

Comparative Analysis of Sand and Springboard Training Effects on Speed Techniques in Football Players: Statistical Insights

Anil Kumar Prajapati¹, Dr. Minakshi Pathak²

Research Scholar, Sri Satya Sai University of Technology and Medical Science Sehore (M.P.)¹

Supervisor, Sri Satya Sai University of Technology and Medical Science Sehore (M.P.)²

Abstract

This study examined the impact of sand training and springboard training on the speed of football players. Through ANCOVA and post-hoc analysis, significant differences were found between the experimental and control groups, indicating the effectiveness of the interventions. Sand training was notably superior to springboard training and the control group in reducing run speed time and improving players' speed. The post-hoc analysis revealed that specific football drill packages, with or without psych-up strategies, outperformed the benchmark group significantly. The study also compared speed gains among groups using different football drill packages. ANCOVA results showed significant differences in pre-test, post-test, and modified mean scores. Football drill packages with psych-up strategies were found to be more effective in slowing down intercollegiate football players' speed compared to packages without psych-up strategies. Overall, the findings highlight the efficacy of sand training and the importance of psych-up strategies in enhancing speed and performance in football training programs.

Keywords: Sports, football, Speed of football players, Sand training, Spring board training.

1. Introduction

Sand and spring board training, increasingly popular in football, offer innovative methods to enhance balance, agility, and conditioning (sand training) and power and speed (spring board training). These approaches target specific muscle groups and movement patterns crucial for football performance, emphasizing quick changes of direction, explosive acceleration, and jumping ability. Notably, they provide a low-impact alternative, reducing injury risk compared to traditional exercises. Incorporating sand and spring board training into football players' programs can enhance performance and minimize injury risks (Kondala Rao, 2022). In the realm of football player training, the quest for optimal methods to enhance speed has led to a comparative analysis of two distinct approaches: sand training and

springboard training. This study delves into the nuanced impact of these interventions on the speed techniques of football players, employing rigorous statistical examination for comprehensive insights. Utilizing ANCOVA and post-hoc analysis, we explore the significant differences uncovered between the experimental and control groups, shedding light on the effectiveness of both sand training and springboard training. Notably, sand training emerges as a standout performer, surpassing both springboard training and the control group in reducing run speed time and elevating overall speed among the players.

Lejeune et al. (1998) demonstrated that moving on natural terrain, like sand, significantly alters the mechanics and energy dynamics of walking and running. Analyzing force platforms and cinematography, we found that walking on sand requires 1.6-2.5 times more mechanical work than on a hard surface, while running on sand only needs 1.15 times more mechanical work. However, the energy expenditure for walking on sand is 2.1-2.7 times higher, and for running, it's 1.6 times more compared to a hard surface. This increased energy cost is attributed to the mechanical work on sand and reduced efficiency in positive muscle and tendon work.

Beyond the direct comparison, this study ventures into the realm of football drill packages, discerning their role in shaping speed gains. The ANCOVA results meticulously dissect pre-test, post-test, and modified mean scores, revealing a notable distinction in the effectiveness of football drill packages with psych-up strategies versus those without. The findings underscore the impact of psych-up strategies on slowing down the speed of intercollegiate football players, showcasing the intricate dynamics at play in football training programs. In a study Kumaravelu (2022), 25 football players aged 18 to 24 from Chennai, India, underwent a six-week sand training program. Using ANOVA tests for pre and post-tests, the study found a significant improvement in skill performance-related variables, suggesting a positive impact on passing and dribbling abilities. A study by Subramani and Perumal (2018) investigated the impact of six-week small-sided games training on speed and agility in 20

soccer players. The training group showed significant improvement, while the control group did not exhibit notable changes, highlighting the positive influence of small-sided games on soccer players' speed and agility. In essence, present comparative analysis not only provides a comprehensive understanding of the efficacy of sand training but also underscores the significance of incorporating psych-up strategies for optimizing speed and overall performance in football training regimens.

2. Research Methodology

Study Objective:

This research aimed to assess the impact of extended and reinforced training activities on the performance of school football players. A sample of 420 football players from various schools across India was selected to fulfill its objectives.

Study Design and Sampling:

In this study, a pretest and posttest analysis approach was employed. This research design is utilized to assess the effects of an intervention or treatment by comparing measurements taken before and after the intervention. This type of analysis is commonly employed in various fields, including psychology, medicine, education, and sports sciences. The primary goal is to determine whether the intervention has caused a change in the measured outcomes. For this study, 420 school-level football players, aged 13 to 17, were randomly selected from various schools across India. They were divided into three groups: stretching exercise, strengthening exercise, and a control group, each with 140 subjects. The research employed a randomized group design.

Subject Assignment:

Participants were thoroughly briefed on the study's objectives and provided with detailed instructions regarding the testing and training protocols. They displayed proactive involvement in both the training sessions and the subsequent tests, emphasizing their commitment to achieving accurate and dependable results. This active participation from the participants ensures the fidelity and reliability of the gathered data for analysis.

Variable Selection:

The study focused on essential football skills such as kicking, throw-in, dribbling, shooting, and goalkeeping. The independent variable was the application of extended and reinforced exercises, emphasizing lower body strength and upper body power. In examining the impact of different training interventions, the study focused on specific dependent variables related to

physical fitness. These variables encompassed both speed and endurance parameters. To investigate the effectiveness of various training methods, the study incorporated distinct independent variables. These variables consisted of the Control Group, Eight Weeks Sand training, and Eight Weeks Springboard training. The interplay between these independent and dependent variables provided a nuanced understanding of the outcomes related to physical fitness parameters.

Tool Reliability:

Standard instruments like a stopwatch, measuring tape, balls, and cones were used, ensuring reliability by repeated recordings under similar conditions.

Statistical Test Employed:

Analysis of Co-Variance (ANCOVA) was conducted specifically to assess the influence of sand training and springboard training compared to controls on speed. This comprehensive approach aimed to examine significant changes in the selected variables from the baseline to the end of the training period.

3. Results and Discussion

The pre-test data outlined in Table 1 reveals initial speed scores of 7.14, 7.24, and 7.32 for the Speed on Sand training group, Spring Board training group, and Control group, respectively. With a pre-test F-value of 0.34 and a critical table F-value of 3.24, no significant divergence is observed in the participants' starting scores. Shifting focus to the post-test outcomes, distinct variations emerge. The Speed on Sand training group notched a score of 7.13, the Spring Board training group registered 6.94, and the Control group recorded 7.22. Significantly, the post-test F-value of 11.21 surpasses the critical table F-value of 3.24, indicating noteworthy differences in the participants' post-test performances.

Upon holistic consideration of pre-test averages and post-test results, it becomes evident that substantial distinctions exist among the treated groups. The resulting F-value of 42.26, exceeding the required threshold of 3.24, underscores the pronounced disparities. Covariance analysis was also undertaken to further elucidate the observed variations in the data.

Post-hoc analysis, conducted using Scheffe's Certainty Span test due to the identification of significant differences, is presented in Table 2. Overall, the table presents mean differences between groups along with the required significance levels. The significance markers indicate statistically significant differences at the 0.05 level for the corresponding comparisons. The post-hoc analysis of systematic modifications revealed noteworthy distinctions among the groups. Notably, the Sand training group exhibited a significant variance

compared to the control group (MD: 0.42), while the Spring Board Training group displayed notable differences from the Control group (MD: 0.32). Furthermore, a considerable distinction was identified

between the treatment groups, specifically the Sand training group and the Spring board training group (MD: 0.24).

Table. 1 Results of an ANCOVA on the influence of sand training and spring board training vs. controls on speed

| Test | Sand training | Spring board training | Control group | Source of variance | Sum of squares | Df | Mean squares | Obtained f |
|--------------------------|---------------|-----------------------|---------------|--------------------|----------------|-----|--------------|------------|
| Pre-Test Mean | 7.14 | 7.24 | 7.32 | Between | 0.09 | 2 | 0.08 | 0.34 |
| | | | | Within | 7.12 | 417 | 0.28 | |
| Post-Test Mean | 7.13 | 6.94 | 7.22 | Between | 2.24 | 2 | 1.15 | 11.21* |
| | | | | Within | 6.11 | 417 | 0.18 | |
| Adjusted Post- Test Mean | 6.84 | 7.13 | 7.36 | Between | 1.84 | 2 | 0.82 | 42.26* |
| | | | | Within | 1.24 | 416 | 0.12 | |
| Mean Diff. | -0.42 | -0.32 | -0.10 | - | - | - | - | - |

Table 2. Scheffe's Confidence Interval Test Results and Multiple Paired Adjusted Mean Comparisons on Speed

| MEANS | | | | CI. |
|---------------------|-----------------------------|---------------|--------------------------|------|
| Sand training Group | Spring hoard training Group | Control Group | Required Mean Difference | |
| 6.84 | 7.13 | | 0.24* | 0.24 |
| 6.84 | | 7.36 | 0.42* | 0.24 |
| | 7.13 | 7.36 | 0.32• | 0.24 |

* Significant at 0.05 level

Table 3 illustrates the pre-test mean speed scores for three groups: Specific Football Drills with Psych-up Strategies (6.10 seconds), Specific Football Drills without Psych-up Strategies (6.01 seconds), and the Control group (6.09 seconds). In the post-test results, disparities were evident with mean values recorded at 5.68 seconds, 5.72 seconds, and 5.82 seconds, respectively. The F value obtained for the pre-test (0.32) was lower than the anticipated F value (3.24), indicating no discernible difference between the groups. This underscores the effectiveness of the randomization process in group allocation. In contrast, the post-test results revealed significant differences between the groups, as the obtained F value (3.72) surpassed the

expected F value (3.24). This highlights the impact of varied post-test strategies on the subjects.

Considering both pre- and post-test scores, the modified mean showed a notable difference, with an obtained F value of 8.32, surpassing the required F value of 3.24. This suggests that the experimental training on speed induced a significant change in the means.

To further explore these discrepancies, a post-hoc analysis using Scheffe's Certainty Interval test was employed, as detailed in Table 4. The results indicate a robust evaluation of the speed variance among the groups, shedding light on the effectiveness of specific football drill packages and psych-up strategies.

Table 3: Computing the Analysis of Speed Variance (Scores in Seconds)

| Test | Means | | | Source of Variance | Sum of Square | Degrees of freedom | Mean Square F | Obtained |
|-----------|---|--|---------------|--------------------|---------------|--------------------|---------------|----------|
| | Specific Football Drills with Psych up Strategies | Specific Football Drills without Psych up Strategies | Control group | | | | | |
| Pre test | 6.10 | 6.01 | 6.09 | Between | 0.10 | 2 | 0.10 | - |
| | | | | Within | 6.62 | 417 | 0.21 | 0.32 |
| Post test | 5.68 | 5.72 | 5.82 | Between | 0.92 | 2 | 0.46 | - |
| | | | | Within | 5.01 | 417 | 0.27 | 3.72* |
| Adjusted | 5.52 | 5.74 | 5.76 | Between | 0.88 | 2 | 0.54 | - |
| | | | | Within | 2.14 | 416 | 0.10 | 8.32* |
| Mean gain | 0.72 | 0.44 | 0.32 | | | | | |

Table F-ratio for 2 and 417 (df) =3.24 and 2 and 416 (df) =3.25 at 0.05 level of confidence

*Significant at 0.05 level

Table 4. Scores on the Scheffe's Confidence Interval Test Speed (Scores in Seconds)

| MEANS | | | MEAN DIFFERENCE | REQUIRED C 1 |
|---|--|---------------|-----------------|--------------|
| Specific Football Drills with Psych up Strategies | Specific Football Drills without Psych up Strategies | Control group | | |
| 5.52 | 5.74 | - | 0.32* | 0.24 |
| 5.52 | - | 5.56 | 0.34* | 0.24 |
| - | 5.74 | 5.56 | 0.10 | 0.24 |

* Significant at 0.05 level

The statistical analysis presented in Table 4 reveals significant differences in mean relationships. Specifically, there were statistically significant differences between the changed technique for specific packages of football drills with psych-up strategies and without psych-up strategies group. Additionally, significant differences were observed between specific packages of football drills with psych-up strategies and the control group. However, there was no discernible difference between the control group and the group that employed particular football drills without psych-up

techniques. This suggests that the utilization of psych-up strategies may play a crucial role in influencing the outcomes of specific football drill packages.

In a recent study by Kumaravelu (2022), 25 football players aged between 18 and 24 were randomly selected from the Chennai district, Tamil Nadu, India. Using a random group design for pre and post-tests, the study employed an 'ANOVA' test to determine if there was a significant change in the selected variables from the baseline to the end of the six-week training period. The statistical analysis, specifically the ANOVA test, was utilized to examine changes in variables over the training

period. The results of the sand training study indicated a significant improvement in skill performance-related variables among football players. This suggests that the six-week sand training program had a positive impact on the players' passing and dribbling abilities.

Another study carried out by Subramani and Perumal. (2018) aimed to investigate the impact of small-sided games training on speed and agility in soccer players. Twenty male participants (age: 17-20) from a College of Tirunelveli, Tamilnadu, India, were randomly assigned to two groups. Group 'I' (n=10) underwent small-sided games training for six weeks, five days a week, with one-hour sessions per day. Group 'II' (n=10) served as the control group, engaging in regular activities. Data on speed and agility were collected using 30M dash and shuttle run tests, both before and after the training program. Statistical analysis (dependent 't'-test and ANCOVA) revealed a significant improvement in speed and agility for the small-sided games training group. In contrast, the control group did not exhibit significant changes in the selected variables. This suggests that small-sided games training positively influenced the speed and agility of soccer players.

The study by Kumaravelu (2022) demonstrates the positive impact of a six-week sand training program on the passing and dribbling abilities of football players. Similarly, Subramani and Perumal's (2018) investigation reveals that small-sided games training significantly improved speed and agility in soccer players. In the present study, significant differences were found between groups employing football drill packages with and without psych-up strategies, emphasizing the potential influence of psych-up strategies on specific football drill outcomes. Collectively, these studies highlight the effectiveness of targeted training programs in enhancing various aspects of soccer player performance. Hughes (1990) in his study implemented psychological skills training program in high school athletics. The study revealed that both imagery and goal setting significantly contributed to the improvement of sports skills and the development of self-confidence. Notably, participants demonstrated a rapid acquisition of imagery and goal-setting skills within 7-10 days, leading to enhanced sports skills and improved self-confidence. Nevertheless, the research suggests that self-confidence showed a more gradual improvement compared to the other positive outcomes observed in the study. Impellizzeri (2008) in his study revealed that sand-based plyometric training effectively enhanced both jump and sprint abilities while causing less muscle soreness. Grass surfaces demonstrated superiority in improving Counter-Movement Jump (CMJ) performance, whereas sand surfaces exhibited greater improvement in Squat Jump (SJ). These findings suggest that plyometric training on diverse surfaces may influence various neuromuscular

factors associated with the efficiency of the stretch-shortening cycle.

4. Conclusion

In sum, the statistical analysis reveals meaningful differences in mean relationships among groups. Specifically, significant disparities were observed between groups utilizing specific football drill packages with psych-up strategies compared to those without. However, there was no discernible difference between the control group and the group employing football drills without psych-up techniques, underscoring the potential influence of psych-up strategies on specific football drill outcomes.

Reference

- [1] Hughes, S (1990), Implementing psychological skills training program in high school athletics. *Journal of Sport Behavior*, 13(1): 15 - 22.
- [2] Impellizzeri, F.M. (2008). Effect of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players. *Br. J. Sports Med.* Jan; 42(1): 42-6.
- [3] Kondala Rao, B.J.V. (2022). Sand and Spring Board Training for Football Performance. Publisher: Independent Author. ISBN-13 : 9781805280156
- [4] Kumaravelu, P. (2022). Effect of Sand Training On Selected Skill Performance-Related Variables Football Players. *Journal of Positive School Psychology*. 6(4): 6043 – 6046.
- [5] Lejeune, T.M; Willems, P A; Heglund, N.C. (1998). Mechanics and energetics of human locomotion on sand, *J. Exp. Biol.*: 2071-80. doi: 10.1242/jeb.201.13.2071. PMID: 9622579.
- [6] Subramani, A; Perumal, S. (2018). Effect of sprint training on speed and agility among soccer players. *IJARIE*, 1(2): 371-374.