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# Effects of Pilates Training on Physical, Physiological and Psychological Performance in Young/Adolescent Volleyball Players: A Randomized Controlled Trial

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**Abstract:** Young athletes are constantly developing, and their performance reflects this ongoing process. By understanding performance variations and implementing appropriate training strategies, coaches and stakeholders can help young athletes develop their skills and athletic potential, as well as psychological well-being. Volleyball skills, such as explosive strength and serving precision, play a crucial role in determining the outcomes of volleyball matches. In contrast, mental well-being contributes to enhancing psychological performance. This prospective, randomized, parallel-group trial investigates the effectiveness of Pilates for young volleyball players. We investigated whether Pilates improves certain individual volleyball skills (explosive strength and serving precision) and certain psychological aspects (state of mindfulness) in young, male, 12–14-year-old athletes. Participation in this 12-week study involved 40 athletes (PG = 20; CG = 20). The Control Group had regular training and the Pilates Group had regular training plus twenty-four additional Pilates sessions. The Pilates Group showed a significant improvement in the variables under investigation by 4–7% ($p < 0.001$). Pilates training can improve individual volleyball skills in young male athletes and may also benefit overall psychophysical development. This study suggests that incorporating Pilates into training programs for young volleyball players can be beneficial for individual skill development and potentially overall psychophysical well-being, assuming an important role in the educational development of the young.

**Keywords:** volleyball; performance; well-being



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## 1. Introduction

Improving performance is essential for a professional athlete [1]. Volleyball is a team ball sport requiring players to have well-developed physical, physiological [2], and psychological capacities [3], in order to obtain a significant performance. Volleyball-specific motor actions are performed in a relatively dynamic and changing environment, which suggests the involvement of high perceptual–cognitive demands during a match [4]. Various investigations have been undertaken to ascertain specific physical, physiological and psychological profiles of athletes in a variety of sports [5–7]. The importance of a positive relationship between these factors has been demonstrated especially in soccer, in which high-level players demonstrated better performance after an intervention that combined physical and physiological aspects with psychological training than their counterparts [8]. In addition, better psychological abilities were found to be associated with future performance success in young soccer players [9]. Similar results were also found for volleyball, where elite players demonstrated better performance when physical and physiological training was integrated with psychological training than controls [10]. A recent study in

volleyball has adopted a multidimensional approach to investigate potential differences between various trainings oriented to improve performance [11]. Volleyball-specific skills, such as serving precision, vertical jump, as well as psychological well-being, were found to be superior in players who focus their training on an approach that combined all of these factors.

Taken together, these findings suggest that a multidimensional approach is an important component of performance in sports, especially in team sports, where perceptual-cognitive demands are high [12]. Thus, a combination of both physiological and physical performances with psychological aspects should be considered to depict a complete portrait of athletes' abilities [13]. These findings support the close interplay of physical, physiological and psychological skills, suggesting a connection between physical and cognitive domains in youth athletic development. By considering all of these factors, athletes can create a well-rounded approach to improving their performance.

Among the various methods used to achieve these goals, Pilates is increasingly included in the training routine of many sports, including volleyball [14]. Pilates involves a sequence of physical activities focused on enhancing strength, flexibility, and endurance of muscles. It facilitates the synchronization of cognitive and physical aspects [15]. Pilates strengthens the central muscle groups and promotes increased range of motion, effectiveness, and muscular strength [16,17]. Moreover, recent empirical appraisals and meta-analyses have demonstrated the efficacy of the Pilates method in enhancing several psychological facets [18]. Specifically, it facilitates the restoration of equilibrium and positivity, enhances satisfaction, and fosters overall well-being both in competitive and non-competitive settings [19,20].

The help that the Pilates method can offer to the world of volleyball is very varied. First of all, the postural setting of Pilates allows the athlete to find a good harmony between the muscle districts, thus redistributing body weight [21]. Afterwards, exercises carried out on unstable surfaces such as the Reformer or proprioceptive tablets ensure balance, strengthening and stabilization of the lower limbs [22]. Studies suggest Pilates can increase hamstring flexibility [23,24]. Moreover, a strong core is crucial for stability and power in volleyball. No less important is the attention paid to the upper body. The reinforcement of the scapulohumeral girdle ensures the safety of the lumbar area and shoulders against the impact of the ball shot or jump [25]. Lastly, Pilates exercises often challenge balance and coordination. This can translate to better control and agility on the court. In the case of volleyball players, a high level of postural stability was found in the study by Borzucka et al. [26], when comparing a team of high-level Polish volleyball players and a group of untrained students. These skills have an important influence on athletic performance, such as the ability to aim correctly, manage attack time, have good control of technical serving and receiving gestures, and gather information about the ball, teammates, and opponents. In the study by Agostini et al. [27], the same results were obtained by comparing a group of volleyball athletes with an untrained control group. The study found that there were significant differences only in open-eyed tests, results that confirm Borzucka's hypothesis. Other studies have investigated the relationship between volleyball and Pilates, proposed as a method to improve strength and jumping [28], and volleyball flexibility and serve [29]. In the first study, Pilates was integrated into a diversified exercise protocol, while in the second, only Pilates was practiced for 40 min 3 times a week. In both cases, after 6 weeks of protocol, improvements in the set goals were detected.

However, while some studies suggest Pilates improves jumping ability and serving precision, others have found there to be no significant impact on explosive lower-body strength and accuracy skill [30]. Further investigation is required to ascertain the enduring impacts on adolescent athletes.

In relation to psychological functioning [31], several studies highlighted a significant increase in mindfulness as a result of Pilates exercises, characterized by a non-judgmental and present-focused information processing approach, which consequently partially mediated the relationship between Pilates and various psychological measures such as self-

efficacy, mood, perceived stress, and sleep quality [32]. The frequency of Pilates sessions conducted longitudinally ranged from two to three workouts per week over a duration of 8 to 15 weeks.

In addition, with a view to a multilateral approach, Pilates, by emphasizing the diversity and versatility of training, aims to develop a broader set of physical and mental skills, essential to promote the growth and holistic development of young athletes [33]. In a sports world that often rewards early specialization, multilateralism offers an alternative path that can lead to long-term benefits in both performance and health. In this sense, Pilates stands as a fundamental alternative, emphasizing the benefits of a more varied and less specialized approach to training. Despite the rapid diffusion of this sport, there is a paucity of research on the performance characteristics of volleyball players [34], and to the authors' knowledge few data are available for young players. Research has predominantly compared the anthropometric and physiological profiles of volleyball players [35], rather than focused on jumping ability, precision serving, and psychological aspects. Thus, there still exists limited information concerning these factors.

Therefore, the aim of this study was to explore the role of Pilates training in the improvement of jumping and serving precision, as well as the psychological factors of young male volleyball players.

## 2. Materials and Methods

### *2.1. Study Design*

This study was a prospective, randomized, parallel-group trial conducted to investigate the effectiveness of Pilates for young volleyball players, over a substantial period. It was developed by detecting jumping and accuracy of execution skills, utilizing the Sargent test and the precision in services exercises.

Upon analysis of the preliminary test outcomes, it appears that a dual approach utilizing data derived from both observational techniques and surveys was adopted to categorize the athletes into two distinct cohorts. The investigators examined the impact of a targeted intervention, namely a Pilates program, on one of the groups in contrast to a control group engaged in conventional training methodologies. Over the course of 12 weeks, each group consistently followed their designated exercise regimens on a bi-weekly basis, undergoing assessments before and after the training sessions. The following figure illustrates the flow diagram of the study (Figure 1):

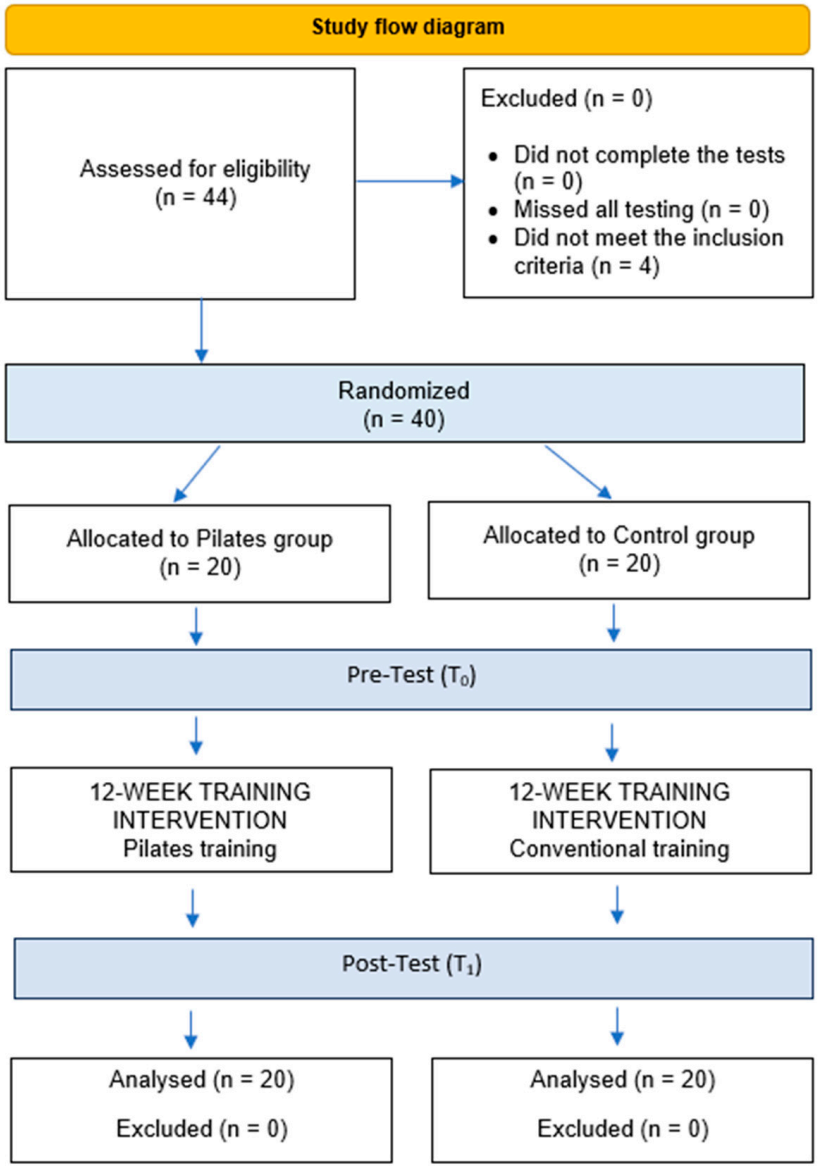


**Figure 1.** Study flow diagram.

2.1.1. Participants

By utilizing G*Power (version 3.1.9.6), a priori power analysis was conducted, revealing that a sample size of 36 would yield sufficient statistical power ($\alpha = 0.05$, 1-$\beta = 0.80$) for detecting a moderate effect size (f = 0.25 or 0.4) with a correlation coefficient of $p = 0.80$, a 95% power level, and $\alpha = 0.05$, employing a within-between mixed design. To mitigate experimental attrition resulting from participant dropout, 44 individuals were recruited. Out of the 44 individuals recruited, 4 were eliminated due to not meeting inclusion criteria. Consequently, the final sample comprised 44 volleyball athletes. As for the randomization protocol, the simple randomization method through the random number table was used. An electronic tool for generating numerical sequences was used for this purpose. Subsequently, it was established as an allocation rule that subjects corresponding to "even" digits would fall into the Pilates Group (PG), while all those corresponding to "odd" digits would fall into the Control Group (CG). The research team was kept unaware of the group assignments.

Thus, forty young volleyball players were randomly assigned to either the Pilates group (PG, n = 20) or the Control group (CG, n = 20). Criteria for inclusion involved being aged between 12 and 14 years upon enrollment, the absence of certain health conditions,

and the ability to comply with measurement instructions. Exclusion criteria considered symptoms requiring exclusion as determined by a medical professional and any (medical) event affecting testing outcomes and leading to participant exclusion. Following the fulfillment of inclusion criteria, participants provided consent according to the Helsinki Declaration and its subsequent revisions. The recruitment of athletes was carried out through the Italian Volleyball Federation, with participation in the study being voluntary and open to all male volleyball players.

Prior to their participation in the study, participants were sent an email with instructions. Subsequently, a second electronic communication was sent out, asking them to attend a briefing session where the trial's objectives were highlighted. Consent forms were signed by parents before participation, detailing the study's objectives, selection criteria, procedures, potential benefits and risks, available alternatives, confidentiality measures, withdrawal process, and a disclaimer concerning injuries. The confidentiality of all participants was ensured by the researchers, with the study taking place from February 2024 to April 2024, in accordance with the principles of the Helsinki Declaration and its subsequent revisions. The study protocol was reviewed and approved by the Department of Medical Science, Exercise and Well-being—University of Naples "Parthenope" (DiSMMeB Prot. N. 88592/2024).

Table 1 summarizes the baseline characteristics of participants.

**Table 1.** Characteristics of volleyball athletes.

| Variable | Pilates Group (n = 20) Mean ± SD | Control Group (n = 20) Mean ± SD |
|---|---|---|
| Age (y) | 13.00 ± 0.81 | 13.30 ± 0.67 |
| Height (cm) | 166.00 ± 5.79 | 169.02 ± 3.08 |
| Weight (kg) | 63.40 ± 4.99 | 65.30 ± 4.42 |
| Sex (n) | male | male |
| | 20 | 20 |

#### 2.1.2. Procedures

All measurements were carried out in the course of two sessions. The testing sessions took place with a 48-h interval between the initiation of the program and the baseline assessment. During the initial session, participants responded to a questionnaire where they provided information related to demographics including age, gender, medical history, smoking habits, and other factors. Following this, athletes participated in the Sargent test and serving precision test to examine the variables being studied. The individuals received separate evaluations and completed each test in a consistent order, at the same time each day, and under similar experimental circumstances.

Both groups, in the course of the competitive endeavor, adhered to the standard training protocol developed by the technical personnel, consisting of two weekly training sessions. These sessions included a combination of athletic, technical, and tactical drills, in addition to practice matches and official competitions. To improve the athletes' posture, an extra training session was scheduled. The alternative Pilates method, alongside their regular training, was used both in indoor and outdoor plants. The Pilates method is founded on a system that combines controlled movements, breath work, and focus to improve overall health, muscle tone, and body awareness [35,36]. The assessment of outcomes was blinded by sending data for analysis to researchers who were unaware of the treatment allocation; they had no vested interest in the experiment and did not know whether a treatment was expected to improve or worsen the outcome.

#### 2.1.3. Measures

The athletes completed a standardized warm-up routine before taking the tests. This is important to ensure all participants are equally prepared for the physical assessments.

The warm-up consisted of the following:

- General activation: Lively exercises to get the blood flowing and activate the muscles;
- Slow running for 8 min with active recovery: This helps increase blood flow, prepare the cardiovascular system, and prevent injury;
- Mobilization and stretching exercises: These improve flexibility and range of motion, which are crucial for volleyball performance.

The total warm-up lasted approximately 20 min, which is a reasonable amount of time for young athletes.

The tests aligned with the study objectives were the following:

### *2.2. Sargent Test*

This test [37], directly evaluates explosive strength, a critical factor for enhancing vertical jump height and striking force in the sport of volleyball. Subsequent to a thorough warm-up session, the athlete positions himself against a vertical surface with his hands, arms, and legs fully extended. A visible indicator is made by the assistant using chalk at the vertical point touched by the athlete with the fingertips. The athlete, bending the knees and keeping the feet close together, initiates an upward thrust while maintaining the extension of the arms and hands vertically. The assistant records the height touched by the athlete with the fingertips and computes the discrepancy between the two points. Following a sufficient rest period, the athlete is required to perform the test twice more. The highest recorded height will be utilized for the conclusive assessment.

### *2.3. Serving Precision Test*

This test assesses a crucial volleyball skill that demands precision in execution and regulation [38]. The execution of the volleyball serve included situating participants five meters away from side "A" of the court, with both feet securely grounded and facing the target located on side "B". The primary aim was to perform the overhand volleyball serve to strike the bull's eye of the target, positioned four meters from the net on side "B". The target comprised various circular segments, ranging from 1 to 4 m in diameter, with scoring dependent on the accuracy of hitting the bull's eye, ranging from 2 to 22 points. A triangular area, marked by adhesive tape, extended from the serving point through the target's side, with all markings being five centimeters wide, leading to higher scores if the ball landed on a marking (Figure 2). Throughout the experiments, serves that effectively reached the central zone of the target received 22 points, while points gradually decreased by 2 as serves deviated from this central region. Serves that reached the triangular zone beyond the target but inside the court garnered 14 points, with an additional 12 points awarded if the serve grazed the upper part of the net and moved towards the target. Serves landing within the court but outside the triangular zone were given 10 points, whereas if the ball made contact with the net and crossed over but missed the target, 8 points were allocated. Serves landing out of bounds were valued at 6 points, with the triangular space on side "A" providing 4 points and the areas outside this triangle on side "A" granting 2 points. The experimentation itself was carried out on an official volleyball court with a net set at a height of 2.24 m, employing adhesive tape, a delineated target, and official volleyball gear.

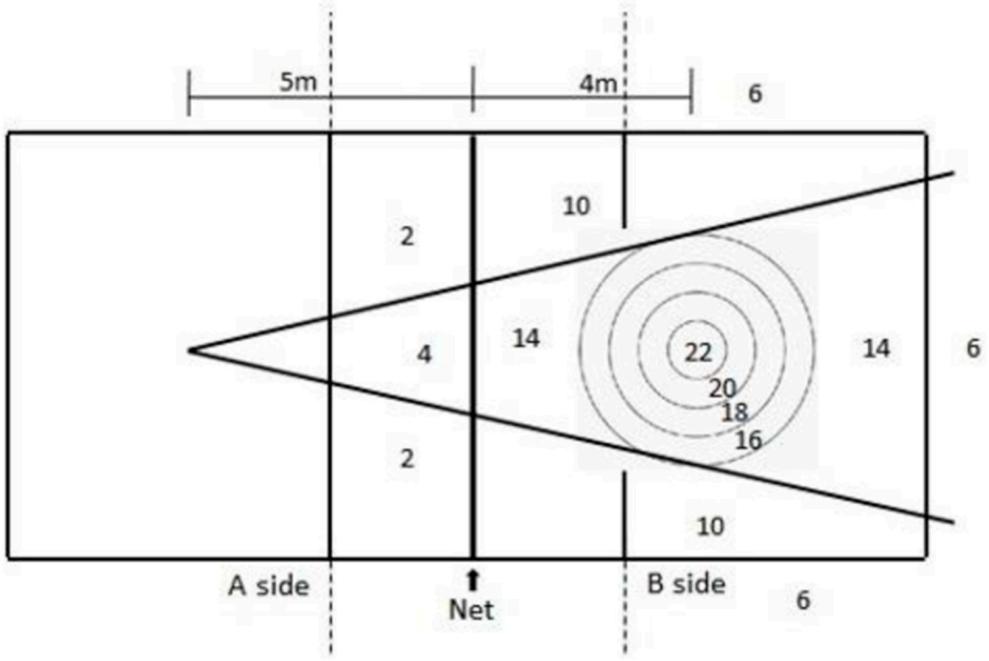


**Figure 2.** Serving test calculation score [38].

### *2.4. Materials*

Facilities and technical equipment used were as follows:

- Regulation volleyball court (18 m × 9 m);
- Volleyball;
- Small tools of the Pilates Method: Mat, Gym band, Fit ball, Magic Circle;
- Great Tools: Leg press, multipower, solid body, barbells, benches.

### *2.5. State Mindfulness Scale (SMS)*

Furthermore, the State Mindfulness Scale was administered in order to explore the degree of the participants' perception regarding their level of consciousness and focus on their current-moment experience during a specified time frame (in this study, the intervention duration served as a temporal reference point) and context (specifically, mindfulness post-pilates and meditation practices) [39].

This scale consisted of 21 items, with two subcategories: state mindfulness of physical sensations (6 items) and state mindfulness of cognitive occurrences (15 items). Participants rated their experiences on a five-point Likert scale, with responses ranging from 1 (not at all) to 5 (very well) based on the extent to which the statements resonated with their own encounters.

An elevation in the participants' state of mindfulness would indicate a heightened and more pleasurable perception of their physical and mental states. The evaluation process lasted approximately 10 to 15 min, encompassing both instructional and practical phases. The assessment procedure was outlined prior to the initiation of the observation phase and upon completion of the intervention to assess any alterations in the state of mindfulness.

### *2.6. Additional Training*

The researchers divided the athletes into two equal groups (Pilates and Control) of 10 each. This ensured a balanced comparison between the groups.

The Pilates Group received 20 additional Pilates sessions spread out over 3–4 months, in addition to their regular training program designed by the coaching staff. These sessions likely focused on the exercises (Table 2 ). The specific Pilates exercises employed were all foundational Pilates mat exercises that target core strength, flexibility, and overall body control.

**Table 2.** Exercise program.

| Main Exercise |
| --- |
| Lateral raise |
| Toe touch |
| Single leg raise |
| Pointed toe tap |
| Crisscross |
| Seated twist |
| Wall sit |
| Pull down |
| V-ups |
| Bridge |
| Each exercise was performed 3 times/10 repetitions—Rest between exercise 30 s |

The Control Group continued with their regular training program designed by the coaching staff without the additional Pilates sessions. They serve as a control group to compare the impact of Pilates on the Pilates Group.

### 2.7. Statistical Analysis

Statistical analyses were performed utilizing IBM SPSS version 25.0 by IBM in Armonk, NY, USA. Data were depicted through group mean (M) values and standard deviations (SD). Normality assumptions validation was executed using the Shapiro–Wilk test, while homogeneity of variances was evaluated employing the Levene test. Evaluation of group differences at baseline was carried out using an independent sample *t*-test. The impact of the exercise program on dependent variables was explored through a two-way ANOVA (group (experimental/control) × time (pre/post-intervention)) with repeated measures on the time dimension. Whenever 'Group × Time' interactions showed significance, paired *t*-tests were performed to pinpoint noteworthy differences. The extent of the significant 'Time × Group' interaction was assessed using the partial eta squared ($\eta^2p$) value, with interpretations indicating small ($\eta^2p < 0.06$), medium ($0.06 \leq \eta^2p < 0.14$), and large ($\eta^2p \geq 0.14$). Furthermore, Cohen's d was utilized for effect size determination in pairwise comparisons, with categorizations of small ($0.20 \leq d < 0.50$), moderate ($0.50 \leq d < 0.79$), and large ($d \geq 0.80$). Statistical significance was established at $p < 0.05$.

## 3. Results

Table 3 shows the changes in jumping performance and serving precision, and the state of mindfulness scale (bodily sensations and mental events) for both groups.

**Table 3.** Changes in jumping and accuracy of execution skills after a Pilates program.

| | Control Group (n = 20) | | | Pilates Group (n = 20) | | |
| --- | --- | --- | --- | --- | --- | --- |
| | **Baseline** | **Post-Test** | **Δ** | **Baseline** | **Post-Test** | **Δ** |
| Sargent test | 44.60 (1.89) | 45.70 (2.40) | 1.10 (1.44) | 41.60 (1.78) | 47.10 (4.74) † * | 5.50 (3.96) |
| Serving precision | 13.50 (1.26) | 13.70 (1.41) | 0.20 (0.42) † * | 11.60 (1.39) | 18.65 (2.41) † * | 5.05 (1.63) |
| SMS | | | | | | |
| state mindfulness of bodily sensations | 6.45 (1.95) | 7.8 (2.30) | 1.35 (1.89) | 5.55 (2.30) | 14.45 (2.11) † * | 8.9 (2.71) |
| state mindfulness of mental events | 16.45 (2.78) | 19.1 (5.28) | 2.65 (4.80) | 15.8 (2.62) | 30.9 (4.73) † * | 15.1 (5.40) |

Note: values are presented as mean (±SD); Δ: pre- to post-training changes; † Significant 'Group × Time' interaction: significant effect of the intervention ($p < 0.001$). * Significantly different from pre-test ($p < 0.001$).

### 3.1. Sargent Test

Normality assumptions validation ($p = 0.056$). Homogeneity of variances (F (1, 28) 5.19; $p = 0.031$). A significant 'Time × Group' interaction was identified in the Sargent test through a two-factor repeated measures ANOVA (F1, 18 = 11.36, $p < 0.001$, $\eta^2p = 0.89$, large effect size). Upon conducting post-hoc analysis, a notable enhancement in the score for this variable was observed in the intervention group (t = 6.20, $p < 0.001$, d = 1.38, large effect size). Conversely, no statistically significant changes were noted in the Control Group ($p > 0.05$).

### 3.2. Serving Precision Test

Normality assumptions validation ($p = 0.064$). Homogeneity of variances (F (1, 28) = 82; $p = 0.10$). A statistically significant interaction effect of 'Time × Group' was observed for the precision test through a two-factor repeated measures ANOVA (F (1, 18) = 166.67, $p < 0.001$, $\eta^2p = 0.85$, large effect size). Subsequent post-hoc analysis demonstrated a noteworthy enhancement in the variable's score (t = 19.25, $p < 0.001$, d = 4.30, large effect size) within the intervention group. Conversely, the Control Group did not exhibit any statistically significant alterations ($p > 0.05$).

### 3.3. State Mindfulness Scale (SMS)

Normality assumptions validation for Bodily sensations and Mental events was ($p = 0.053$; $p = 0.061$) respectively. The Homogeneity of variances for Bodily sensations and Mental events was (F (1, 28) = 4.58; $p = 0.013$) and (F (1, 28) = 6.42; $p = 0.051$) respectively. A significant 'Time × Group' interaction was also found for SMS of Bodily Sensations (F (1, 38) = 62.21, $p < 0.001$, $\eta^2p = 0.88$, large effect size) and SMS of Mental Events (F (1, 38) = 112.94, $p < 0.001$, $\eta^2p = 0.93$, large effect size). Moreover, post hoc analysis revealed that the experimental group made significant improvements in both Bodily Sensations (t = 13.67, $p < 0.001$, d = 2.28, large effect size) and Mental Events (t = 11.48, $p < 0.001$, d = 1.69, large effect size). No significant changes were found in the Control Group ($p > 0.05$).

## 4. Discussion

The aim of this investigation was to explore the role of Pilates training in the improvement of jumping and accuracy of execution skills of young male volleyball players. Our findings suggest that adding Pilates to the usual/habitual volleyball training is effective for improving jumping performance and serving precision as well as psychological outcomes (bodily sensations and mental events) in adolescent male players. Our results reinforce the use of Pilates training for young volleyball players to improve physical, physiological and psychological performance; therefore, it is essential in promoting the growth and holistic development of young athletes.

Indeed, the final results of the study provided valuable insights into the effectiveness of the Pilates program. The Control Group, which did not receive the Pilates program, showed an average increase of 4% in service and smash accuracy compared to their initial scores. This could be due to factors such as regular training, practice effects (improvement due to repeated testing), or other unmeasured variables. Only two players (central blockers) showed even greater improvements (6–7%) in their accuracy. This suggests individual variability in response to training. In contrast, the Pilates Group, who incorporated Pilates into their training, showed a significant improvement. It confirmed the positive trend with an average increase of around 77% in service and smash accuracy. This is a significant improvement compared to their initial scores (around 73% based on previous information) and the Control Group's final average (64%). Moreover, the final average for the Pilates Group also represents a further 2% increase over their mid-term results (around 75%). This suggests the Pilates program had a sustained positive effect on their accuracy. The Pilates Group showed the greatest improvement in service accuracy and core strength (measured by crunches). This suggests that Pilates could be a valuable tool for volleyball players

looking to improve specific skills. It is important to note that both groups (Pilates and Control) improved their performance. This highlights the effectiveness of the overall training program, regardless of the Pilates inclusion. The athletes in the Pilates Group specifically mentioned improvements they attributed to Pilates. These included the following:

- Uniform Muscle Toning: This likely led to better overall strength and potentially more efficient movement patterns;
- Improved Respiratory Control: Better breathing can enhance stamina and performance during training and competition.

Several previous studies have shown that the results align with the notion that Pilates could result in more significant enhancements in jumping ability and precision in skill execution when compared to conventional training [40–42]. A number of research inquiries have delved into the effects of incorporating Pilates as a valuable supplement to an athlete's training regimen. Indeed, Pilates can be considered an unconventional method to improve athletic performance. It addresses postural imbalances by strengthening core muscles, improving flexibility, and enhancing body awareness—all of which contribute to better posture, postural imbalances being a significant factor in youth athletic performance. Volleyball players are prone to postural imbalances due to the repetitive motions of spiking, serving, and digging. These imbalances can lead to decreased performance and an increased risk of injuries [43,44]. Identifying the causes (physical, psychological and technical) of inconsistent performance in young athletes, which "discontinuous agonistic performance" refers to, is crucial. By understanding these factors, we can design targeted training programs to improve their physical and mental well-being, leading to more consistent performance [45,46]. Discontinuities in performance could stem from physical limitations like inadequate strength, endurance, or flexibility [47,48]. Training programs addressing these weaknesses can lead to a more stable physical foundation. Moreover, psychological factors such as anxiety, performance pressure, or lack of focus can also contribute. Training programs incorporating mental skills training techniques such as visualization, relaxation methods, and goal setting can help young athletes develop mental toughness.

The Negrini et al. study [49], on postural imbalances highlights the potential consequences of neglecting them, where paramorphisms (temporary changes) can progress into permanent deformities (dimorphisms). This emphasizes the importance of early intervention through methods like Pilates to prevent such complications.

Bernardo [50] showed that employing unconventional methods aligns with the concept of using Pilates for posture correction and performance improvement in young athletes.

Several studies support the hypothesis that there is an association between neuromuscular activation of the trunk and the muscles of the legs, as it has been found that strengthening the trunk (core) muscles can increase the level of muscle strength in the extremities (upper and lower limbs) [51,52]. Pilates can be an excellent tool in the strengthening and activation of the deep trunk muscles [53], and therefore it can be important in improving postural control skills, in particular the control of the correct posture of the pelvic girdle [54]. In volleyball, postural control is fundamental, as volleyball players are required to continuously and quickly adjust their posture in order to react in the best possible way to game situations. The training of postural control, resulting in an improvement of static balance, is therefore fundamental in this sport in order to create the basis for work on dynamic balance and on flight balance [55].

While the athletes perceived these benefits, it is important to acknowledge that the study design does not definitively prove that Pilates caused the improvements. Other factors could have been at play [56,57].

The psychological benefits revealed in the present investigation, following a twelve-week regimen of Pilates exercise sessions, manifested in heightened body awareness and reduced negative emotions associated with bodily and mental sensations. While assertions regarding the enhancement of body awareness through Pilates training can be found in existing literature [58], this psychological aspect has not been directly examined in previous studies [59–61] or up to the present time. Thus, the current research empirically upholds the

assertions in literature regarding the positive impact of Pilates training on body awareness and indicates that a 12-week duration is adequate for eliciting such transformations. These favorable outcomes can be attributed to the mechanisms through which Pilates routines engage various interoceptive pathways (such as proprioception from the musculoskeletal and vestibular systems, and visceral perception through regulated breathing) that significantly contribute to the cultivation and/or preservation of the individual's subjective perception of their body, commonly known as body awareness [62–64]. The study findings demonstrated that the twelve-week Pilates exercise intervention plan notably assisted athletes in enhancing their recognition of bodily sensations and emotional states, ultimately enhancing both physical and psychological performances. In comparison to the control group, participants in the Pilates group reported substantially lower levels of mental fatigue, as well as reduced emotional exhaustion and depersonalization. Additionally, they experienced considerable enhancements in feelings of mental clarity, calmness, joy, vitality, and self-assurance [65–67].

Several studies have concentrated on the advantages of Pilates in alleviating the stress response, consistently highlighting this beneficial association. It has been endorsed and researched in the context of stress to such an extent that a considerable body of research has showcased highly advantageous outcomes from engaging in Pilates sessions for stress relief and its ramifications [68–70]. According to Vicente [71], a collective Pilates training program could boost functional capacity and overall well-being while diminishing physical complaints and psychological strain. The researchers also inferred that this intervention might yield enduring positive effects. Relaxation techniques can aid in combatting stress and rejuvenating the mind, promoting a harmonious equilibrium between mind and body while bolstering self-assurance. Similarly, Frantsi [72], noted a significant reduction in symptoms of depression and anxiety following Pilates practice. In a similar vein, Parveen, Kalra, and Jain [73], advocated for increased resilience-building training for athletes to better cope with stress. Moreover, engaging in Pilates offers a convenient and effective means of alleviating stress-induced tension, guiding athletes towards improved posture, heightened energy levels, enhanced focus, and an overall sense of well-being and health [74–76].

Overall, this study offers promising insights into the potential of Pilates for young volleyball players. While more research is needed, the observed improvements in jumping performance and serving precision as well as psychological outcomes (bodily sensations and mental events), suggest that Pilates could be a valuable addition to training programs [77–81]. The adolescent growth spurt undoubtedly plays a role in the performance improvement observed in the study.

The limitations of the study were the duration of both the intervention and each session, which was insufficient to achieve more consistent adaptations. As far as the sample is concerned, it could be effective in the future to increase the number and technical level of the athletes involved in the study in order to achieve a greater number of statistically significant results. With a small sample size, it is more likely that the results will be inconsistent, as data that is further away from the average emerges more easily and even a few unfavorable data can negatively affect the final result. Another limitation may have been the low number of training hours of the group of athletes and the tool used to measure physical and psychological performance. A final limitation concerns the use of SMS to investigate the degree of participants' perception regarding their level of consciousness and focus on their current-moment experience. Indeed, the overall body of empirical research of SMS psychometrics and utility is modest in scale and scope. Despite this, however, it represents an important direction for mindfulness research Future investigations should consider these variables.

## 5. Conclusions

This research clearly demonstrates the overall benefits of Pilates training on both physical and psychological measures in young male volleyball players. In conclusion,

this study suggests that incorporating Pilates exercises into training programs for young athletes can be beneficial. While natural growth and development undoubtedly contribute to performance improvement during adolescence, Pilates offers additional advantages. By promoting proper posture and reducing the risk of injuries, Pilates can help young athletes train safely and effectively, potentially maximizing the benefits of their natural development. Pilates appears to be a promising addition to training programs for young male volleyball players. While more research is needed to solidify cause-and-effect relationships, the potential benefits for specific skills, overall well-being, and ease of integration make it worth considering. In the future, it would be interesting to investigate the relationship between Pilates and volleyball with a group of high-level athletes or in other collective and individual sports disciplines in order to evaluate the effectiveness of this method on improving the specific athletic performance of each discipline.

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## References

1. Bonavolontà, V.; Fischetti, F. Weekly Variations of Well-Being and Interactions with Training and Match Intensities: A Descriptive Case Study in Youth Male Soccer Players. *Int. J. Environ. Res. Public Health* **2022**, *19*, 2935. [CrossRef] [PubMed]
2. Latino, F.; Tafuri, F. Wearable Sensors and the Evaluation of Physiological Performance in Elite Field Hockey Players. *Sports* **2024**, *12*, 124. [CrossRef]
3. Messina, G.; Valenzano, A.; Moscatelli, F.; Triggiani, A.I.; Capranica, L.; Messina, A.; Piombino, L.; Tafuri, D.; Cibelli, G.; Monda, M. Effects of Emotional Stress on Neuroendocrine and Autonomic Functions in Skydiving. *J. Psychiatry* **2015**, *18*, 2. [CrossRef]
4. Lidor, R.; Ziv, G. Physical and physiological attributes of female volleyball players—A review. *J. Strength Cond. Res.* **2010**, *24*, 1963–1973. [CrossRef] [PubMed]
5. Aidar, F.J.; Cataldi, S.; Badicu, G.; Silva, A.F.; Clemente, F.M.; Latino, F.; Greco, G.; Fischetti, F. Paralympic Powerlifting as a Sustainable Way to Improve Strength in Athletes with Spinal Cord Injury and Other Disabilities. *Sustainability* **2022**, *14*, 2017. [CrossRef]
6. Latino, F.; Cataldi, S.; Carvutto, R.; De Candia, M.; D'Elia, F.; Patti, A.; Bonavolontà, V.; Fischetti, F. The importance of lipidomic approach for mapping and exploring the molecular networks underlying physical exercise: A systematic review. *Int. J. Mol. Sci.* **2021**, *22*, 8734. [CrossRef]
7. Farì, G.; Latino, F.; Tafuri, F.; Dell'Anna, L.; Raele, M.V.; Fai, A.; De Serio, C.; Intonti, G.; De Salvo, A.L.; Ricci, V.; et al. Shoulder Pain Biomechanics, Rehabilitation and Prevention in Wheelchair Basketball Players: A Narrative Review. *Biomechanics* **2023**, *3*, 362–376. [CrossRef]
8. Abarghoueinejad, M.; Barreira, D.; Dias, C.; Guimarães, E.; Baxter-Jones, A.D.; Maia, J. Body physique, body composition, physical performance, technical and tactical skills, psychological development, and club characteristics of young male Portuguese soccer players: The INEX Study. *Int. J. Environ. Res. Public Health* **2021**, *18*, 3560. [CrossRef]
9. Farì, G.; Di Paolo, S.; Ungaro, D.; Luperto, G.; Farì, E.; Latino, F. The Impact of COVID-19 on Sport and Daily Activities in an Italian Cohort of Football School Children. *Int. J. Athl. Ther. Train.* **2021**, *26*, 274–278. [CrossRef]
10. Shieh, S.F.; Lu, F.J.; Gill, D.L.; Yu, C.H.; Tseng, S.P.; Savardelavar, M. Influence of mental energy on volleyball competition performance: A field test. *PeerJ* **2023**, *11*, e15109. [CrossRef]
11. Ballıkaya, E.; Saraç, L. The Effect of 12-Week Psychological Skills Training on Coping Skills and Performance Strategies in High School Volleyball Players. *Pamukkale J. Sport Sci.* **2024**, *15*, 167–187. [CrossRef]

12. Astuti, Y.; Orhan, B.E.; Erianti, E.; Al Mhanna, S.B.; Batrakoulis, A. Mental training models in physical education, sports and health subjects for volleyball in elementary school students. *Retos Nuevas Tend. Educ. Fís. Deporte Recreación* **2024**, *55*, 697–703. [CrossRef]
13. Musa, R.M.; Abdul Majeed, A.P.; Suhaimi, M.Z.; Abdullah, M.R.; Mohd Razman, M.A.; Abdelhakim, D.; Abu Osman, N.A. Identification of high-performance volleyball players from anthropometric variables and psychological readiness: A machine-learning approach. *Proc. Inst. Mech. Eng. Part P J. Sports Eng. Technol.* **2023**, *237*, 317–324. [CrossRef]
14. Latey, P. The Pilates method: History and philosophy. *J. Bodyw. Mov. Ther.* **2001**, *5*, 275–282. [CrossRef]
15. Kloubec, J.A. Pilates for improvement of muscle endurance, flexibility, balance, and posture. *J. Strength Cond. Res.* **2010**, *24*, 661–667. [CrossRef] [PubMed]
16. Latino, F.; Saraiello, E.; Tafuri, F. Outdoor Physical Activity: A Training Method for Learning in an Experiential and Innovative Way. *J. Phys. Educ. Sport (JPES)* **2023**, *23*, 1852–1860. [CrossRef]
17. Morsanuto, S.; Peluso Cassese, F.; Tafuri, F.; Tafuri, D. Outdoor Education, Integrated Soccer Activities, and Learning in Children with Autism Spectrum Disorder: A Project Aimed at Achieving the Sustainable Development Goals of the 2030 Agenda. *Sustainability* **2023**, *15*, 13456. [CrossRef]
18. Sarıtaş, D.; Pişirici, P. Investigation of the effect of Pilates combined exercise program with mat and equipment on fatigue and physical self-perception in sedentary women: A randomized controlled study. *Turk. J. Kinesiol.* **2024**, *10*, 110–118. [CrossRef]
19. de Abreu, M.; Santos, F.C.; Nogueira, A.L.; Zampieri, M.L.; Bertoncello, D. How the Pilates Method Can Influence Sports Performance in Different Modalities. *Lect. Educ. Fís. Deportes* **2020**, *25*, 139–152. [CrossRef]
20. Vigue, S. *Pilates for Athletes: More than 200 Exercises and Flows to Improve Performance in Any Sport*; Hatherleigh Press: Hobart, NY, USA, 2021.
21. Lim, S.J.; Kim, H.J.; Kim, Y.S.; Kim, E.; Hwang, I.; Kang, J.S. Comparison of the Effects of Pilates and Yoga Exercise on the Dynamic Balancing Ability and Functional Movement of Fencers. *Life* **2024**, *14*, 635. [CrossRef]
22. Kamatchi, K.; Arun, B.; Tharani, G.; Yuvarani, G.; Vaishnavi, G.; Kaviraja, N. Effects of swiss ball exercise and pilates exercise on core muscle strengthening in college cricketers. *Biomedicine* **2020**, *40*, 377–380. [CrossRef]
23. Preeti, K.S.; Yadav, J.; Pawaria, S. Effect of pilates on lower limb strength, dynamic balance, agility and coordination skills in aspiring state level badminton players. *J. Clin. Diagn. Res.* **2019**, *13*, 1–6. [CrossRef]
24. Manshouri, M.; Rahnama, N.; Khorzoghi, M.B. Effects of pilates exercises on flexibility and volleyball serve skill in female college students. *Sport Sci. Pract. Asp.* **2014**, *11*, 19–25.
25. dos Santos, N.T.O.; Raimundo, K.C.; da Silva, S.A.; Souza, L.A.; Ferreira, K.C.; Urbano, Z.F.B.S.; Gasparini, A.L.P.; Bertoncello, D. Increased strength of the scapular stabilizer and lumbar muscles after twelve weeks of Pilates training using the Reformer machine: A pilot study. *J. Bodyw. Mov. Ther.* **2017**, *21*, 74–80. [CrossRef]
26. Borzucka, D.; Kręcisz, K.; Rektor, Z.; Kuczyński, M. Differences in static postural control between top level male volleyball players and non-athletes. *Sci. Rep.* **2020**, *10*, 19334. [CrossRef] [PubMed]
27. Agostini, V.; Chiaramello, E.; Canavese, L.; Bredariol, C.; Knaflitz, M. Postural sway in volleyball players. *Hum. Mov. Sci.* **2013**, *32*, 445–456. [CrossRef]
28. Parolini, F.; Bertolini, G.; Santos, R.; Abreu, M.; Nogueira, A.L.; Bertoncello, D. Unlocking the Potential: Increasing Muscle Strength in Lower Limbs of Youth Soccer Players over Five Weeks through Mat Pilates Training—A Pilot Study. *Sensors* **2024**, *24*, 473. [CrossRef]
29. Dos Reis, A.L.; de Oliveira, L.C.; de Oliveira, R.G. Effects of stretching in a pilates program on musculoskeletal fitness: A randomized clinical trial. *BMC Sports Sci. Med. Rehabil.* **2024**, *16*, 11. [CrossRef]
30. Vera-Saura, P.; Agudo-Pavón, J.; Velázquez-Torres, D.M.; Martín-Alemán, M.; León-Morillas, F.; Infante-Guedes, A.; Cruz-Díaz, D. The Importance of Mind–Body in Pilates Method in Patients with Chronic Non-Specific Low Back Pain—A Randomized Controlled Trial. *J. Clin. Med.* **2024**, *13*, 4731. [CrossRef]
31. Röthlin, P.; Horvath, S.; Trösch, S.; Holtforth, M.G.; Birrer, D. Differential and shared effects of psychological skills training and mindfulness training on performance-relevant psychological factors in sport: A randomized controlled trial. *BMC Psychol.* **2020**, *8*, 80. [CrossRef]
32. Metz, V.R.; Scapini, K.B.; Gomes, A.L.D.; Andrade, R.M.; Brech, G.C.; Alonso, A.C. Effects of pilates on physical-functional performance, quality of life and mood in older adults: Systematic review and meta-analysis of randomized clinical trials. *J. Bodyw. Mov. Ther.* **2021**, *28*, 502–512. [CrossRef]
33. Cataldi, S.; Latino, F.; Greco, G.; Fischetti, F. Multilateral training improves physical fitness and fatigue perception in cancer patients. *J. Hum. Sport Exerc.* **2019**, *14*, 910–920. [CrossRef]
34. Hushmandi, K.; Jamali, J.; Saghari, S.; Raesi, R. The Effect of Eight Weeks of Pilates Exercises on Anthropometric Indices and Subjective Well-being in Obese Middle-aged Women. *Open Public Health J.* **2023**, *16*, e187494452306010. [CrossRef]
35. Tarnas, M.; Marszałek, A.; Kufel-Grabowska, J.; Marszałek, S.; Wieliński, D.; Zieliński, J. Effects of Pilates Training on Cardiorespiratory Functions in Medical Conditions-Comprehensive Approach: A Narrative Review. *Aging Dis.* **2024**, *15*, 1771. [PubMed]
36. de Oliveira, L.C.; de Oliveira, R.G.; de Almeida Pires-Oliveira, D.A. Effects of Pilates on muscle strength, postural balance and quality of life of older adults: A randomized, controlled, clinical trial. *J. Phys. Ther. Sci.* **2015**, *27*, 871–876. [CrossRef]

37. Tafuri, F.; Latino, F. School Medical Service: Strategies to Promote Psycho-Physiological Well-Being. *Pediatr. Rep.* **2024**, *16*, 214–231. [CrossRef]
38. de Salles, P.; Vasconcellos, F.; de Salles, G.; Fonseca, R.; Dantas, E. Validity and Reproducibility of the Sargent Jump Test in the Assessment of Explosive Strength in Soccer Players. *J. Hum. Kinet.* **2012**, *33*, 115–121. [CrossRef] [PubMed]
39. Costa, C.L.A.; Valentini, N.C.; Do Nascimento, E.M.; Ugrinowitsch, H. Validity and reliability of the volleyball serve accuracy-test. *J. Hum. Sport Exerc.* **2024**, *19*, 570–578. [CrossRef]
40. Tanay, G.; Bernstein, A. State Mindfulness Scale (SMS): Development and initial validation. *Psychol. Assess.* **2013**, *25*, 1286–1299. [CrossRef]
41. Panihar, U.; Sagwal, P.; Joshi, S. Efficacy of 6 Weeks Pilates Training on Physical Parameters and Sports-Specific Skills of Volleyball Players: A Randomized Controlled Trial. *Sports Sci. Health* **2024**, *27*, 41–48.
42. Latino, F.; Tafuri, F. Physical Activity and Academic Performance in School-Age Children: A Systematic Review. *Sustainability* **2023**, *15*, 6616. [CrossRef]
43. Latino, F.; Tafuri, F. Physical Activity and Cognitive Functioning. *Medicina* **2024**, *60*, 216. [CrossRef] [PubMed]
44. Muscogiuri, G.; Palomba, S.; Caggiano, M.; Tafuri, D.; Colao, A.; Orio, F. Low 25 (OH) vitamin D levels are associated with autoimmune thyroid disease in polycystic ovary syndrome. *Endocrine* **2016**, *53*, 538–542. [CrossRef] [PubMed]
45. Rocca, A.; Aprea, G.; Surfaro, G.; Amato, M.; Giuliani, A.; Paccone, M.; Salzano, A.; Russo, A.; Tafuri, D.; Amato, B. Prevention and treatment of peritoneal adhesions in patients affected by vascular diseases following surgery: A review of the literature. *Open Med.* **2016**, *11*, 106–114. [CrossRef]
46. Latino, F.; Greco, G.; Fischetti, F.; Cataldi, S. Multilateral training improves body image perception in female adolescents. *J. Hum. Sport Exerc.* **2019**, *14*, S927–S936. [CrossRef]
47. Sasaki, S.; Tsuda, E.; Yamamoto, Y.; Maeda, S.; Kimura, Y.; Fujita, Y.; Ishibashi, Y. Core-muscle training and neuromuscular control of the lower limb and trunk. *J. Athl. Train.* **2019**, *54*, 959–969. [CrossRef] [PubMed]
48. Latino, F.; Tafuri, F.; Saraiello, E.; Tafuri, D. Classroom-based Physical Activity as a Means to Improve Self-efficacy and Academic Achievement among Normal-weight and Overweight Youth. *Nutrients* **2023**, *15*, 2061. [CrossRef]
49. Vezina, M.J.; Hubley-Kozey, C.L. Muscle activation in therapeutic exercises to improve trunk stability. *Arch. Phys. Med. Rehabil.* **2000**, *81*, 1370–1379. [CrossRef]
50. Negrini, S.; Aulisa, L.; Ferraro, C.; Fraschini, P.; Masiero, S.; Simonazzi, P.; Tedeschi, C.; Venturin, A. Italian guidelines on rehabilitation treatment of adolescents with scoliosis or other spinal deformities. *Eur. Medicophys.* **2005**, *41*, 183–201.
51. Bernardo, L.M. The effectiveness of Pilates training in healthy adults: An appraisal of the research literature. *J. Bodyw. Mov. Ther.* **2007**, *11*, 106–110. [CrossRef]
52. Kurniawan, A.W.; Wiguno, L.T.; Setyawan, H.; Shidiq, A.A.; García-Jiménez, J.V.; Eken, Ö.; Latino, F.; Tafuri, F.; Pranoto, N.W.; Rahmatullah, M.I.; et al. I-Spring Assisted Development of a Basketball Shooting Technique Program. *Retos Nuevas Perspect. Educ. Fís. Deporte Recreación* **2024**, *55*, 874–881. [CrossRef]
53. Mardiyah, S.U.K.; Setyawan, H.; García-Jiménez, J.V.; Eken, Ö.; Latino, F.; Pranoto, N.W.; Darmawan, A.; Shidiq, A.A.P.; Rahmatullah, M.I.; Tafuri, F.; et al. Differences in the Implementation of Physical Education (PE) Learning Management Based on Years of Work: Analysis of Differences in the Quality of Quality Assurance Culture. *Retos* **2024**, *55*, 797–803. [CrossRef]
54. Teixeira de Carvalho, F.; de Andrade Mesquita, L.S.; Pereira, R.; Neto, O.P.; Amaro Zangaro, R. Pilates and proprioceptive neuromuscular facilitation methods induce similar strength gains but different neuromuscular adaptations in elderly women. *Exp. Aging Res.* **2017**, *43*, 440–452. [CrossRef] [PubMed]
55. Queiroz, B.C.; Cagliari, M.F.; Amorim, C.F.; Sacco, I.C. Muscle activation during four Pilates core stability exercises in quadruped position. *Arch. Phys. Med. Rehabil.* **2010**, *91*, 86–92. [CrossRef] [PubMed]
56. Zirek, E.; Akbaba, Y.A.; Emir, İ.; Arslantürk, A.; Koyuncu, M. The effect of pilates on body awareness, activity level, aerobic capacity and balance in healthy young adults. *Adıyaman Üniv. Sağlık Bilim. Derg.* **2021**, *7*, 129–135. [CrossRef]
57. Greco, G.; Fischetti, F.; Cataldi, S.; Latino, F. Effects of Shotokan Karate on resilience to bullying in adolescents. *J. Hum. Sport Exerc.* **2019**, *14*, S890–S899.
58. Lazarowitz Zanzuri, C.; Hadas, D.; Hutzler, Y.; Goral, A.; Tsuk, S. Remote Pilates training is effective in improving physical fitness in healthy women: A randomized controlled study. *Healthcare* **2024**, *12*, 724. [CrossRef]
59. Lee, H.-S.; Lee, D.-J.; Baek, K.-W.; Lee, A.; Park, Y.; Kim, J.-S. Effects of Pilates-Combined Training on the Improvement of Flexibility and Pain Relief in Elite Fencers. *Exerc. Sci.* **2024**, *33*, 131–139. [CrossRef]
60. Niroomand, A.; Goodarzi, K.; Roozbahani, M.; Tanha, Z. The effectiveness of pilates exercises on emotion regulation and distress tolerance in students with premenstrual syndrome. *Health Dev. J.* **2022**, *11*, 187–194. [CrossRef]
61. Latino, F.; Fischetti, F.; Cataldi, S.; Monacis, D.; Colella, D. The impact of an 8-weeks at-home physical activity plan on academic achievement at the time of COVID-19 lock-down in Italian school. *Sustainability* **2021**, *13*, 5812. [CrossRef]
62. La Torre, M.E.; Monda, A.; Messina, A.; De Stefano, M.I.; Monda, V.; Moscatelli, F.; Tafuri, F.; Saraiello, E.; Latino, F.; Monda, M.; et al. The potential role of nutrition in Overtraining syndrome. *Nutrients* **2023**, *15*, 4916. [CrossRef] [PubMed]
63. Corvino, A.; Pignata, S.; Campanino, M.R.; Corvino, F.; Giurazza, F.; Tafuri, D.; Pinto, F.; Catalano, O. Thyroglossal duct cysts and site-specific differential diagnoses: Imaging findings with emphasis on ultrasound assessment. *J. Ultrasound* **2020**, *23*, 139–149. [CrossRef] [PubMed]

64. Ruimi, L.; Hadash, Y.; Tanay, P.; Bernstein, A. Meta-awareness of dysregulated emotional attention. *Clin. Psychol. Sci.* **2018**, *6*, 658–670. [CrossRef]
65. Thompson, E. Neurophenomenology and contemplative experience. In *The Oxford Handbook of Science and Religion*; Oxford Academic: Oxford, UK, 2006; pp. 226–235.
66. Latino, F.; Cataldi, S.; Fischetti, F. Effects of an 8-week yoga-based physical exercise intervention on teachers' burnout. *Sustainability* **2021**, *13*, 2104. [CrossRef]
67. Varela, F.J. Neurophenomenology: A methodological remedy for the hard problem. *J. Conscious. Stud.* **1996**, *3*, 330–349.
68. Hargus, E.; Crane, C.; Barnhofer, T.; Williams, J.M.G. Effects of mindfulness on meta-awareness and specificity of describing prodromal symptoms in suicidal depression. *Emotion* **2010**, *10*, 34–42. [CrossRef] [PubMed]
69. Montesano, P.; Tafuri, D.; Mazzeo, F. Improvement of the motor performance difference in athletes of weelchair Basketball. *J. Phys. Educ. Sport* **2013**, *13*, 362–370. [CrossRef]
70. Mazzeo, F.; Santamaria, S.; Montesano, P. Gender difference, nutritional supplements and drug use in sport to enhancing performance: An italian revision over the last decade. *Sport Mont* **2019**, *17*, 69–73. [CrossRef]
71. Bonato, M.; DECapitani, M.C.; Banfi, G. Agility training in volleyball. *J. Sports Med. Phys. Fit.* **2022**, *62*, 56–64. [CrossRef]
72. Vicente, S.J. The Tree of Mindful Self-Compassion: Exploring Contemplative Practices in Yoga/Pilates. Doctoral Dissertation, California State University San Marcos, San Marcos, CA, USA, 2022.
73. Frantsi, J. Focus on Mindful Movement: Problematizing Contemporary Dancers' Training Practices through Pilates. *Mov. Matters* **2023**, *2*, 40–57. [CrossRef]
74. Parveen, A.; Kalra, S.; Jain, S. Effects of Pilates on health and well-being of women: A systematic review. *Bull. Fac. Phys. Ther.* **2023**, *28*, 17. [CrossRef]
75. Chicomban, M. The pilates program. A mean of improving balance-related motor abilities. *Bull. Transilv. Univ. Braşov. Ser. IX Sci. Hum. Kinet.* **2020**, *13*, 27–34. [CrossRef]
76. Mazzeo, F.; Monda, M.; Messina, G.; Santamaria, S.; Messina, A.; Montesano, M.; Monda, V.; Tafuri, D. Doping in Italy: An analysis of its spread in ten years. *Biol. Med.* **2016**, *8*, 1. [CrossRef]
77. Abdul Rafeeque, T.C. Psychological Antecedents of Athletic Performance: A Study on the Mediating Role of Mindfulness and Coping Styles. Doctoral Dissertation, Department of Physical Education and Sports, Pondicherry University, Puducherry, India, 2016.
78. Pires, K.A.; Rocha, D.S.; Alves RR, G.; Silva, O.O.; Bertolini GR, F.; Bertoncello, D. Acute effects of a pilates method session on flexibility and performance in practitioners of an extreme conditioning program: A preliminary study. *J. Bodyw. Mov. Ther.* **2024**, *39*, 330–334. [CrossRef]
79. Yang, H.; Wang, X.; Wang, X.; Yang, J.; Zhang, W.; Ding, Y.; Sang, T.; Chen, W.; Wang, W. Effect of mindfulness-based mind-body therapies in patients with non-specific low back pain—A network meta-analysis of randomized controlled trials. *Front. Aging Neurosci.* **2023**, *15*, 1148048. [CrossRef] [PubMed]
80. Mulyanti, C.; Prasetyo, Y.; Sumarjo, S.; Setyawan, H.; Kurniawan, A.W.; Shidiq, A.A.P.; Eken, Ö.; Pavlovic, R.; Latino, F.; Tafuri, F.; et al. Differences in Archery Skill Results for Vocational School Students and Beginners Based on Shooting Distance. *Retos Nuevas Tend. Educ. Fís. Deporte Recreación* **2024**, *55*, 957–962. [CrossRef]
81. Septiantoko, R.; Murdiono, M.; Saliman, S.; Setyawan, H.; García-Jiménez, J.V.; Latino, F.; Tafuri, F.; Pranoto, N.W.; Kurniawan, A.W.; Anam, K.; et al. Differences in Achievement in Physical Education Learning Outcomes for High School Students Based on Parental Occupation: Analysis of Differences in Parental Social Status in Providing Learning Motivation. *Retos Nuevas Tend. Educ. Fís. Deporte Recreación* **2024**, *55*, 882–888. [CrossRef]