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Body Composition and Physical Fitness Profile of PERSIPASI (Persatuan Sepakbola Indonesia Patriot Bekasi) U-17 Soccer Players in Bekasi City

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Abstract

This study aimed to describe the body composition and physical fitness profile of PERSIPASI U-17 soccer players in Bekasi City. A descriptive quantitative design with a cross-sectional approach was used. Participants were 11 male U-17 players who were actively involved in regular training. Body composition was assessed using a Karada Scan. Physical fitness was evaluated through field tests, including push-up, sit-up, agility run, sit-and-reach, standing broad jump, endurance run, and leg strength test. Results showed that players generally had BMI values within the normal to slightly above-normal range, with inter-individual variation in body fat and skeletal muscle mass. Most players demonstrated good to excellent upper-body and abdominal strength, high flexibility, and adequate aerobic endurance. However, agility, leg power, and leg strength were predominantly in the moderate to poor categories. These findings suggest that the current training program sufficiently develops endurance and general strength but needs to be refined to more specifically target agility and explosive lower-limb performance. In conclusion, the physical profile of PERSIPASI U-17 players is characterized by favorable body composition and several strong fitness components, yet there remains substantial room for improvement in agility, leg power, and leg strength through more focused and integrated training interventions.

How to Cite

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INTRODUCTION

Soccer is a team sport with high physical demands, involving repeated high-intensity running, sprinting, rapid changes of direction, physical duels, and complex technical–tactical requirements. Optimal performance in soccer is strongly influenced by appropriate body composition and physical fitness. Body composition—including fat mass, fat-free mass, and body mass index (BMI) is recognized as a key component of the physical profile and is related to speed, strength, endurance, and risk of fatigue and injury (Becerra-Patiño et al., 2025; Leão et al., 2022). Longitudinal and cross-sectional studies in youth soccer players have shown meaningful changes in fat mass, fat-free mass, and somatotype across adolescence, differentiating players from their age-matched peers and providing useful reference values for talent identification and training design (Nikolaidis & Karydis, 2011; Ivanov, 2025; Mala et al., 2015). At the competitive level, players with higher skeletal muscle mass and lower body fat percentage tend to present better fitness profiles and accumulate more minutes of play across a season (Ulloa-Díaz et al., 2025).

Beyond body composition, physical fitness components such as aerobic endurance, muscular strength, power, agility, and flexibility are fundamental to soccer performance. Training models such as fartlek have been shown to improve aerobic endurance in youth soccer players (Atradinal, 2018). Small-sided games and interval training effectively increase VO_2max in U-17 players (Arianto & Setyawan, 2019), and recent evidence indicates that combining small-sided games with resistance training can enhance aerobic endurance, agility, and leg power simultaneously in young players (Kusuma et al., 2025). From a technical perspective, BMI and agility are significantly associated with dribbling skills in school-aged players (Khozim & Nugroho, 2022), while VO_2max, sprint speed, and lower-limb explosive power have been reported as strong contributors to agility and change of direction speed in soccer players (Himmatul Aulia et al., 2023). These findings suggest that body composition and fitness profiles are relevant not only for general physical capacity but also for the execution of key technical skills during match play.

PERSIPASI (Persatuan Sepakbola Indonesia Patriot Bekasi) U-17 is a youth development team based in Bekasi City that regularly participates in regional competitions and youth tournaments. However, scientific information regarding the body composition and physical fitness profile of PERSIPASI U-17 players i`s still limited. Such information is crucial for mapping players' physical potential, identifying strengths and weaknesses, and designing more targeted training programs. Regular assessments of body composition (Lubis et al., 2020) and fitness can also assist coaches in assigning players to positions that match their physical characteristics (Campa et al., 2019; Nikolaidis & Karydis, 2011).

The novelty of this study lies in its integrated profiling of body composition and field-based physical fitness components in PERSIPASI U-17 soccer players in Bekasi City using a portable Karada Scan device and standardized field tests, thereby generating context-specific normative data for this population. Therefore, this study aimed to describe the body composition and physical fitness profile of PERSIPASI U-17 soccer players in Bekasi City. Specifically, the study: (1) examined players' body composition using a Karada Scan device; and (2) described the main components of physical fitness (strength, agility, flexibility, power, endurance, and leg strength) based on field tests and normative values. The findings are expected to provide evidence-based information for coaches and club managers in developing more specific and effective training programs.

METHODS

This study employed a descriptive quantitative design with a cross-sectional approach. Descriptive quantitative research relies heavily on numerical data from collection through analysis and interpretation, allowing the researcher to portray the condition of the object in a factual and systematic way (Mubarak, 2022). In this context, the design was used to capture a snapshot of the body composition and physical fitness profile of PERSIPASI U-17 players at a single time point.

Participants were 11 male soccer players registered as active members of the PERSIPASI U-17 team in Bekasi City. Inclusion criteria were: (1) being listed as an active U-17 player; (2) attending regular training sessions at least three times per week; and (3) being free from acute injury at the time of testing. All players and their parents/guardians received an explanation of the study's aims and procedures and provided consent to participate.

Body composition was assessed using a Karada Scan device based on bioelectrical impedance analysis (BIA), which is widely used to estimate body fat percentage, skeletal muscle mass, BMI, and other parameters such as visceral

fat and resting metabolism. When standardized procedures are followed, BIA provides a practical and sufficiently accurate method for group assessments in youth athletes (Campa et al., 2019; Mala et al., 2015). The parameters recorded in this study included body fat, visceral fat, resting metabolism, BMI, body age, subcutaneous fat (whole body, trunk, arm, leg), and skeletal muscle mass (whole body, trunk, arm, leg).

Physical fitness was evaluated using a field test battery commonly applied in youth soccer development programs in Indonesia, including:

1. Upper-body strength (shoulder and arm): 60-second push-up test, with total repetitions converted into normative categories.
2. Abdominal strength: 60-second sit-up test.
3. Agility: agility run test, recording completion time (seconds) over a course requiring several changes of direction.
4. Flexibility: sit-and-reach test (centimeters).
5. Leg power: standing broad jump (centimeters).
6. Endurance: field endurance run (e.g., 12-minute Cooper run), converted into scores and normative categories.
7. Leg strength: dynamic leg strength test or leg strength dynamometry, recorded in kilograms and converted into normative categories.

Score intervals, frequencies, percentages, and categories for each fitness component are presented in **Table 1, Table 2**.

Testing was conducted at the PERSIPASI training facility during a regular training schedule. Players performed a general and specific warm-up for approximately 15 minutes before testing. The testing order was: (1) body composition measurement using the Karada Scan; (2) upper- and core-strength tests (push-up, sit-up); (3) leg power and leg strength tests; (4) agility test; (5) flexibility test; and (6) endurance test. Adequate rest was provided between tests to minimize fatigue effects. All tests were supervised by the researcher and coaches familiar with the testing procedures.

Data were analyzed using descriptive statistics with SPSS version 25 (IBM Corp.). For numerical variables, minimum, maximum, mean, and standard deviation values were calculated. For fitness categories, frequency distributions and percentages were computed based on available normative values for adolescents and youth soccer players. The results were interpreted in relation to these norms and the specific context of youth soccer.

RESULTS AND DISCUSSION

The body composition characteristics of the PERSIPASI U-17 squad (n = 9) are summarized in **Table 1.**

Table 1. Body composition profile of PERSIPASI U-17 players (n = 9)

Variable	Mean ± SD	Range	Category (based on mean)
Body fat (%)	19.3 ± 16.0	8.0–60.7	Normal body fat
Visceral fat (level)	0.6 ± 1.2	0.0–3.5	Very low / healthy visceral fat
Resting metabolism (kcal)	1512.1 ± 150.3	1352–1853	Within expected range
BMI (kg/m²)	20.9 ± 2.5	18.0–26.4	Normal weight (WHO)
Body age (years)	4.2 ± 8.4	0–20	Young biological age
Subcutaneous fat – whole body (%)	9.8 ± 2.7	5.6–14.8	Low–moderate subcutaneous fat
Subcutaneous fat – trunk (%)	7.9 ± 3.7	0.0–13.5	Low–moderate subcutaneous fat trunk
Subcutaneous fat – arm (%)	15.9 ± 3.0	11.5–20.6	Moderate subcutaneous fat arm
Subcutaneous fat – leg (%)	14.8 ± 3.5	9.7–20.7	Moderate subcutaneous fat leg
Skeletal muscle – whole body (%)	37.0 ± 1.5	34.7–39.1	High skeletal muscle – whole body
Skeletal muscle – trunk (%)	31.6 ± 2.2	27.9–34.9	High skeletal muscle – trunk
Skeletal muscle – arm (%)	42.2 ± 1.6	38.9–44.4	High skeletal muscle – arm
Skeletal muscle – leg (%)	54.1 ± 1.4	51.9–56.2	High skeletal muscle – leg

Body Composition Profile

Karada Scan measurements indicated that the U-17 PERSIPASI players generally had BMI values within the normal to slightly above-normal range (approximately 18–26 kg/m²). Fat percentage and skeletal muscle mass varied among players, with most showing sufficient whole-body and leg muscle mass, as expected in youth soccer players, although a few players presented relatively higher fat levels. Overall, this pattern is consistent with previous studies reporting that adolescent soccer players tend to be taller, leaner, and more muscular than their age-matched peers (Nikolaidis & Karydis, 2011; Ivanov, 2025).

Such variability in body composition is important for coaches to consider, especially when linking it to playing positions and specific on-field demands. Earlier studies have shown that body composition and somatotype differ across positions (defenders, midfielders, forwards), and these differences can be used to optimize positional assignment and individualized training (Mala et al., 2015; Leão et al., 2022). Players with relatively higher body fat may require closer monitoring of training load and nutritional strategies, as elevated fat mass has been associated with reduced aerobic performance and power output (Becerra-Patiño et al., 2025).

Physical Fitness Profile

Table 2. Physical fitness test results of PERSIPASI U-17 players (n = 11)

Component	Test	Category	Score interval	n	%
Upper-body strength	Push-up (reps/60 s)	Excellent	> 38	5	45
		Good	29–37	2	18
		Fair	20–28	3	27
		Poor	12–19	1	10
		Very poor	4–11	0	0
Abdominal strength	Sit-up (reps/60 s)	Excellent	50–60	6	54
		Good	36–49	2	19
		Fair	< 36	3	27
Agility	Agility run (s)	Excellent	< 12.10	0	0
		Good	12.11–13.53	0	0
		Fair	13.54–14.96	1	10
		Poor	14.97–16.39	9	80
		Very poor	> 16.40	1	10
Flexibility	Sit-and-reach (cm)	Excellent	> 14	10	90
		Good	11–14	1	10
		Fair	7–10	0	0
		Poor	4–6	0	0
		Very poor	< 4	0	0
Leg power	Standing broad jump (score)	Excellent	> 70	0	0
		Good	62–69	0	0
		Fair	53–61	5	45
		Poor	46–52	5	45
		Very poor	38–45	1	10
Endurance	Endurance run (score)	Excellent	> 55.9	4	36
		Good	51.0–55.9	3	27
		Fair	45.2–50.9	0	0
		Poor	38.4–45.1	3	27
		Very poor	< 38.3	1	10
Leg strength	Leg strength test (kg)	Excellent	> 153.30	0	0
		Good	112.5–153.0	2	18
		Fair	76.5–112.0	6	55
		Poor	52.5–76.0	3	27
		Very poor	< 52.0	0	0

Push-up test results showed that 5 players (45%) were in the excellent category, 2 players (18%) good, 3 players (27%) moderate, and 1 player (10%) poor. This indicates that upper-body strength in most PERSIPASI U-17 players is adequate to support actions such as aerial duels, throw-ins, and body contact during defense and attack. Abdominal strength appeared even better, with 6 players (54%) classified as excellent, 2 players (19%) good, and 3 players (27%) moderate. Strong core musculature is essential for postural stability, efficient force transmission from the lower to upper body, and injury prevention in the lumbar region. These findings are in line with reports that youth soccer players often exhibit good trunk strength due to repeated exposure to core-related training and game activities (Leão et al., 2022).

In contrast, agility results revealed that no player fell into the excellent or good categories. Only one player (10%) was in the moderate category, while nine players (80%) were classified as poor and one player (10%) as very poor. This suggests that change of direction speed is relatively low among PERSIPASI U-17 players. Given that soccer players change direction every 2–4 seconds during matches, especially in transitions and one-on-one situations, limited agility can negatively affect pressing, marking, and penetration with the ball (Himmatul Aulia et al., 2023). Regarding flexibility, 10 players (90%) were in the excellent category and one player (10%) in the good category, indicating very good hamstring and lower-back flexibility. High flexibility contributes to movement efficiency, increased range of motion, and reduced risk of muscle strains during explosive actions and abrupt changes of direction. Leg power results were more heterogeneous: five players (45%) were classified as moderate, five players (45%) poor, and one player (10%) very poor, with no players in the good or excellent categories. This indicates that explosive power of the lower limbs critical for sprinting, jumping, and acceleration—needs improvement. Previous studies have identified leg power as a major determinant of sprint and jump performance, and an important factor for match performance and positional demands (Leão et al., 2022; Becerra-Patiño et al., 2025).

For endurance, four players (36%) were in the excellent category, three players (27%) good, three players (27%) poor, and one player (10%) very poor. Overall, most players showed good to excellent aerobic capacity, which is adequate to meet the demands of a full match. These results resonate with previous findings that structured

endurance training (e.g., fartlek, small-sided games, and interval training) can successfully increase VO_2max in youth soccer players (Atradinal, 2018; Arianto & Setyawan, 2019). Finally, leg strength tests showed that two players (18%) were classified as good, six players (55%) moderate, and three players (27%) poor. The majority of players demonstrated moderate leg strength, leaving room for improvement through progressive resistance and plyometric training.

Taken together, the PERSIPASI U-17 players display relatively good upper-body and core strength, high flexibility, and adequate endurance, but suboptimal agility, leg power, and leg strength. This pattern suggests that the current training program may emphasize general endurance and basic strength more than agility and explosive power. Recent research in youth soccer indicates that integrated training interventions combining small-sided games with resistance or power training can improve VO_2max, agility, and leg power simultaneously (Kusuma et al., 2025; Ferrini et al., 2025; Tangkudung, 2020). Low agility and power should also be interpreted in relation to technical performance. Khozim and Nugroho (2022) reported significant associations between BMI, agility, and dribbling skills in youth players, while Himmatul Aulia et al. (2023) showed that VO_2max, speed, and lower-limb explosive power jointly explain a large portion of agility variance. Therefore, improving agility and leg power is expected not only to enhance physical performance but also to positively influence technical abilities such as dribbling, pressing, and cover–support movements.

In terms of body composition, the relatively wide range of body fat levels suggests a need for regular monitoring and integrated training–nutrition interventions. Higher fat mass has been linked to reduced speed, acceleration, and aerobic performance, whereas higher skeletal muscle mass is associated with better jump and sprint performance (Leão et al., 2022; Becerra-Patiño et al., 2025). Periodic assessments can help coaches and nutritionists design individualized training and dietary programs, while also supporting overtraining and injury prevention (Nikolaidis & Karydis, 2011; Ulloa-Díaz et al., 2025).

This study has several limitations. First, the sample size was small (11 players) and limited to a single club, which restricts generalizability to the wider U-17 soccer population. Second, the cross-sectional design does not allow causal inferences regarding the relationships between body composition, physical fitness, and technical performance. Third, the study used basic field tests; additional measures such as Yo-Yo intermittent recovery tests, countermovement jumps, or GPS-based match analysis would provide a more comprehensive understanding of the physical and performance profiles of youth players. Nevertheless, the present findings offer valuable baseline information on the body composition and physical fitness profile of PERSIPASI U-17 players and can serve as a starting point for more targeted training interventions, particularly in improving agility, leg power, and leg strength.

CONCLUSION

This study showed that PERSIPASI U-17 soccer players generally have BMI values within the normal range, with inter-individual variability in body fat and skeletal muscle mass. Regarding physical fitness, upper-body and abdominal strength, flexibility, and endurance were mostly in the good to excellent categories. In contrast, agility, leg power, and leg strength were predominantly in the moderate to poor categories. These findings imply the need to refine the current training program by emphasizing agility drills (e.g., change of direction training), lower-limb power development (plyometric and power-oriented resistance training), and progressive strength training for the legs, while maintaining the already favorable levels of endurance and flexibility. Regular body composition monitoring is also recommended to ensure players remain within an optimal physical profile for performance and long-term health.

Future studies should include larger samples from multiple clubs, employ more comprehensive performance test batteries, and link body composition and fitness profiles to match-play indicators (e.g., minutes played, total distance, number of sprints) to strengthen our understanding of performance determinants in youth soccer players.

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