0%
V Sit and Reach	Very Good	3	21%	1	10%
	Good	8	58%	8	80%
	Enough	3	21%	1	10%
	Low/Lowest	0	0%	0	0%
Sit-Up Test	Very Good	0	0%	0	0%
	Good	7	50%	9	90%
	Enough	3	21%	1	10%
	Low	4	29%	0	0%
	Lowest	0	0%	0	0%
Squat Thrust	Very Good	0	0%	0	0%
	Good	7	50%	5	50%
	Enough	4	29%	4	40%
	Low	3	21%	1	10%
	Lowest	0	0%	0	0%
Pacer Test	Very Good	0	0%	0	0%
	Good	6	43%	4	40%
	Enough	7	50%	5	50%
	Low	1	7%	1	10%
	Lowest	0	0%	0	0%

the need to support one's own body against gravity. Desan (2020) highlights that ideal anthropometric characteristics contribute positively to climbing efficiency, as excessive fat mass can reduce strength-to-weight ratio, a critical determinant of success in vertical movements.

Flexibility, evaluated using the V Sit and Reach test, was also categorized as "good" for both genders. This supports the notion that climbing requires substantial flexibility, particularly in the hips, hamstrings, shoulders, and lower back, to navigate dynamic and complex movements on the wall. Saputra (2023) emphasizes that improved flexibility enhances joint mobility and enables climbers to achieve more efficient and controlled movements, especially when reaching for distant holds or executing precise foot placements. Flexibility is further associated with injury prevention, as it allows muscles and tendons to adapt to sudden loads or shifts in body position during climbs.

Regarding muscular strength, particularly core strength measured via sit-up tests, the athletes also performed well. A strong core is crucial in climbing as it supports balance, posture, and the transfer of force between limbs during ascent. Abadi (2016) suggests that core stability is directly correlated with improved motor control in complex physical activities, including vertical locomotion. In line with this, lower body strength, assessed through the squat thrust test, also showed encouraging results. Strong leg muscles assist in pushing the body upwards and maintaining dynamic balance on the wall. This is consistent with findings by Virgita et al. (2022), who observed that athletes with well-developed quadriceps and hamstring strength are better able to perform explosive and sustained lower-limb movements essential for bouldering and lead climbing.

However, cardiorespiratory endurance, measured using the PACER (Progressive Aerobic Cardiovascular Endurance Run) test, was categorized as "fair." This finding is notable given that climbing, particularly in disciplines like lead and speed climbing, involves prolonged muscular effort and intermittent bursts of high intensity. As stated by Bompa & Buzzichelli (2018), endurance is a limiting factor in repeated high-effort performances and recovery between attempts. Therefore, structured aerobic and anaerobic conditioning programs may be necessary to address this shortfall and enhance performance sustainability during long training sessions or competitions.

An essential aspect of this research is the utilization of the TKPN application, which streamlined the process of test administration, data input, calculation, and result analysis. The use of digital applications in physical fitness assessment represents a shift toward more objective and efficient evaluation methods, minimizing human error and improving data

accessibility. Hartati (2019) supports this view by asserting that mobile-based testing applications can improve accuracy, engagement, and motivation among youth athletes. Similarly, Marpaung & Al Amzah (2022) underline the value of integrating technology into physical education to enhance instructional delivery and result transparency.

From a broader perspective, the results suggest that the training regimen followed by the Baby Rock Climbing Club is generally effective in fostering balanced physical development. However, the lower performance in aerobic endurance warrants attention. Coaches and trainers should consider integrating periodized endurance training, including both steady-state aerobic workouts and high-intensity interval training (HIIT), to build cardiovascular resilience without compromising muscle strength and flexibility.

Furthermore, the positive outcome in BMI and flexibility aligns with previous studies on elite rock climbers, who typically exhibit low body fat percentages and high levels of joint mobility (Mermier et al., 2000). The integration of regular fitness monitoring using digital tools not only enables better athlete profiling but also assists in tailoring training loads, identifying weaknesses, and tracking progress over time.

Finally, the motivation and enthusiasm shown by the athletes during the test phase further reflect a positive training culture. This psychosocial component, while not directly measured in this study, is a valuable asset in long-term athlete development and is enhanced through engaging tools such as the TKPN application, which offers immediate feedback and fosters accountability.

In conclusion, the discussion demonstrates that the application-based fitness assessment offers a holistic and evidence-based approach to understanding the physical demands of climbing, while also providing practical insights for coaches, sport scientists, and youth sport development programs.

Conclusions

Based on the physical fitness test results of Baby Rock Climbing Club athletes using the TKPN application, it can be concluded that:

1. The overall fitness level of both male and female athletes is in the "good" category, indicating a solid foundation for climbing performance.
2. Most test components—including BMI, flexibility, and muscle strength—support the athletes' climbing ability and suggest consistency in training and healthy lifestyle habits.
3. Lower performance in the endurance category signals the need for more structured training programs focused on improving cardiorespiratory capacity.
4. The integration of digital technology through the TKPN application proved to be effective in managing, processing, and interpreting physical test data efficiently and transparently.

These findings underscore the importance of using technology to enhance learning, assessment, and development processes in sports training, particularly in skill- and strength-based disciplines like rock climbing. Coaches are encouraged to design balanced programs that not only maintain strengths in flexibility and strength but also address gaps in endurance.

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