



The Effect of Station Training on Some Physical Abilities of Junior Football Tennis Players

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Abstract:

The significance of station training as a contemporary training method is evident in its proven effectiveness for developing diverse physical capacities, particularly explosive power, speed-strength, transitional speed, and speed endurance. This method is distinguished by its capacity to diversify stations in accordance with the specific demands of the sport, and to arrange them in a manner that ensures appropriate training loads while enhancing performance efficiency through systematic transitions among multiple stations targeting different physical and functional capacities.

1. Introduction

1.1 Research Problem and Significance

Furthermore, station training constitutes an effective means for implementing modern training principles — including progressive overload, specificity, and load variation — making it a suitable approach for developing football tennis players' capacities in alignment with competitive demands and the characteristics of technical and physical performance. Based on the researcher's field observations of junior football tennis players at the specialized academy in Thi-Qar Governorate, a notable deficiency was observed in the level of certain physical abilities and performance speed among a number of junior players. This deficiency may be attributed to coaches' reliance on traditional training methods that are inconsistent with the modern characteristics of football tennis. Accordingly, the research problem centers on the lack of clarity regarding the effect of station training on the development of performance-related physical capacities among football tennis players, making it necessary to investigate this contemporary scientific method to assess its effectiveness relative to the conventional approaches currently employed.

1.2 Research Objectives

- To compare the experimental and control groups in order to determine the effectiveness of station training relative to the traditional training method adopted by coaches.
- To identify the effect of a station-based training program on the development of specific physical abilities in football tennis players (explosive power, speed-strength, transitional speed, and speed endurance).

1.4 Research Hypotheses

- There is a statistically significant difference between the pre-test and post-test measurements of the experimental group in the physical abilities under investigation, in favor of the post-test.
- There are statistically significant differences between the experimental and control groups in the post-test measurements of physical abilities, in favor of the experimental group.

1.5 Research Scope

Human Scope: Junior players of Al-Gharraf Club in football tennis, aged 13–16 years.

Temporal Scope: From 15/10/2024 to 17/12/2025.

Spatial Scope: The indoor hall of Al-Gharraf Football Tennis Club.

3. METHODOLOGY

3.1 Research Design

The researcher adopted the experimental method, defined as the method in which an independent variable is manipulated and controlled in order to observe its effect on a dependent variable, with resulting changes being observed and interpreted, whether the experiment involves one independent and one dependent variable or more than one of each.

3.2 Research Population and Sample

The researcher defined the research population as football tennis players in the junior category, aged between 13 and 15 years, in accordance with the provisions of the International Football Tennis Law of 2017. The researcher identified football tennis players in Thi-Qar (the Specialized School in Thi-Qar). The research sample was selected using the purposive method, limited to Al-Gharraf Club players in the specified category, with a total of 16 players representing 100% of the population.

3.3 Sample Homogeneity and Equivalence

3.3.1 Sample Homogeneity

Table (1): Sample Homogeneity in Key Variables

Variables (Unit)	N	Mean ($\bar{X}$)	Median	SD	Skewness Coeff.
Training Age (years)	16	1.78	2.02	0.62	0.309
Chronological Age (years)	16	13.31	13.00	0.62	0.537
Body Height (cm)	16	1.54	1.56	0.066	0.980
Body Weight (kg/m ²)	16	46.34	45.25	5.98	0.684

Note: The normal distribution skewness coefficient is defined within the range (± 3).

3.3.2 Sample Equivalence

The experimental design of this study requires verification of baseline equivalence by establishing statistical parity between the two groups in the pre-test results. Accordingly, the researcher subjected the pre-test results to statistical analysis, as shown in Table (2).

Table (2): Pre-test Results Between the Two Research Groups

Dependent Variable	Unit	Group	Mean	SD	t-test	Sig.	Significance
Explosive Power	cm	Experimental	38.250	1.035	1.158	0.285	Non-significant
		Control	36.625	1.597			
Speed-Strength	sec	Experimental	14.756	0.501	1.788	0.177	Non-significant
		Control	14.376	0.550			
Transitional Speed	sec	Experimental	6.380	0.483	0.896	0.400	Non-significant
		Control	6.271	0.399			
Speed Endurance	sec	Experimental	22.885	0.877	1.025	0.340	Non-significant
		Control	23.431	1.389			

Degrees of freedom ($n_1 + n_2 - 2 = 14$) at significance level (0.05); non-significant when Sig. ≥ 0.05 .

3.4 Identification of Main Research Variables

3.4.1 Identification of Physical Abilities

Numerous scientific references were reviewed to determine the candidate physical abilities. A pilot survey questionnaire was distributed to a group of (9) specialist professors and experts to identify the importance and priority of these abilities for football tennis players, and to record any observations deemed necessary by the experts but not included in the questionnaire. After collecting and analyzing the data, Table (3) presents the total scores and final ranking of the candidate physical abilities based on the opinions of the (9) specialists and experts. The researcher applied the Chi-square (χ^2) test and percentage to determine the level of agreement, adopting a threshold of 80% or higher, and a χ^2 value at (8) degrees of freedom and significance level (0.05) of 3.84.

Table (3): Results for Determining Physical Abilities

No.	Physical Ability	Experts	Agree	Disagree	%	χ^2	Significance
1	Speed-Strength	9	9	0	100%	9	Significant
2	Explosive Power	9	8	1	88.88%	5.4	Significant
3	Strength Endurance	9	5	4	55.55%	0.4	Non-significant
4	Speed Endurance	9	9	0	100%	10	Significant
5	Transitional Speed	9	8	1	88.88%	5.4	Significant
6	Reaction Speed	9	6	3	66.66%	1.6	Non-significant

7	Motor Speed	Response	9	4	5	55.55%	0	Non-significant
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Number of experts = 9; χ^2 critical value at degrees of freedom (8) and significance level (0.05) = 3.84.

3.5 Pilot Study

Following the identification of the research sample, physical abilities, and their corresponding tests, the researcher conducted a pilot study on a sample of (4) junior football tennis players drawn from the main research sample and selected randomly with the assistance of the research team. The pilot study was conducted on Tuesday, 22/04/2025, with the following objectives:

- To assess the suitability and appropriateness of the sequence in which the tests are administered.
- To verify the suitability of the tests for sample participants and the ease of their administration.

3.6 Pre-Tests

The pre-tests for the specific physical abilities under investigation were conducted on Thursday, 24/04/2025. During this session, height, weight, chronological age, and training age were measured, along with the specific physical ability tests: the standing vertical jump test, the bilateral hopping test over a distance of 10 meters, the 20m × 5 shuttle run test, and the 30-meter sprint from a standing start for transitional speed. The tests were conducted at the indoor football tennis hall in Al-Gharraf, where testing conditions and procedures were standardized, and the same conditions were maintained as closely as possible during the post-tests.

3.7 Training Program

The researcher designed a proposed training program based on the available resources and the general physical levels of the research sample, taking into account the nature of the training environment and the availability of equipment and auxiliary tools. The program consisted of (24) training units, at a rate of (3) units per week over (8) weeks, drawing on the findings of the previously conducted pilot study. The exercises were designed using diverse training stimuli and tools related to the specific demands of the sport, while accounting for the developmental characteristics and training age of the 13–15 age group to ensure appropriate training load and optimal physical response.

Regarding training methods, the program employed high-intensity interval training (HIIT) as well as repetition training. These methods were applied within the specific preparation phase in alignment with the defined objectives. To promote motivation and competitive spirit, the researcher employed the competitive approach in certain units, alongside the station training method, which aims to develop multiple physical capacities within a single training session.

3.8 Post-Tests

Upon completion of the training program, post-tests were administered to the research sample (experimental and control groups) on Saturday, 21/06/2025, at the indoor football tennis hall in Al-Gharraf, under conditions comparable to those of the pre-tests in terms of the testing environment, venue, and equipment used.

4. Results and Discussion

The researcher presents the results of statistical analyses in tables and graphical representations for the dependent variables under investigation, in accordance with the study's title and the parameters of the experimental design, comparing pre- and post-test measurements for each of the two research groups and between them in the post-test phase.

Table (4): Means, Standard Deviations, Mean Differences, SD of Differences, Calculated t-Values, Significance Levels, and Significance of Differences for Pre- and Post-Tests of the Experimental and Control Groups

Physical Ability	Unit	Group	Test	Mean	SD	Mean Diff.	SD Diff.	t-calc.	Sig.	Significance
Explosive Power	cm	Experimental	Pre	38.250	1.035	5.625	1.187	13.375	0.001	Significant
			Post	43.875	0.991					
		Control	Pre	38.625	1.597	0.625	1.302	1.367	0.217	Non-significant
			Post	39.250	1.164					
Speed-Strength	sec	Experimental	Pre	14.828	0.501	2.992	1.204	7.026	0.001	Significant
			Post	11.763	1.023					
		Control	Pre	14.376	0.550	0.153	0.411	1.057	0.326	Non-significant

			Post	14.222	0.446					
Transitional Speed	sec	Experimental	Pre	6.380	0.483	1.208	0.658	5.192	0.001	Significant
			Post	5.171	0.551					
		Control	Pre	6.271	0.399	0.106	0.312	0.963	0.368	Non-significant
			Post	6.377	0.255					
Speed Endurance	sec	Experimental	Pre	22.885	0.877	3.625	1.187	8.632	0.001	Significant
			Post	19.260	0.882					
		Control	Pre	23.431	1.389	0.351	0.591	1.680	0.137	Non-significant
			Post	23.080	1.327					

n = 8 per group; degrees of freedom (n – 1) per group; difference is significant when Sig. $\geq$ 0.05 at significance level (0.05); tabulated value = 1.895.

4.1.3 Discussion of Pre- and Post-Test Physical Ability Results for Both Research Groups

As evident from Table (4), a significant difference was found between the pre- and post-test measurements in favor of the experimental group, as the mean of the experimental group exceeded that of the control group. This development is attributed to the quality of the exercises incorporated in the proposed training program and their effective contribution to improving and developing the level of explosive power — one of the fundamental specific physical capacities in certain sports activities such as football tennis, which is characterized by continuous variations in effort volume and intensity. Various types of movements, ball kicking, and short-distance sprinting are performed, and these activities differ in intensity and effort volume. The researcher further attributes the development in leg muscle explosive power to the application of various jumping exercises imposed on the sample members through a scientifically designed approach aligned with the principles of proper training load distribution throughout the specified period.

Regarding speed-strength, the researcher attributes its development to the sustained work of the muscle groups through high-speed movements during training aimed at overcoming the various resistances encountered by the player during performance. The development of this quality is based on rapid changes in nerve signals, indicating that the training devised by the researcher successfully developed the working muscle groups during motor performance. This relative development was clearly evident in the experimental group through the improvement of leg muscle speed-strength, which led to increased bilateral hopping capacity over a specified distance.

The researcher also notes that the exercises implemented at relatively high repetitions exerted a positive influence on the development of the physical capacities that necessarily depend on speed-strength, which is directly linked to the execution of any technical skill. Speed is entirely dependent on strength; from a physics perspective, speed is a movement resulting from force in conjunction with the time factor.

The researcher attributes the development of transitional speed to the effect of leg muscle explosive power training through jumping and running exercises. This is consistent with the findings cited by Ra'ad Jabir (quoting Özelin, 1995), who confirmed the possibility of developing transitional speed as a result of improving muscle strength, in addition to the fact that developing speed-strength in the athlete is among the important factors contributing to speed development, particularly transitional speed. Several factors contribute to the development of this speed, including the structural characteristics of muscle fibers, the capacity for relaxation, muscle extensibility, and viscosity. Short-distance speed is essential, along with the ability to control movement following this speed.

The researcher attributes the development observed in speed endurance to the quality of the effective exercises employed in its development, through precisely determined work durations in terms of intensity, volume, and inter-repetition and inter-set rest intervals. The application and adoption of modern training principles, theories, and methods — with attention to their sequencing and coordination according to the principle of progressive overload within the framework of functional adaptation throughout training units — contributed to achieving the principle of optimal recovery. As stated by Mohammed Othman (2000): 'If the coach is able to identify the appropriate timing of the optimal recovery phase and apply the progressive increase in training load precisely at this point, within a process of gradual elevation of the physical level at a rate of 70 to 80%.'

4.2 Post-Test Results Between the Experimental and Control Groups

Table (5): Means, Standard Deviations, and Calculated t-Values for Post-Tests Between the Experimental and Control Groups for Physical Abilities

Physical (Unit)	Ability	Group	N	Mean	SD	t-calc.	Sig.	Significance
Explosive (cm)	Power	Experimental	8	43.875	0.991	10.044	0.001	Significant
		Control	8	39.250	1.164			
Speed-Strength (sec)		Experimental	8	11.763	1.023	6.127	0.001	Significant
		Control	8	14.222	0.446			
Transitional Speed (sec)		Experimental	8	5.171	0.551	6.986	0.001	Significant
		Control	8	6.377	0.255			
Speed (sec)	Endurance	Experimental	8	19.260	0.882	8.115	0.000	Significant
		Control	8	23.080	1.327			

Degrees of freedom ($n_1 + n_2 - 2$) = (14); difference is significant when Sig. $\geq$ 0.05 at significance level (0.05); tabulated value = 2.145.

4.2.3 Discussion of Post-Test Physical Ability Results Between the Two Groups

Table (5) demonstrates the existence of significant differences in the post-test physical abilities between the experimental and control groups, in favor of the experimental group. The researcher initially notes that both groups showed improvement in post-test physical abilities; however, the advantage was attributed to the experimental group. The researcher contends that the sole factor contributing to this additional improvement was the experimental group's engagement with station training or the increased constructive processes following training units, which positively reflected on the manifestation of physical ability development.

The researcher holds that one of the methods for developing and improving physical capacities is the implementation of exercises and the repetition and habituation of their execution mechanism, linking movements with and without the ball and with the use of equipment, performed at varying speeds. The use of conditions and constraints in accordance with the training objective contributed to the development and occurrence of differences in favor of the post-tests. The researcher also attributes this to the preparation and formulation of exercises in a manner consistent with the research sample. The use of specific exercises by the experimental group only in the main part of the training unit had a clear effect on developing the physical variables under investigation, as the main component contained the specific exercises prepared by the researcher, which served as a novel approach that alleviated the monotony experienced by the players due to the use of conventional exercises. The organization of training provides a fundamental impact on the development of performance level, in harmony with the level of players' abilities.

5. Conclusions and Recommendations

5.1 Conclusions

- The station training program demonstrated clear effectiveness in developing explosive power among experimental group participants, reflecting improvement in the anaerobic energy production system and greater reliance on rapid force pathways.
- Speed-strength showed notable growth as a result of load diversification and elevated training intensity, reinforcing neuromuscular adaptation and enhancing motor unit recruitment efficiency during performance.
- Transitional speed recorded a significant improvement following the training program, indicating the effectiveness of exercises based on directional changes, short-speed repetitions, and the development of nerve conduction velocity.
- Speed endurance training effectively contributed to improving fatigue resistance among experimental group participants by enhancing the capacity of the muscular and cardiorespiratory systems to tolerate the accumulation of metabolic by-products associated with high-intensity effort

5.2 Recommendations

- It is recommended to adopt station training as an effective strategy in athlete preparation programs, given its capacity for load diversification and its ability to simultaneously develop multiple physical and functional elements.

- Adherence to the principle of progressive training intensity, while accounting for individual differences among players, to ensure the achievement of the required physiological adaptation without exposing players to excessive fatigue.
- Incorporating speed endurance training within long-term programs, given its direct impact on improving fatigue resistance during matches and enhancing performance capacity under pressure.
- Encouraging coaches to adopt station training due to its significant impact on developing the physical dimension and moving away from traditional training methods.
- Conducting the experiment on other age groups using station training in combination with other training methods.

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Appendix: Sample Training Unit

Sample Training Unit — Week 1, Unit 1

Week	First	Unit Objectives	Develop Explosive Power & Transitional Speed	Intensity	80%	Work:Rest Ratio	1:3	Unit	First	Day
Station	Exercise	Time (sec)	Reps	Rest/Rep (sec)	Sets	Rest/Set (sec)	Total Work (sec)	Total Rest/Reps	Total Rest/Sets	Exer Time
Station 1	A1	6.13	3	18.39	4	24.52	73.56	147.12	98.08	5:31
	A2	5.65	3	16.95	4	22.6	66.72	135.6	90.4	5:27
	A3	4.62	3	13.86	4	18.48	55.44	110.88	73.92	4:00
Station 2	C1	12.45	3	37.35	2	49.8	74.7	149.4	99.6	5:39
	C2	11.72	3	35.16	2	46.88	70.32	140.64	93.76	5:07
	C3	16.53	3	49.59	2	66.12	99.18	198.36	66.12	6:06