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Personal Training Support and Motor Performance Test Outcomes in Trained Youth Athletes: A Cross-Sectional Study

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ABSTRACT

Purpose: The purpose of this study was to examine the impact of personal training (PT) support on motor performance test outcomes (flexibility, explosive power, speed, and aerobic endurance) in youth athletes (aged 14–19 years) with at least three years of regular sports participation.

Methods: 61 participants divided into a PT group (n = 30, receiving at least 6 months of customized training) and a Non-PT group (n = 31, participating only in routine club training). Standardized field tests including the Sit-and-Reach test, vertical jump (measured via laser-based sensors), 10-m and 20-m sprint tests (measured via dual-beam photocells), and the 20-m shuttle run test were administered. The Mann-Whitney U tests were conducted to evaluate differences between groups. The analyses were stratified by gender (female and male sub-groups) and also evaluated for the total sample.

Results: The results revealed no statistically significant differences ($p > .05$) in any of the motor performance parameters between athletes who trained with a personal trainer and those who did not, across all stratified groups. Rank-biserial correlations showed trivial-to-small effect sizes for all variables.

Conclusion: These findings suggest that for young athletes already involved in structured club sports, additional personal training was not associated with significantly superior motor performance scores. Long-term athletic development models should focus on the quality and specificity of training stimuli rather than the mere addition of individualized supervision.

Keywords: Personal training; Youth athletes; Motor performance; Physical fitness; Talent identification ; Motor tests

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INTRODUCTION

In sports sciences, maximizing athletic performance and guiding youth athletes toward elite levels depends not only on the volume and intensity of training loads but fundamentally on the precision and quality of the applied methodology. While traditional team or group training models focus on macro-level objectives, they frequently overlook micro-level biomechanical deficiencies, functional asymmetries, and individualized physiological thresholds. To bridge this gap, personal training (PT) applications have emerged as a critical strategy within modern athletic structures to optimize performance and monitor developmental trends (Karaağaç & Şahan 2021; McClaran, 2003). Individualized exercise programming allows for the dynamic adjustment of periodization principles based on an athlete's real-time physiological adaptations, musculoskeletal mechanics, and anthropometric characteristics (Ratamess et al., 2008). In addition, in modern sports, measuring performance is essential for athletic development, and the rise of wearable technologies now allows youth athletes to actively self-monitor their own data (Mancı et al., 2018). Customized exercise regimens are postulated to yield higher rates of neuromuscular and metabolic adaptation compared to standardized group programs, particularly in enhancing muscular strength, dynamic balance, agility, and aerobic/anaerobic capacities. The one-on-one interaction inherent in personal training optimizes technical execution and form, thereby improving movement efficiency and mitigating potential musculoskeletal injury risk factors (Cabacı & Taşkıran, 2021). Furthermore, the continuous feedback and psychological reinforcement provided by a personal trainer have been shown to elevate intrinsic motivation and training adherence among young athletes (Çik, & Küçük, 2019). Standardized motor performance test outcomes and physical fitness test batteries represent the international gold standard for quantifying current motor capacities, projecting sport-specific potential, and tracking longitudinal development (Eurofit, 1993; Tsigilis et al., 2002). Protocols such as the sit-and-reach, vertical jump, short-distance sprints, and the multi-stage shuttle run test provide objective, reproducible measures of flexibility, explosive power, acceleration speed, and cardiorespiratory endurance (Popović et al., 2017). During adolescence (14–19 years), the precise analysis of these parameters is crucial, as training stimuli interact dynamically with biological maturation processes (Dinçer, 2023; Güçlüöver et al., 2019). While a substantial body of literature validates the efficacy of personal training in modifying physical activity behaviors and health markers in sedentary populations (McClaran, 2003), controlled comparative studies evaluating its direct transfer to standardized motor performance in actively competing youth athletes remain remarkably scarce (Turna, O.,

& İri, R. 2022). Existing research often focuses heavily on sport-specific tactical parameters or general fitness metrics rather than standardized baseline motor skills.

This study aims to fill this gap by evaluating and comparing the motor performance test outcomes of young athletes who have been working with a personal trainer for at least six months against those who rely solely on routine club training. The resulting data seek to provide a scientific foundation for athletic orientation models, periodization strategies, and resource allocation in youth sports academies (Kaya et al., 2025). Youth athletes who have been training with a personal trainer for at least 6 months would demonstrate superior motor performance test scores compared with athletes participating only in routine club training.

MATERIAL and METHODS

Research Design and Participants

This study utilized a quantitative, cross-sectional design to investigate differences in physical performance parameters based on the utilization of personal training. The target population consisted of licensed youth athletes actively competing in sports clubs in İzmir, Turkey. Sample size calculation was performed *a priori* using G*Power software (v3.1.9.7, Düsseldorf, Germany). Based on equivalent literature, setting the effect size d = 0.80 (large effect), type-I error rate, alpha = 0.05, and statistical power (1-beta) = 0.90, the minimum required sample size was determined to be 60 participants (at least 30 per group), (Faul et al., 2007). Purposive sampling yielded a final sample of 61 healthy athletes separated into two cohorts: a) PT Group (n = 30): Athletes executing personalized performance training under the direct supervision of a personal trainer for at least 6 months (minimum 2 sessions/week), in addition to or independent of regular club practice, b) Non-PT Group (n = 31): Athletes participating exclusively in their respective sports clubs' routine team/group training without any individual coaching support.

*Inclusion Criteria: ı) a*ge between 14 and 19 years, ıı) a minimum of 3 years of regular, licensed sports participation, ııı) absence of any acute or chronic musculoskeletal injuries in the past 6 months that caused a cessation of training, ıv) written informed consent was obtained from both the participants and their legal guardians prior to testing. The study protocol was approved by the Non-Interventional Research Ethics Committee of İzmir Demokrasi University (Approval No: 2026/6-10).

Data Collection Tools and Test Protocols

Anthropometric measurements were recorded before the performance tests. Stature was determined to be the nearest 0.1 cm using a wall-mounted stadiometer, and body mass was measured to the nearest 0.1 kg via a calibrated digital scale. All testing sessions occurred during identical hours of the day (10:00 AM to 12:00 PM). A standardized 10-minute dynamic warm-up protocol preceded all physical tests (Günay et al., 2023).

Flexibility (Sit-and-Reach Test): The sit-and-reach test box was utilized to evaluate the flexibility of the hamstring muscles and the lower back region. Participants sat barefoot with knees fully extended, placing the soles of their feet flat against the box. They were instructed to reach forward slowly and smoothly with hands overlapping (palms facing down) as far as possible along the measuring scale. The maximum reach position was held for 2 seconds, and the score was recorded in centimeters (cm). The superior score of two trials was retained for analysis (Ayala et al., 2012; Hoeger & Hopkins, 1992).

Explosive Power (Vertical Jump Test): To assess lower-extremity explosive power, countermovement jump (CMJ) height was quantified using a laser-based optoelectronic sensor system (Optojump, Microgate, Italy). The system detects flight time between the athlete's take-off and landing phases with millisecond precision, computing vertical displacement through kinematic equations (Attia et al., 2017; Glatthorn et al., 2011). Participants performed maximum vertical jumps with hands fixed on hips to isolate lower-limb kinetics. Two trials were performed with 2 minutes of passive recovery between attempts, and the highest jump was recorded in centimeters (cm).

Speed (10-m and 20-m Sprint Tests): Short-distance acceleration and maximal sprinting velocity were measured over 10 meters and 20 meters. To eliminate manual timing errors, dual-beam photocell electronic timing gates were positioned at 0 m, 10 m, and 20 m at the participants' hip height (Cronin & Templeton, 2008; Haugen et al., 2012). From a stationary high-start position set up 50 cm behind the initial timing gate, athletes sprinted at maximal effort down the designated running lane. Two trials were completed per distance with a 3-minute inter-trial rest period, and times were recorded in seconds (s).

Aerobic Endurance (20-m Shuttle Run Test): Cardiorespiratory endurance and maximal oxygen uptake (VO_{2max}) surrogates were determined using the 20-meter multi-stage shuttle run test. Participants ran back and forth between two lines, spaced 20 meters apart, synchronized with an acoustic compact disc signal. The initial velocity commenced at 8.5 km/h and escalated by

0.5 km/h every minute. The test was terminated if an athlete failed to reach the target boundary line simultaneously with the audio bleep twice consecutively or withdrew due to volitional exhaustion. The final completed lap and stage were documented for statistical modeling.

Statistical Analysis

Data analysis was conducted using SPSS version 27.0 (IBM Corp., Armonk, NY, USA) and JASP Software. Descriptive statistics were expressed as mean (X) and standard deviation (±SD). Normality of data distribution was verified using the Shapiro-Wilk test. Because several parameters across the subgroups deviated significantly from a normal distribution ($p < .05$) , the non-parametric Mann-Whitney U test was consistently implemented for all group comparisons to ensure methodology uniformity. To interpret the clinical and practical significance of differences, Rank-Biserial Correlations (r) were calculated as the effect size metric for the Mann-Whitney tests. Effect sizes were evaluated as trivial (< 0.10), small (0.10 - 0.29), medium (0.30 - 0.49), and large (0.50). The statistical significance threshold was established at $p < .05$.

RESULTS

Descriptive values and Mann-Whitney U test outputs contrasting female athletes who trained with a personal trainer (n = 15) and those who did not (n = 15) are presented in Table 1 and comparing male athletes who worked with a personal trainer (n = 15) and those who did not (n = 16) are outlined in Table 2.

Table 1: Descriptive Statistics and Mann-Whitney U Test Results for *Female Athletes*

Parameter	**PT Status** ***(PT n=15 Control n=15)***	**Mean**	**±*SD***	**p** ***U***	**Rank-Biserial Correlation**
Age (Years)	Yes	14.80	1.08	N/A	N/A
	No	15.20	1.26		
Sit-and-Reach (cm)	Yes	10.98	3.07	.950 *114.5*	-0.018
	No	11.17	2.86		
10-m Sprint (s)	Yes	2.64	0.45	.934 *115.0*	-0.022
	No	2.57	0.37		
20-m Sprint (s)	Yes	4.46	0.50	1.00 *113.0*	-0.004
	No	4.49	0.64		
Vertical Jump (cm)	Yes	26.33	3.53	.070 *156.5*	-0.391
	No	24.00	4.22		
Shuttle Run (laps)	Yes	7.06	2.21	.244 *140.0*	-0.244
	No	6.26	2.12		

Note: For the Mann-Whitney test (U), effect size is given by the rank biserial correlation

The analysis indicated that female athletes utilizing a personal trainer demonstrated slightly higher mean scores in vertical jump height (X = 26.33 cm) and shuttle run completed laps (X = 7.07 laps) compared to their non-supervised peers (X= 24.00 cm and X = 6.27 laps, respectively). However, these disparities did not reach statistical significance: Sit-and-Reach ($p = .95$), 10-m Sprint ($p = .93$), 20-m Sprint ($p = 1.0$), Vertical Jump ($p = .07$), and Shuttle Run ($p = .24$). The effect size for the vertical jump approached a medium threshold ($r = -0.391$) but remained non-significant.

Table 2: Descriptive Statistics and Mann-Whitney U Test Results for *Male Athletes*

Parameter	PT Status (*PT n=15 Control n=16)*	Mean	±*SD*	p *U*	Rank-Biserial Correlation
Age (Years)	Yes	15.06	1.10	N/A	N/A
	No	15.00	0.89		
Sit-and-Reach (cm)	Yes	9.20	1.86	.471 *135.5*	-0.154
	No	8.73	2.12		
10-m Sprint (s)	Yes	1.90	0.10	.649 *132.0*	-0.100
	No	1.90	0.11		
20-m Sprint (s)	Yes	3.43	0.24	*.890* *124.0*	-0.033
	No	3.40	0.26		
Vertical Jump (cm)	Yes	43.49	7.17	.213 *152.0*	-0.267
	No	40.28	6.38		
Shuttle Run (laps)	Yes	9.13	1.64	.423 *99.50*	-0.171
	No	9.56	2.03		

Note: For the Mann-Whitney test (U), effect size is given by the rank biserial correlation

For the male cohort, no statistically significant differences were observed across any tested motor performance markers: Sit-and-Reach (p = .47), 10-m Sprint (p = .64), 20-m Sprint (p = .89), Vertical Jump (p = .21), and Shuttle Run (p = .42). The mean scores for speed and endurance were highly homogenous between both groups. All computed rank-biserial correlation values indicated trivial or small effect sizes.

When pooling all participants to maximize statistical power, the data reinforced the sub-group trends. No significant performance variances emerged between the PT and Non-PT groups: Sit-and-Reach (p = .74), 10-m Sprint (p = .75), 20-m Sprint (p = .81), Vertical Jump (p = .33), and Shuttle Run (p = .78). The effect sizes remained negligible (r< 0.15), confirming the absence of a distinct advantage associated with personal training under these cross-sectional parameters (Figure 1).

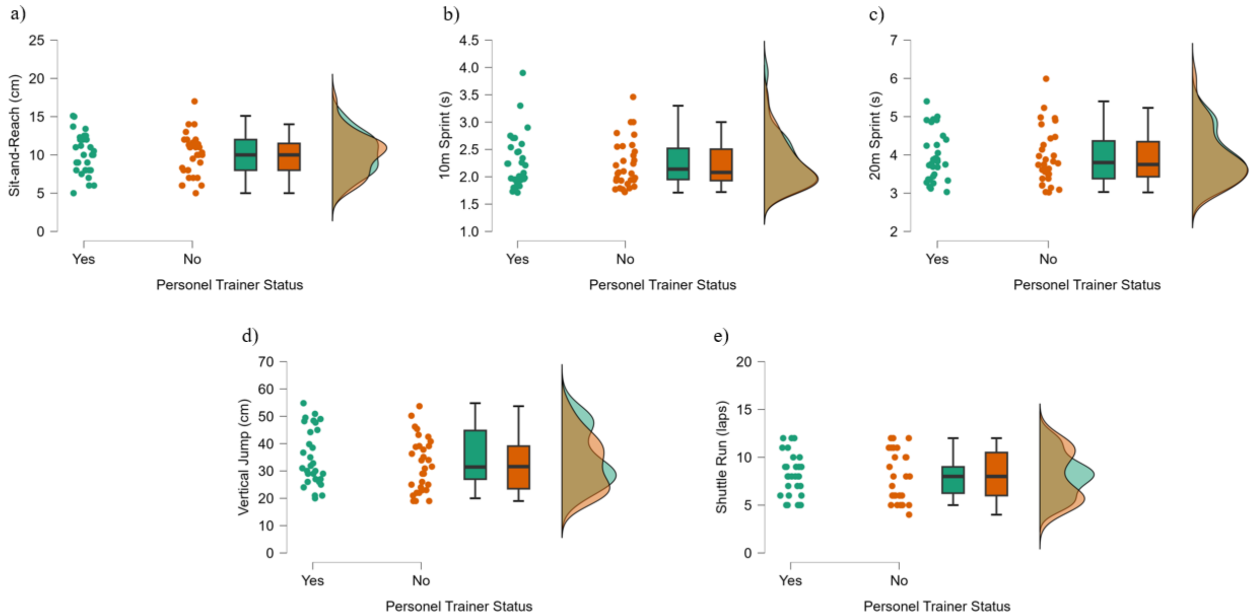

Figure 1: Mann-Whitney U Test Results for the Combined Sample (PT Status Yes n= 30 and PT Status No n=31)

DISCUSSION

The primary objective of this study was to evaluate the association between personal trainer support and baseline motor performance parameters. We hypothesized that athletes working with a personal trainer would achieve significantly better scores across all motor dimensions. However, the statistical analyses failed to support these assumptions, leading to the rejection of our hypotheses. No significant differences were found in flexibility, sprint speeds, vertical jump heights, or multi-stage shuttle run endurance laps between the cohorts, regardless of gender stratification.

While personal training is frequently praised for its ability to optimize performance and accelerate adaptations (Ratamess et al., 2008), our findings diverge from studies reporting substantial fitness improvements under individual coaching (McClaran, 2003). This divergence can be attributed to critical methodological and contextual factors. First, our participants were not sedentary individuals starting a new exercise regimen; they were licensed athletes with over three years of competitive club training. In trained populations, the "ceiling effect" limits rapid, massive gains in baseline motor properties. Standard club training environments already subject these athletes to high-volume physiological conditioning, leaving a narrower window for additional training interventions to produce substantial improvements.

Second, the lack of statistical differences highlights the unstandardized nature of personal training in practice. In many settings, personal training sessions focus on general conditioning, hypertrophy, body composition, or sport-specific tactical skill drills rather than targeted athletic performance periodization (Karaağaç & Şahan 2021). Unless individual sessions specifically target sprint mechanics, plyometrics for explosive power, or high-intensity intervals to improve maximal aerobic speed, baseline motor performance test outcomes scores may remain unchanged (Turna, O., & İri, R. 2022).

Interestingly, female athletes who had a personal trainer showed a slight, non-significant trend toward higher vertical jumps ($p = .07$, $r = -0.391$) and more completed shuttle run laps ($p = .24$, $r = -0.244$). This alignment suggests that female youth athletes may benefit from the closer monitoring and increased motivation provided by one-on-one coaching, which can push them closer to volitional exhaustion during intense field tests (Çik, & Küçük, 2019). Conversely, the male athletes showed nearly identical scores between groups, suggesting that routine club practices may already provide a sufficient stimulus to maximize their anaerobic and cardiorespiratory profiles during this developmental stage.

In summary, the results suggest that simply adding a personal trainer does not guarantee automatic improvements in baseline motor skills for young athletes. The value of individual supervision appears to depend heavily on the implementation of highly specific, evidence-based strength and conditioning periodization.

Practical Application

The empirical findings of this research provide clear, actionable directions for sports scientists, youth academy directors, strength and conditioning specialists, and parents looking to optimize athletic development. First, stakeholders must recognize that simply hiring a personal trainer or adding uncoordinated extra sessions will not automatically improve an athlete’s baseline motor skills; individualized programs must be explicitly structured around target-specific athletic goals, such as utilizing plyometric periodization for explosive power or tailored sprinting drills for speed mechanics. Second, to prevent overtraining and maximize physiological adaptation, personal trainers must collaborate closely with team coaches to ensure that individual sessions complement, rather than conflict with, the metabolic and neuromuscular demands of routine club training. Additionally, instead of duplicating the general fitness or tactical work already covered in team practices, personal training sessions for competitive youth athletes should strategically prioritize fixing specific movement deficiencies, kinetic asymmetries, and personal biomotor weaknesses.

Limitation and Future Research

While this study offers valuable insights into the intersection of personal coaching and youth athletic performance, several limitations should be acknowledged. First, the minimum duration of personal training required for inclusion was set at 6 months, which, despite being a sufficient timeframe for observing neuromuscular and cardiorespiratory adaptations in recreational populations, may be inadequate to produce contrasting baseline biomotor shifts in already trained youth athletes who naturally exhibit higher adaptation thresholds. Second, the lack of direct programming control meant that the specific design, volume, intensity, and physiological focus of each participant's personal training sessions were not controlled or standardized; this variation between sessions focused on general fitness versus those designed for specific biomotor parameters may have diluted potential group differences. Furthermore, the lack of precise logbooks detailing the exact intensity, volume, and specific exercise selection of each participant's personal training sessions prevents a definitive conclusion on whether specialized athletic periodization would yield different outcomes. Additionally, due to the cross-sectional design of this research, baseline performance scores prior to the initiation of personal training were unavailable, which effectively prevented the assessment of longitudinal intra-individual progression rates over time. The sample size (N = 61) was calculated based on a large effect size (d = 0.80). Consequently, the study may have been underpowered to detect trivial, small, or medium effects, potentially overlooking subtler performance enhancements associated with personal training in this elite sub-group. Thus, the results should be interpreted as a lack of statistical difference within this specific sample, rather than a definitive absence of coaching efficacy. Limits the immediate generalizability of the findings to different competitive levels, various sports branches, or broader geographic demographics. Additionally, the specific sports branches (e.g., team sports vs. individual sports), weekly club training volume, and exact sports age of the participants were not controlled or balanced between groups, which represents a major confounding variable capable of skewing baseline motor performance profiles.

CONCLUSION

In this cross-sectional sample of trained youth athletes, personal training support was not associated with significantly superior motor performance test outcomes in competitive youth athletes aged 14–19. The small arithmetic trends observed in the personal training group did not translate into meaningful statistical effects. These findings indicate that for youth athletes who are already active in structured sports clubs, supplemental personal training only provides a clear advantage if it explicitly targets and addresses individual biomotor deficits.

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Conflict of Interest: The authors declare no conflict of interest.

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Ethics and Consent to Participate: This research was conducted in accordance with the Declaration of Helsinki and was approved by the Non-Interventional Research Ethics Committee of İzmir Demokrasi University (2026/6-10). Prior to the commencement of data collection, institutional permissions were obtained from the participating sports clubs. All participants and their legal guardians (parents) provided written informed consent by signing the Informed Volunteer Consent Form before taking part in any physical testing.

Data Availability: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration of AI Use: During the preparation of this work, the authors used AI-based tools solely for grammatical polishing, language editing, and translating structural components of the manuscript into English to improve readability. After using these services, the authors reviewed, edited, and verified all parts of the content and took full responsibility for the scientific integrity and accuracy of the final published work.

Credit Authorship Contribution Statement

Ceyda SEVİM: Methodology, Data Curation, Analysis, Writing — Original Draft

Onur Mutlu YAŞAR: (https://orcid.org/0000-0001-7598-3927) Conceptualization, Methodology, Data Curation, Analysis, Visualization, Writing — Original Draft, Writing — Reviewing & Editing

*All authors read and approved the final manuscript.

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