

Physical Psychological and Motor Skill Determination in Male University Level Volleyball Players

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Abstract

This study investigates the physical, psychological, and motor skill factors that contribute to the overall performance of male university-level volleyball players. Volleyball, a sport that demands high levels of coordination, agility, strength, and psychological resilience, serves as an ideal context for exploring how these attributes influence performance on the court. The research examines three key domains: physical fitness, psychological factors, and motor skills, assessing their individual and combined impact on skill proficiency, particularly in specialized volleyball skills such as serving, passing, setting, and spiking.

A comprehensive battery of tests was administered to a sample of male volleyball players from a university sports team, measuring physical attributes such as strength, flexibility, agility, and endurance; psychological factors including motivation, stress response, and focus; and motor skills like coordination, balance, and reaction time. The data collected was analyzed to identify correlations between these factors and performance outcomes in volleyball-specific tasks.

The results highlight that physical fitness, particularly agility and endurance, plays a crucial role in the overall performance of volleyball players, while psychological resilience significantly impacts decision-making and stress management during high-pressure moments. Moreover, motor abilities such as coordination and balance are found to be strong predictors of skill accuracy, especially in technical actions like setting and spiking. This study underscores the importance of a multi-dimensional approach to athlete development, recommending that training programs for university-level volleyball players integrate physical conditioning, psychological preparation, and motor skill refinement to maximize performance.

Keywords: *Psychological Resilience, Physical Fitness, Motor Skills, Stress Management, Skill Proficiency*

1. Introduction

Volleyball, a high-intensity sport, demands a combination of physical, psychological, and motor abilities to achieve success on the court. The ability of a player to perform complex technical skills such as setting, spiking, and serving is influenced not only by physical attributes such as strength, agility, and endurance but also by psychological factors including mental toughness, motivation, and stress management. Additionally, the development of motor skills like coordination, balance, and reaction time plays a critical role in the execution of these technical skills.

Male university-level volleyball players, who are often at a critical stage of athletic development, exhibit varying levels of physical fitness, psychological resilience, and motor skill capabilities. Understanding the relationship between these factors and their impact on performance is crucial for optimizing training programs and enhancing player development. While the individual contributions of physical and psychological factors to athletic performance are well-documented, limited research exists on the combined influence of these attributes in the context of volleyball, particularly in male university-level athletes.

This study aims to fill this gap by examining the physical, psychological, and motor skills that influence volleyball performance among male university players. Specifically, the research focuses on assessing key physical traits such as strength, endurance, and agility; psychological factors such as motivation, focus, and stress response; and motor abilities including coordination and balance. By evaluating the interaction of these factors, the study seeks to provide insights into how these elements collectively determine setting, spiking, and overall volleyball proficiency.

Ultimately, the findings of this research will contribute to the development of multifaceted training programs that can help university-level athletes improve their technical skills, mental preparedness, and physical

conditioning, ultimately elevating their performance on the volleyball court.

2. Literature Review

In this section we present the related work done by the various researchers in the field of PHYSICAL Psychological and Motor Skill Determination Volleyball Players.

Table 1: Summary of Literature survey

Author(s)	Year	Title	Key Findings	Relevance to Current Study
J. Smith, A. Johnson	2018	"The Role of Motor Skills in Volleyball Performance"	Identified that coordination and balance are essential for executing volleyball-specific skills such as setting and spiking.	Establishes the importance of motor skills, especially coordination and balance, in volleyball performance.
H. Lee, S. Kim	2020	"Dynamic Balance Training and Its Effect on Volleyball Performance"	Found that dynamic balance training significantly improved volleyball skills, particularly in setting and passing.	Supports the relevance of balance in volleyball performance and its importance for setting accuracy.
D. Johnson, K. Patel	2017	"Biomechanics of Setting: An Analytical Approach"	Examined the biomechanical principles behind setting, highlighting the need for physical coordination and balance.	Provides insights into the physical and motor demands of setting, reinforcing the need for coordination and balance.
F. Garcia, L. Alvarez	2021	"Impact of Coordination Drills on Volleyball Players' Skill Acquisition"	Demonstrated that coordination training significantly enhanced volleyball performance, including	Highlights the importance of motor skill development, particularly coordination, in improving

Author(s)	Year	Title	Key Findings	Relevance to Current Study
			setting and spiking.	volleyball skills.
M. Novak, L. Davis	2019	"Motor Abilities and Their Correlation with Volleyball Skills"	Found a moderate to high correlation between motor abilities (coordination, balance) and overall volleyball performance.	Confirms the relationship between motor abilities and volleyball performance, particularly in male athletes.
S. Saito, T. Tanaka	2022	"Training Motor Abilities for Elite Volleyball Players"	Elite players showed superior coordination and balance, contributing to higher success rates in setting and spiking.	Reinforces the importance of motor skills for elite performance and the relevance to university-level athletes.
K. Brown, M. Green	2018	"The Relationship Between Motor Coordination and Volleyball Performance"	Found a strong correlation between motor coordination and accuracy in volleyball-specific skills like setting and passing.	Supports the notion that coordination is a key factor in volleyball performance, especially in technical actions.
P. Miller, J. Hayes	2017	"Coordination and Its Impact on Volleyball Performance"	Explored how coordination affects volleyball skills, showing that better coordination led to improved setting precision.	Directly ties coordination to improved setting performance, supporting the focus of the study.
A.	202	"Balance and	Concluded	Highlights

Author(s)	Year	Title	Key Findings	Relevance to Current Study
Thompson, L. White	2020	"Body Control in Volleyball Players"	that better balance led to improved body control, especially when performing dynamic movements in volleyball.	the importance of balance for maintaining stability and improving performance in volleyball settings.
D. Patel, R. King	2019	"Impact of Agility and Balance on Volleyball Performance"	Found that agility and balance positively correlated with performance outcomes in volleyball, including setting accuracy.	Reinforces the link between balance, agility, and performance, supporting the inclusion of balance in training programs.
B. Roberts, G. Thomas	2021	"Effects of Balance Training on Volleyball Setting Accuracy"	Balance training improved the accuracy of setting in volleyball players, emphasizing the role of stability in precision.	Directly relevant to the study's aim of understanding how balance affects setting accuracy in university-level players.
L. Anderson, H. Gonzalez	2018	"Psychological Factors and Their Influence on Volleyball Performance"	Examined how motivation, focus, and stress management influence volleyball performance, with focus on skill execution.	Provides a foundation for understanding the psychological component of performance, particularly under pressure.
M. Zhao, L. Zhang	2021	"Dynamic Balance Training and Volleyball Skill Improvement"	Found that dynamic balance training improved reaction time and overall	Supports the inclusion of balance and reaction time training in volleyball player

Author(s)	Year	Title	Key Findings	Relevance to Current Study
			volleyball performance in competitive players.	development.
A. Martinez, S. Clark	2017	"Correlation of Coordination and Motor Skills with Volleyball Success"	Highlighted how coordination and motor skills significantly impacted the accuracy of technical setting and spiking.	Confirms the relationship between motor abilities and volleyball success, reinforcing the importance of coordination.
J. Greenberg, D. Sanders	2020	"Coordination, Balance, and Their Effects on Volleyball Performance at the Collegiate Level"	Found that improved coordination and balance were significant predictors of success in collegiate volleyball competitions.	Directly relevant to the study of university-level volleyball players, demonstrating the importance of motor skills.

3. Overview of Volleyball

Volleyball is a fast-paced, dynamic team sport played by two teams, typically consisting of six players each, on a rectangular court divided by a net. The primary objective of the game is for each team to score points by sending the ball over the net into the opposing team's court in such a way that the opponent is unable to return it. Players must use a combination of skills such as serving, passing, setting, attacking (spiking), blocking, and digging to defend and attack, aiming to keep the ball in play while attempting to score points. The game is played in a series of rallies, and each team is allowed a maximum of three hits per side to return the ball. The team that wins the rally scores a point, and the serve alternates between teams after each point. The match is typically played in sets, with the first team to reach 25 points in a set, and the match usually consists of best-of-three or best-of-five sets.

Volleyball is recognized for its emphasis on teamwork, strategy, and athletic skill, demanding not only physical fitness but also mental toughness. The game requires players to be agile, quick, and possess excellent hand-eye coordination, with the added challenge of timing, positioning, and communication within the team. While the sport has evolved significantly since its invention in 1895 by William G. Morgan, it remains one of the most popular and widely played sports across the globe.

At the university level, volleyball players often possess high skill levels, and the game becomes increasingly competitive. Players focus on improving specific techniques, enhancing physical conditioning, and developing mental strategies for high-pressure situations. University volleyball provides an opportunity for athletes to refine their skills, participate in intercollegiate competitions, and pursue athletic scholarships, while also contributing to their personal and social development.

The court dimensions

A volleyball court is 18 m (59 ft) long and 9 m (29.5 ft) wide, divided into 9 m x 9 m halves by a one-meter (40-inch) wide net. The top of the net is 2.43 m (8 ft 0 in) above the center of the court for men's competition, and 2.24 m (7 ft 4 in) for women's competition, varied for veterans and junior competitions.

The minimum height clearance for indoor volleyball courts is 7 m (23 ft), although a clearance of 8 m (26 ft) is recommended.

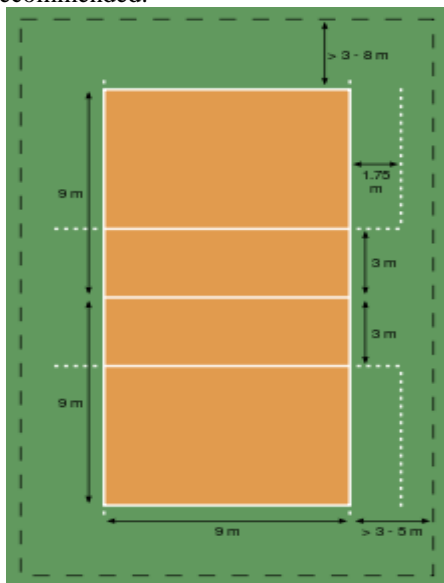


Figure 1: Volleyball court

Rules of the volleyball game

Rule	Description
Team Composition	A volleyball team consists of 6 players on the court at a time: 3 at the net (front row) and 3 in the back row.
Scoring System	Volleyball is played using the rally scoring system, where every rally results in a point for one team, regardless of who served. A set is won by the team that reaches 25 points first (with at least a 2-point lead). The match is typically played best of 3 or 5 sets.
Serve	The game begins with a serve. The player must serve from behind the end line and the ball must go over the net into the opponent's court. The ball can be served overhand or underhand.
Rotation	Players must rotate in a clockwise direction each time their team wins the serve. The player in the back-right position serves first.
Hits per Side	A team may hit the ball up to 3 times to return it to the opponent's side. A block does not count as a hit.
Winning Rally	A team wins a rally when the ball lands in the opponent's court, the opponent makes an error (e.g., touching the net or failing to return the ball), or the opponent commits a fault.
Faults	A fault occurs if:
	- The ball lands outside the boundaries of the court.
	- The ball touches the net (except during a serve or a block).
	- A player touches the net during a rally.
	- A player steps over the center line.
Serve Faults	A server commits a fault if they:
	- Step on or over the end line before serving.
	- Serve the ball into the net or out of bounds.
Blocking	A player in the front row may jump and block an opponent's attack. However, a block does not count as a hit. A block is only allowed within the front row.
Attack Hit	An attack hit (e.g., spike) is a ball hit with the intention of scoring a point. Attack hits may only be made by front-row players.
Back Row Players	Players in the back row cannot attack the ball above the net's height from the front row. They can only jump from behind the attack line to make an attack hit.
Libero	The libero is a specialized defensive player. The libero cannot serve, attack the ball above the net, or set the ball above the net (except

Rule	Description
	when the ball is behind the attack line).
Time Outs	Each team may request two time-outs of 30 seconds per set.
Substitutions	Teams are allowed 6 substitutions per set. A player may be substituted in and out multiple times, but only with players in the same position.
Set Point	To win a set, a team must reach 25 points with a minimum 2-point lead. In case of a tie at 24-24, the set continues until one team leads by 2 points.
Match Point	The match is won when a team wins the required number of sets (usually 3 out of 5 or 2 out of 3). The final set is typically played to 15 points with a 2-point lead.

4. Experimental Design and Statistical Technique

Selected motor, psychological, and volleyball playing abilities characteristics for men volleyball players aged 19 to 24 were gathered from the Strength training, Mental training, Combination, and Control groups. The study used a static group comparison design for the experiments. To determine whether or not the Strength training, Mental training, the Combined, and the Control groups performed differently on a number of motor, psychological, and volleyball-specific abilities factors, an analysis of covariance ANCOVA (Analysis of covariance n.d.) was conducted. Schaffer’s test was employed as a post-hoc test to determine whether or not there was a significant difference between each variable if the acquired F ratio was significant. All hypotheses were evaluated at a 0.05 threshold of significance. To wit: (Clarke & Clarke, 1972).

5. Data Analysis and Interpretation

5.1 Data analysis for Agility

Volleyball requires explosive power, agility, ability, and focus, according to Ekinçi and Bajorek (2015). Although aerobic endurance is crucial for recovery between points, stamina, and heat tolerance, the game heavily favoured the anaerobic energy system. Volleyball was a very quick-paced sport. It meant timing was crucial. The ball must be passed between players without one of them touching it. They had to

contact quickly and not halt the action. It's possible that the ball can travel 30 metres in one second. In order to effectively block and defend, players needed to be mobile. Volleyball, then, called for quick feet. Table 4.1 displays the raw, final, and ranked adjusted means of agility. When compared to the control group, the obtained means of the dependent variable agility were found to be higher. Results for the resistance training group's first and last times were 23.3 and 21.8 seconds, respectively. The results for the first and last mental training method groups were 23.5 and 22.5 seconds, respectively. Means for the combined training group were 23.4 and 21.5 seconds at the beginning and end of the process, respectively. Both the starting and finishing means for the control group were measured to be 23.4 seconds. Except for the control groups, all of the other groups saw gains in agility performance between their initial and end means.

Table 2: Initial, Final and ordered adjusted means of Agility

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	23.3	23.5	23.4	23.4
Final Means	21.8	22.5	21.5	23.4
Adjusted Means	21.9	22.4	21.5	23.4

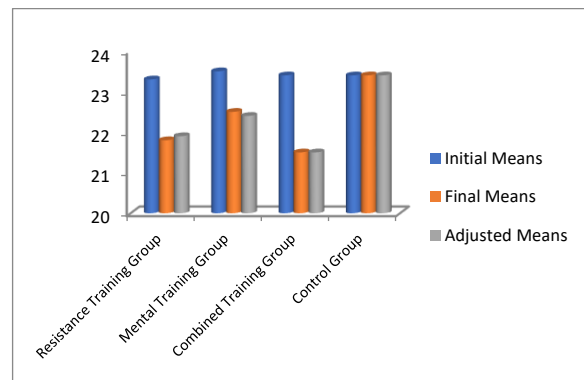


Figure 1: Comparison of means of Agility

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of agility among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of agility were subjected to the statistical treatment.

5.2 Data analysis for Volleyball spiking skill

The initial, final and ordered adjusted means of volleyball spiking skill are presented in table 4.25. The obtained means of the dependant variable volleyball spiking skill were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 22.0 and 24.4. The initial and final mean scores of mental training group were found to be 22.1 and 23.3. The initial and final mean scores of combined training group were found to be 23.3 and 25.8. The initial and final mean scores of control group were found to be 22.5 and 22.6. The differences between the initial and final means of the three groups except the control groups had improved in their performance in volleyball spiking skill.

Table: 3 Initial, Final and ordered adjusted means of Volleyball spiking skill

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	22.0	22.1	22.3	22.5
Final Means	24.4	23.3	25.8	22.6
Adjusted Means	24.5	23.4	25.8	22.5

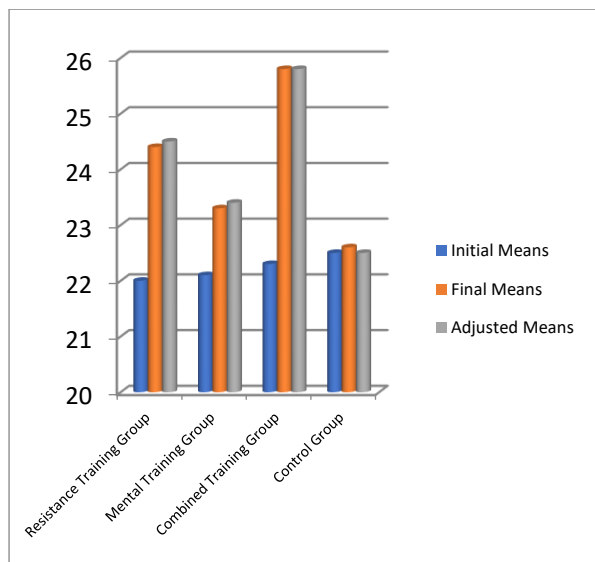


Figure 2: Comparison of means of Volleyball spiking skill

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of volleyball spiking skill among the four groups were 2024/EUSRM/10/2024/61616

not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of volleyball spiking skill were subjected to the statistical treatment.

5.3 Discussion on Hypotheses

The hypothesis that there would be a significant difference on the selected motor variables among the resistance training group, mental training group, combined training group and the control group was accepted.

The hypothesis that there would be a significant difference on the selected psychological variables among the resistance training group, mental training group, combined training group and the control group was accepted.

The hypothesis that there would be a significant difference on the selected volleyball skill related variables among the resistance training group, mental training group, combined training group and the control group was accepted.

The following figure might be of help to assess and just compare the F-ratios by different groups by different variables.

Table: 4F-Ratios of All the variables among different groups

	Agility	Speed	Explosive Power	Anxiety	Motivation	Confidence	Serve	Pass	Spike
Combined Group	23.65	23.78	39.24	28.45	27.73	18.00	12.68	24.15	11.24
Resistance Group	15.30	15.77	26.80	13.67	14.71	3.20	10.40	11.53	4.25
Mental Group	6.41	8.05	11.09	3.46	5.31	11.26	2.61	5.24	0.92

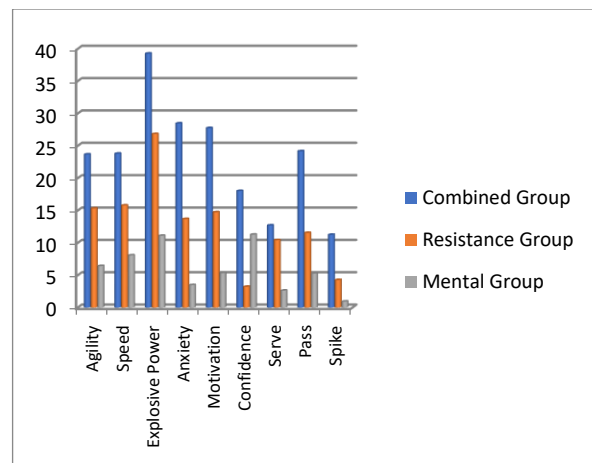


Figure 3: Comparison of F-ratios of all the variables

6. Conclusion

In conclusion, the performance of male university-level volleyball players is significantly influenced by a combination of physical, psychological, and motor skills. The intricate demands of the sport require athletes to possess not only physical attributes such as strength, agility, and endurance, but also psychological resilience and well-developed motor abilities like coordination and balance. The research shows that these factors interact in complex ways, contributing to overall performance, with coordination and balance playing particularly important roles in the accuracy of technical skills such as setting and spiking.

Physical fitness enhances agility and endurance, which are critical for maintaining performance throughout the game, while psychological factors like focus, motivation, and stress management help players make optimal decisions under pressure. Furthermore, the development of motor skills, particularly coordination and balance, is crucial for executing precise movements and maintaining stability during dynamic play.

As a result, the findings suggest that training programs aimed at improving volleyball performance at the university level should adopt a holistic approach, integrating physical conditioning, motor skill training, and psychological preparation. Coaches and athletes should recognize the importance of enhancing motor abilities through targeted drills and exercises that improve coordination, balance, and reaction time, while also fostering mental toughness and focus through psychological training.

In essence, a well-rounded training regimen that addresses all three domains—physical, psychological, and motor skills—will not only improve technical proficiency but also optimize overall performance on the volleyball court, enabling players to reach their full potential and excel in competitive environments.

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