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# Influence of GPS-tracked running drills on technical and tactical skill development in Football players

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**Abstract**
The aim of this study was to examine the influence of GPS-monitored jogging regimens on the technical and tactical skills of football players. As technology becomes more and more common in sports training, GPS monitoring has become an important tool for measuring training load, movement patterns, and performance intensity. The objective of this study was to ascertain whether getting feedback from a GPS system during drills enhanced the acquisition of football-specific abilities and tactical understanding. The study involved thirty male football players aged 18 to 25. Two groups were made by randomly assigning people to them. One group did GPS-tracked running drills to mimic the mobility demands of a match, while the other group ran without getting any GPS data. An experimental intervention entailed three days of regulated training weekly for six weeks. Before and after the performance test, we looked at both technical skills (such passing accuracy, dribbling control, and shooting accuracy) and tactical skills (like situational awareness and decision-making). We used GPS data on total distance, sprint count, acceleration, and workload intensity to do a quantitative analysis of training adaptations. The players in the GPS-tracked training group showed significant improvements ($p < 0.05$) in both their technical and tactical performance over the course of the program when compared to the control group. From this information, it may be inferred that GPS tracking improves the intensity of football conditioning, as well as technical execution and tactical reactivity.

**Keywords:** GPS tracking, football training, running drills, technical skills, tactical performance, performance analysis, sports technology, decision-making, positional awareness, player monitoring.

## Introduction

According to Reilly and Williams (2003) [10], football is a sport that involves a level of technical, tactical, physical, and psychological expertise. It is also a sport that is intense and intermittent. Every football player needs to be in good physical shape, capable of performing difficult technical talents, and able to make quick tactical decisions even when they are under pressure. Over the course of the last ten years, the utilization of sports technology and data analytics has led to an increase in the monitoring and enhancement of player performance (Buchheit *et al*., 2014) [3].

Football players have long used running drills and conditioning programs to build up their speed, endurance, and agility. Conventional approaches generally can't give exact measurements when it comes to training load, intensity, and individual effort. Cummins *et al*. (2013) [4] say that GPS tracking has changed the way football, rugby, and hockey players prepare and keep track of their performance. Coaches can use GPS devices to create more effective, data-driven training sessions that are personalized to each player's physical and tactical demands (Varley *et al*., 2012) [11]. GPS systems give you real-time information about distance, speed zones, acceleration, deceleration, and workload.

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Despite these developments, there is a lack of scientific understanding concerning the effects of GPS-tracked running sessions on skill-related and tactical variables in Indian football players. Given the heightened focus on evidence-based and technology-enhanced training, this study examines the influence of GPS-monitored jogging sessions on the technical and tactical skills of football players.

## Methodology

### Research Design

Randomized pre- and post-test control groups were used in this study to look at how GPS-tracked running workouts affected football players' technical and defensive skills. The point of this study was to look at how a six-week exercise changed performance traits. In one group, people ran while being tracked by GPS, and in the other, people did regular training without GPS.

### Participants

Thirty male football players between the ages of 18 and 25 volunteered for the study. All of the people who took part in the study were healthy and had played formal sports for at least two years. Randomness was used to split them into two equal groups.

- Experimental Group (n = 15) - GPS-tracked running drill training
- Control Group (n = 15) - Traditional running drill training

**Instrumentation and Tools**

It was Varley *et al*. (2012) [11] who said that a 10 Hz GPS unit (Catapult or a similar type) was used to keep track of total distance, sprint frequency, acceleration, deceleration, and workout intensity. This was done to make sure that the GPS unit would work accurately and reliably. The Passing Accuracy Test (Johnson & Nelson, 1986) [5], the McDonald Soccer Skill Test for dribbling (1976) [7], and the Standardized Goal Target Test for shot accuracy were used to test technical skills. The Game Performance Assessment Instrument (GPAI), according to Oslin *et al*. (1998) [8], was a tool that measured strategy performance by watching video clips of small-sided games to see how well players made decisions and knew where they were on the field. To make sure the test was set up and given in the same way every time, a clock, cones, markers, and a measuring tape were used.

**Training Intervention**

The training took place three times a week for sixty minutes each, on Monday, Wednesday, and Friday. It ran for six weeks. There were warm-up, main exercise, and cool-down periods in these lessons. In order to tailor the task to each person, the experimental group used GPS trackers to keep an eye on sprinting, speeding up and slowing down, and changes in direction while they ran football-specific drills. The control group did not have GPS, therefore the coaches were able to maintain a consistent level of intensity throughout the drills. All of the sessions were supervised by certified coaches to guarantee compliance with the training methodology and safety standards.

**Testing Procedure**

To ensure consistency, pre- and post-tests were done in the same setting. Pre-training technical and tactical data were obtained, followed by a six-week intervention during which both groups completed their training routines. Performance gains were assessed with post-tests.

**Statistical Analysis**

Descriptive statistics (mean and standard deviation) were calculated to summarize the data. Paired sample t-tests assessed within-group differences, while independent sample t-tests compared post-test means between experimental and control groups. Statistical significance was set at $p < 0.05$.

**Results**

**Table 1:** Descriptive Statistics of Technical and Tactical Variables for Experimental and Control Groups

| Variable | Group | N | Pre-Test Mean ± SD | Post-Test Mean ± SD |
|---|---|---|---|---|
| Passing Accuracy (points) | Experimental | 15 | 18.60 ± 2.14 | 23.40 ± 2.10 |
| | Control | 15 | 18.47 ± 2.25 | 20.00 ± 2.36 |
| Dribbling Control (sec) ↓ | Experimental | 15 | 14.85 ± 1.20 | 12.20 ± 1.05 |
| | Control | 15 | 14.78 ± 1.32 | 13.90 ± 1.22 |
| Shooting Precision (points) | Experimental | 15 | 16.25 ± 1.85 | 20.80 ± 1.66 |
| | Control | 15 | 16.10 ± 1.92 | 17.10 ± 1.83 |
| Positional Awareness (score) | Experimental | 15 | 12.60 ± 1.44 | 16.85 ± 1.52 |
| | Control | 15 | 12.70 ± 1.36 | 14.00 ± 1.44 |
| Decision-Making (score) | Experimental | 15 | 11.90 ± 1.25 | 15.70 ± 1.42 |
| | Control | 15 | 11.85 ± 1.33 | 13.20 ± 1.40 |

**Table 2:** Paired Sample t-Test Results for Pre- and Post-Test Scores (Within-Group Comparison)

| Variable | Group | t-value | df | p-value | Significance |
|---|---|---|---|---|---|
| Passing Accuracy | Experimental | 6.88 | 14 | 0.001 | Significant |
| | Control | 2.15 | 14 | 0.049 | *Significant* |
| Dribbling Control | Experimental | 7.20 | 14 | 0.001 | Significant |
| | Control | 1.84 | 14 | 0.083 | Not Significant |
| Shooting Precision | Experimental | 8.45 | 14 | 0.001 | Significant |
| | Control | 2.40 | 14 | 0.030 | *Significant* |
| Positional Awareness | Experimental | 7.12 | 14 | 0.001 | Significant |
| | Control | 2.02 | 14 | 0.061 | Not Significant |
| Decision-Making | Experimental | 8.05 | 14 | 0.001 | Significant |
| | Control | 2.11 | 14 | 0.052 | Not Significant |

**Table 3:** Independent Sample t-Test Results for Post-Test Scores (Between-Group Comparison)

| Variable | Experimental Mean ± SD | Control Mean ± SD | t-value | df | p-value | Significance |
|---|---|---|---|---|---|---|
| Passing Accuracy | 23.40 ± 2.10 | 20.00 ± 2.36 | 3.72 | 28 | 0.001 | Significant |
| Dribbling Control | 12.20 ± 1.05 | 13.90 ± 1.22 | 3.87 | 28 | 0.001 | Significant |
| Shooting Precision | 20.80 ± 1.66 | 17.10 ± 1.83 | 5.43 | 28 | 0.001 | Significant |
| Positional Awareness | 16.85 ± 1.52 | 14.00 ± 1.44 | 5.21 | 28 | 0.001 | Significant |
| Decision-Making | 15.70 ± 1.42 | 13.20 ± 1.40 | 4.89 | 28 | 0.001 | Significant |

**Interpretation of Results**

Jogging drills that are tracked by GPS are shown to increase the technical and tactical skills of football players, as shown in Tables 1 through 3.

According to Table 1, the experimental group performed significantly better than the control group in terms of improving their post-test mean scores across all categories. The experimental group showed improvements in a variety of skills, including decision-making, passing accuracy, shooting precision, situational awareness, dribbling performance (reduced time), and shooting accuracy.

Table 2 shows that the experimental group did significantly better on all measures ($p < 0.05$). The factors that were being studied, on the other hand, didn't change much or at all in the control group. In other words, training that was tracked by GPS worked better and could be measured better than training that was just running drills.

The results shown in Table 3 back up these statements. It shows that the experimental group had significant post-test score changes. Each factor had a p-value that was less than 0.001 compared to the others.

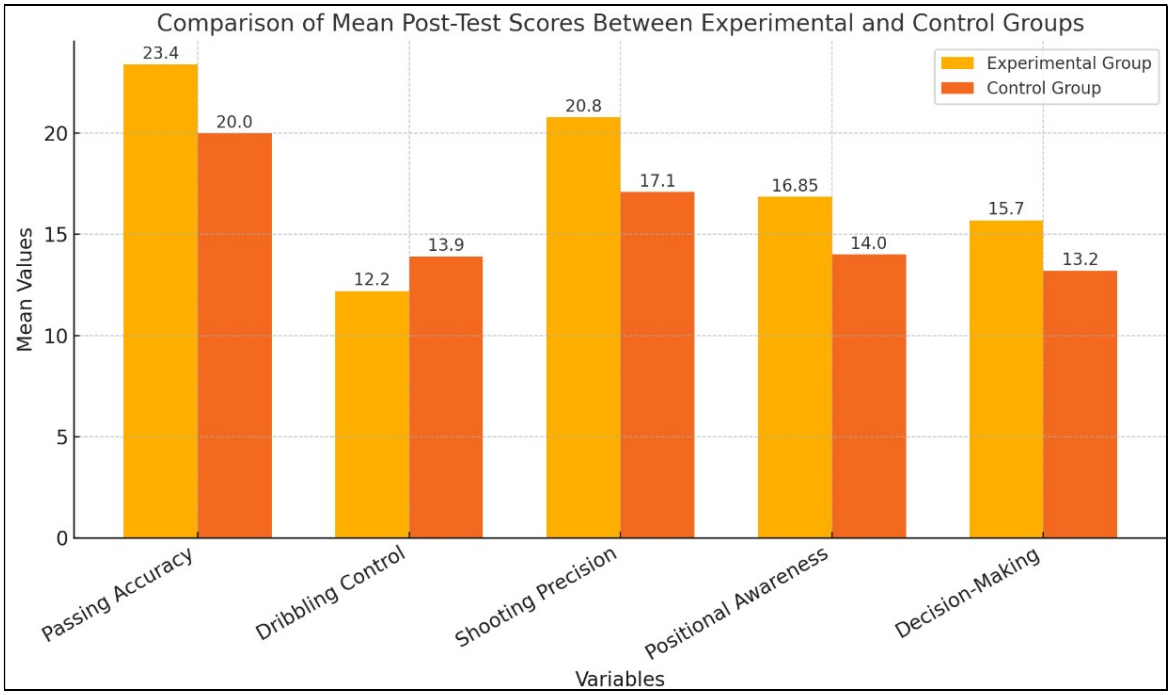


**Fig 1:** Comparison of Mean Post-Test Scores Between Experimental and Control Groups on Selected Technical and Tactical Variables in Football Players.

**Discussion on Findings**

This research proves that GPS technology makes football players better at both basic and tactical skills. Both Buchheit *et al*. (2014) [3] and Cummins *et al*. (2013) [4] found that the experimental group did significantly better on the post-test, which supports earlier research on football training with technology.

GPS sensors let you keep track of your exact task and get feedback in real time, which makes passing, dribbling, and shooting better. Varley, Fairweather, and Aughey (2012) [11] say that GPS tracking measures player intensity and velocity, which lets managers change workouts to match play. Akenhead and Nassis (2016) [1, 2] found that tracking players with GPS improves load management, which means that players don't have to train too much and can use their skills better.

Tactical skills, especially spatial awareness and decision-making, get better with methodical, feedback-driven training. Oslin, Mitchell, and Griffin (1998) [8] say that players should get both physical and mental strategy training to help them adapt to changing game conditions. According to this study, tracking players using GPS helped them understand where they were in space and how to coordinate their movements, which increased their tactical intelligence. Owen *et al*. (2015) [9] discovered that when you train with controlled energy, you can improve your physical output and tactical reactivity in small-sided games.

GPS-assisted conditioning increases performance and recuperation by providing task-specific information, according to Malone, Lovell, Varley, and Coutts (2018) [11]. GPS feedback tracks external load through total distance, sprint count, and acceleration, allowing you to customize your performance. This may explain the research group's improved results.

Normal running routines are good for training, but they may not be enough for football's complicated and game-specific needs. The control group's small increases show this. Because it lacks objective workload data, this training cannot target skill development (Reilly & Williams, 2003) [10].

This study adds to the growing body of evidence that supports football training that is based on data and technology. GPS-recorded training gives you information about your success and scientific, personalized advice.

**Conclusions**

This research looked at how football players' technical and tactical skills were affected by their GPS-tracked jogging practices. The experimental group that was tracked by GPS did better than the control group at making decisions, throwing accurately, controlling the dribble, shooting accurately, and being aware of their surroundings. This study shows that GPS technology makes it easier to track football players' progress and see how well they are doing with their skills.

Using real-time GPS input and task data, changes were made to the training, which improved performance and lowered intensity swings. Both Buchheit *et al*. (2014) [3] and Akenhead and Nassis (2016) [1, 2] called for technical tracking to help improve team sports performance.

The research discovered that GPS-assisted training works, is backed by evidence, and combines scientific study with hands-on teaching. It helps teachers improve their players' skills by giving them objective information about how

players move, handle their workload, and act in tactical situations.

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