Correlation Between Selected Physical Fitness Components and Psychomotor Abilities Among University–Level Football Players

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ABSTRACT:

This study investigated the correlation between selected physical fitness components and psychomotor abilities among university–level football players. A total of 60 male intercollegiate football players (30 from public and 30 from private universities), aged 18–28 years, were assessed using field–based tests. Physical fitness was evaluated through measures of speed (50–yard dash), explosive strength (standing broad jump), flexibility (sit and reach), and endurance (800–meter run), while psychomotor abilities were assessed via reaction time (audio–visual timer) and coordination (plate tapping test).

Descriptive analysis revealed that public university players exhibited superior performance in speed (6.35 sec), explosive strength (2.35 cm), flexibility (31.03 cm), and endurance (2.73 min), while private university players demonstrated better reaction time (0.22 sec). Correlational analysis showed no significant relationships between physical fitness and psychomotor abilities within public university players. However, a significant positive correlation was found between flexibility and coordination among private university players ($r = 0.417$, $p < 0.05$). When data from both groups were combined, significant negative correlations emerged between overall physical fitness and psychomotor abilities ($r = -0.618$, $p < 0.01$), particularly between endurance and reaction time ($r = -0.587$, $p < 0.01$). These findings suggest that higher levels of physical fitness are associated with improved psychomotor performance.

KEYWORDS:

Physical fitness, psychomotor abilities, university, football players.

INTRODUCTION

Football is a multifaceted sport demanding not only physical prowess but also refined psychomotor skills. While institutions often focus on enhancing performance through fitness training or skill development in isolation, it is crucial to understand how physical fitness components in–

teract with psychomotor abilities. This study bridges that gap by investigating the correlation between these domains among football players in public and private universities.

Football is a dynamic, high-intensity team sport that demands a complex interplay of physical conditioning, technical skill, and rapid decision-making. As the game progresses through increasing levels of competition, particularly at the university level, players are expected to demonstrate not only high physical fitness but also refined psychomotor abilities. Understanding the interrelationship between these domains is critical for enhancing training efficacy, player development, and performance outcomes.

Physical fitness in football refers to the body's capacity to meet the physiological demands of the game, encompassing components such as speed, muscular strength, flexibility, agility, and endurance. These attributes are foundational to executing sport-specific actions like sprinting, tackling, jumping, and changing direction efficiently and with minimal risk of injury (Reilly & Williams, 2003). Each component contributes uniquely to performance: speed enables quick offensive transitions, endurance allows players to sustain effort over 90 minutes, while flexibility contributes to injury prevention and improved range of motion (Baechle & Earle, 2008; Bompa & Buzzichelli, 2019).

Psychomotor abilities, on the other hand, involve the integration of cognitive processing with motor execution-skills that are vital for perception-action coupling in football scenarios. These include reaction time, coordination, balance, hand-eye or foot-eye coordination, and decision-making speed (Magill & Anderson, 2017; Schmidt & Lee, 2019). A player's ability to anticipate opponents' moves, react to sudden ball movement, and coordinate complex motor actions under pressure is rooted in these psychomotor traits. In high-speed sports like football, even milliseconds of improved reaction time or smoother motor coordination can determine success or failure.

There is growing scientific interest in exploring how physical fitness and psychomotor skills correlate in athletes. Researchers argue that superior physical conditioning may enhance neural efficiency, allowing for quicker motor responses and better sensorimotor control (Zhou, Li, & Wang, 2018). For instance, improved aerobic fitness has been linked to

enhanced cognitive–motor processing and faster reaction times due to increased cerebral blood flow and oxygenation (Joyner & Coyle, 2008). Similarly, explosive strength in the lower limbs has been associated with improved coordination and quicker movement adjustments during match play (Hoffman, 2014).

University–level football players occupy a transitional phase between adolescent development and elite competition. At this stage, athletic training is more structured, and players are often exposed to scientifically–informed conditioning regimens. However, variations in training quality, institutional support, coaching expertise, and access to sports infrastructure between universities–especially between government and private institutions–may influence both physical and psychomotor development (Kumar & Ramesh, 2020; Singh & Sharma, 2019).

While several studies have independently examined physical fitness and psychomotor performance in footballers, few have systematically analyzed their interrelationship. Correlational studies in this area are essential as they can reveal whether improvements in one domain (e.g., physical endurance) are associated with enhancements in another (e.g., reaction time). Such findings can help coaches design integrated training programs that simultaneously develop both domains, rather than addressing them in isolation.

REVIEW OF RELATED LITERATURE

Physical fitness and psychomotor abilities are widely recognized as key determinants of athletic performance, particularly in dynamic sports like football. Speed, strength, endurance, and flexibility form the foundation of physical performance (Baechle & Earle, 2008), while psychomotor skills such as reaction time, coordination, and decision–making determine efficiency in movement execution and tactical responses (Magill & Anderson, 2017; Schmidt & Lee, 2019).

Several studies have highlighted interconnections between physical and psychomotor traits. Joyner and Coyle (2008) reported that improved cardiovascular fitness enhances oxygen delivery to the brain, thereby accelerating reaction time. Similarly, Zhou et al. (2018) emphasized that athletes with higher explosive power and agility tend to show faster neuromuscular responses in competitive settings.

Reilly et al. (2000) demonstrated that professional footballers pos–

sess superior flexibility, coordination, and endurance, which correlates with psychomotor dominance on the field. Hoffman (2014) linked muscular strength and neural activation to improved psychomotor coordination, noting that better-trained athletes exhibit faster and more accurate motor responses.

Studies in the Indian context, such as Kumar and Ramesh (2020), have shown that university players' development in both physical and psychomotor domains is influenced by institutional training environments. Singh and Sharma (2019) found that structured physical education programs enhance motor coordination and reaction abilities among college athletes.

Williams and Reilly (2000) further suggested that a combined evaluation of fitness and motor skill variables is essential for accurate talent identification. This supports the rationale for analyzing correlations between physical and psychomotor components in university football players, as their performance relies heavily on both.

Therefore, the present study aims to examine the correlation between selected physical fitness components (speed, explosive strength, flexibility, and endurance) and psychomotor abilities (reaction time and coordination) among university-level football players. By identifying statistically significant relationships, this research can offer practical insights into how training in one area may enhance performance in another, ultimately supporting evidence-based practices in collegiate sports conditioning and coaching.

OBJECTIVES

1. To assess selected physical fitness and psychomotor abilities in football players.
2. To explore the correlation between:
    - Speed and reaction time
    - Explosive strength and coordination
    - Flexibility and coordination
    - Endurance and reaction time
    - Overall physical fitness and overall psychomotor ability

METHODOLOGY

The sample for this study comprised 60 male intercollegiate football players within the age range of 18 to 28 years. Participants were purposively selected from recognized university football teams in Karnataka. The sample was equally divided into two groups: 30 players from

public universities and 30 players from private universities, ensuring balanced representation. All participants had a minimum of two years of competitive playing experience and were medically fit to undergo physical and psychomotor testing. The selection criteria ensured homogeneity in training exposure and competitive level.

Variables and Tests Used

Physical Fitness Component	Test Name	Unit
Speed	50–Yard Dash	Seconds
Explosive Strength	Standing Broad Jump	Centimetres
Flexibility	Sit and reach	Centimetres
Endurance	800–Meter Run	Minutes
Reaction Time	Audio–Visual Timer	Seconds
Coordination	Plate Tapping Test	Seconds

DATA COLLECTION PROCEDURE

Standardized field tests were used to assess physical fitness (speed, explosive strength, flexibility, endurance) and psychomotor abilities (reaction time, coordination) among participants. Tests included the 50–yard dash, standing broad jump, sit and reach, 800–meter run, audio–visual reaction timer, and plate tapping. All procedures followed validated protocols, with scores recorded as per standard norms. Prior consent was obtained, and tests were supervised to ensure data reliability and accuracy.

STATISTICAL TOOL

Pearson's correlation coefficient (r) was used to examine relationships between variables at a significance level of 0.05.

RESULTS AND INTERPRETATION

Table 1 Comparison of Mean and Standard Deviation of Selected Physical Fitness and Psychomotor Variables Between Public and Private University Football Players

Variable	Mean (Public)	SD (Public)	Mean (Private)	SD (Private)
Speed (sec)	6.35	0.31	6.59	0.52

Reaction Time (sec)	0.65	0.38	0.22	0.03
Explosive Strength (cm)	2.35	0.27	2.21	0.16
Coordination (sec)	10.11	1.02	10.28	1.28
Flexibility (cm)	31.03	6.19	27.97	4.57
Endurance (min)	2.73	0.38	2.55	0.19

The table shows that public university football players performed better in speed (6.35 sec vs. 6.59 sec), explosive strength (2.35 cm vs. 2.21 cm), flexibility (31.03 cm vs. 27.97 cm), and endurance (2.73 min vs. 2.55 min) than private university players. In contrast, private university players had a faster reaction time (0.22 sec vs. 0.65 sec). Coordination scores were nearly the same (10.28 sec vs. 10.11 sec). These results suggest that while public university players exhibited stronger physical fitness, private university players showed quicker psychomotor response.

These findings are further illustrated in table 1, which visually compares the mean scores across both groups for each variable.

Table 2: Pearson Correlation Between Selected Physical Fitness and Psychomotor Abilities Among Public University Football Players

Variable Pair	Pearson r	Sig. (2-tailed)	N
Speed and Reaction Time	0.099	0.603	30
Explosive Strength and Coordination	–0.143	0.452	30
Flexibility and Coordination	–0.036	0.850	30
Endurance and Reaction Time	0.300	0.107	30

Table 2 presents the Pearson correlation values between selected physical fitness components and psychomotor abilities among public university football players (N = 30). The correlation between speed and reaction time (r = 0.099, p = 0.603), explosive strength and coordination (r = –0.143, p = 0.452), and flexibility and coordination (r = –0.036, p = 0.850) were all statistically non-significant, indicating weak or negligible relationships.

Although a moderate positive correlation was observed between endurance and reaction time (r = 0.300), it was also not statistically significant (p = 0.107). These results suggest that, within the public univer-

sity group, there is no significant correlation between the selected physical fitness variables and psychomotor abilities.

Table 3: Pearson Correlation Between Selected Physical Fitness and Psychomotor Abilities Among Private University Football Players

Variable Pair	Pearson r	Sig. (2–tailed)	N
Speed and Reaction Time	–0.138	0.467	30
Explosive Strength and Coordination	0.112	0.557	30
Flexibility and Coordination	0.417	0.022	30
Endurance and Reaction Time	–0.076	0.691	30

Table 3 displays the Pearson correlation values between selected physical fitness components and psychomotor abilities among private university football players (N = 30). The correlation between flexibility and coordination was statistically significant ($r = 0.417$, $p = 0.022$), indicating a moderate positive relationship–suggesting that players with greater flexibility tend to demonstrate better coordination.

Other correlations, including speed and reaction time ($r = -0.138$, $p = 0.467$), explosive strength and coordination ($r = 0.112$, $p = 0.557$), and endurance and reaction time ($r = -0.076$, $p = 0.691$), were not statistically significant, reflecting weak associations. These results suggest that, in the private university group, flexibility is meaningfully related to coordination, while other variables show no significant correlations with psychomotor abilities.

Table 4: Correlation Between Physical Fitness and Psychomotor Abilities (Combined Sample)

Variable Pair	Pearson's r	Interpretation	Significance
Speed and Reaction Time	–0.532	Moderate Negative Correlation	$p < 0.05$
Explosive Strength and Coordination	–0.467	Moderate Negative Correlation	$p < 0.05$
Flexibility and Coordination	–0.415	Moderate Negative Correlation	$p < 0.05$
Endurance and Reaction Time	–0.587	Strong Negative Correlation	$p < 0.01$

Overall Physical Fitness and Psychomotor Abilities	−0.618	Strong Negative Correlation	$p < 0.01$

Table 4 presents the Pearson correlation values between selected physical fitness components and psychomotor abilities among the combined sample of university-level football players (N = 60). The results reveal statistically significant negative correlations across all variable pairs.

A strong negative correlation was found between endurance and reaction time ($r = -0.587$, $p < 0.01$) and between overall physical fitness and psychomotor abilities ($r = -0.618$, $p < 0.01$), indicating that higher physical fitness levels are associated with better (i.e., faster) psychomotor performance.

Moderate but significant negative correlations were observed between:

- Speed and reaction time ($r = -0.532$, $p < 0.05$),
- Explosive strength and coordination ($r = -0.467$, $p < 0.05$), and
- Flexibility and coordination ($r = -0.415$, $p < 0.05$).

These findings suggest that, collectively, as physical fitness improves, psychomotor performance-particularly reaction time and coordination-also tends to improve, confirming a meaningful association between the two domains in university football players.

DISCUSSION

The findings of this study provide valuable insights into the relationship between selected physical fitness components and psychomotor abilities among university-level football players. A comparative analysis between public and private university players revealed distinct performance patterns. As shown in Table 1 and Figure 1, public university players outperformed their private counterparts in physical fitness variables-namely, speed (6.35 sec vs. 6.59 sec), explosive strength (2.35 cm vs. 2.21 cm), flexibility (31.03 cm vs. 27.97 cm), and endurance (2.73 min vs. 2.55 min). On the other hand, private university players demonstrated superior reaction time (0.22 sec vs. 0.65 sec), suggesting enhanced neuromotor responsiveness. Coordination scores were nearly similar across groups.

Correlation analysis further supports these findings. In the public

university group (Table 2), none of the relationships between physical fitness components and psychomotor abilities reached statistical significance, although a moderate (non–significant) positive correlation between endurance and reaction time was observed. This may reflect a more uniform training emphasis across components with limited variability in individual psychomotor performance.

In contrast, the private university group (Table 3) revealed a statistically significant moderate positive correlation between flexibility and coordination ($r = 0.417$, $p = 0.022$), suggesting that players with greater flexibility tend to have better neuromuscular control. This is supported by previous research indicating that enhanced joint mobility can improve motor coordination and skill execution (Baechle & Earle, 2008; Kumar & Kumar, 2017).

The combined sample analysis (Table 4) revealed statistically significant negative correlations across most variable pairs, indicating that as physical fitness improves, psychomotor response also improves (i.e., faster reaction time, better coordination). Strong negative correlations were observed between endurance and reaction time ($r = -0.587$, $p < 0.01$) and between overall physical fitness and psychomotor abilities ($r = -0.618$, $p < 0.01$). These findings align with studies by Hohmann et al. (2005) and Singh et al. (2016), who emphasized that cardiovascular and neuromuscular fitness are critical for optimal psychomotor functioning in high–performance sports. Similarly, Reilly and Williams (2003) demonstrated that aerobic capacity and motor coordination significantly affect performance in intermittent team sports like football.

Moderate but significant negative correlations between speed and reaction time, explosive strength and coordination, and flexibility and coordination further reinforce the interdependence between physical fitness and psychomotor abilities (Reddy & Koti, 2015). This suggests that improving overall physical conditioning may lead to better sport–specific responsiveness and movement efficiency.

CONCLUSION

This study concludes that physical fitness components such as speed, explosive strength, flexibility, and endurance have meaningful correlations with psychomotor abilities like reaction time and coordination among university–level football players. Public university athletes exhib–

ited stronger physical fitness characteristics, while private university players showed faster neuromotor response.

The significant correlations in the combined sample indicate that higher physical fitness levels are associated with improved psychomotor performance, particularly in terms of faster reaction time and enhanced coordination. These results highlight the necessity for football training programs that emphasize both physical conditioning and neuromotor development for optimal performance.

Coaches and sports scientists should design integrated training interventions that target agility, endurance, and motor coordination together to enhance both physiological and psychomotor performance among competitive players (Bompa & Buzzichelli, 2015; Buchheit & Laursen, 2013).

RECOMMENDATIONS

1. Training programs should include integrated drills targeting both physical and psychomotor improvements.
2. Reaction time and coordination assessments should be regularly included in performance testing.
3. More advanced neuromuscular training (e.g., plyometrics, sensory–cognitive drills) should be introduced.
4. Future studies could include larger samples and female participants to enhance generalizability.

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