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THE ROLE AND RELEVANCE OF PHYSICAL TRAINING IN THE PERFORMANCE OPTIMIZATION OF JUNIOR II COMPETITIVE DANCERS

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Abstract: This study examines the role of physical training in optimizing performance among Junior II dance sport competitors aged 12–13 years. Although technical and choreographic elements traditionally dominate dance training, physical conditioning represents an essential yet often underestimated component of performance preparation. The study involved 20 competitive dancers (10 pairs) who completed a 12-week structured physical training program alongside regular dance practice. Six standardized motor and coordinative tests were administered before and after the intervention, and a structured questionnaire was used to assess dancers' perceptions regarding the role of physical training. The results showed statistically significant improvements across all assessed parameters, particularly in flexibility, strength, and coordination. Questionnaire responses indicated strong agreement regarding the benefits of physical training for injury prevention, endurance, rhythm control, and technical precision. These findings support the integration of structured physical training into youth dance sport programs as a means of enhancing physical preparedness and performance efficiency.

Key words: physical training, dance sport, junior dancers, motor skills, coordination, performance development,

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INTRODUCTION

Dance sport represents a complex discipline that merges the athletic rigor of competitive sport with the expressive and technical demands of performance art. Competitive dancers are required to demonstrate not only aesthetic quality and technical precision, but also high levels of strength, endurance, coordination, balance, and neuromuscular control. Consequently, contemporary research increasingly recognizes dancers as performing athletes whose preparation must be grounded in scientifically based training principles comparable to those applied in other high-performance sports (Koutedakis & Jamurtas, 2004).

The Junior II category, comprising dancers aged 12 to 13, represents a crucial stage in long-term athletic development. During this period, increasing technical and choreographic complexity coincides with important neuromuscular and physiological adaptations. At this age, dancers are expected to internalize complex movement sequences, refine execution quality, and demonstrate expressive maturity, while maintaining physical resilience. Insufficient or inadequately structured physical preparation during this stage may lead to decreased performance efficiency, premature fatigue, and an increased risk of musculoskeletal overload and injury (Allen et al., 2012).

From a biomechanical perspective, dance performance relies on efficient movement patterns, optimal joint loading, and precise motor coordination. Biomechanics provides essential tools for analyzing movement execution, identifying potentially harmful patterns, and optimizing training strategies aimed at improving performance while minimizing injury risk. Research in dance biomechanics has emphasized the importance of movement efficiency and neuromuscular coordination in maintaining both performance quality and physical health (Koutedakis et al., 2008; Mundermann et al., 2006).

Physical training plays a fundamental role in supporting the technical and artistic demands of dance sport. Strength and power development are essential for executing dynamic elements such as jumps, rapid changes of direction, and spatial transitions, while flexibility contributes to movement amplitude, joint mobility, and the formation of aesthetic movement lines (Shan, 2005; Bennell et al., 1999). In addition, core strength and postural control are critical for maintaining balance, stability, and movement fluidity, particularly under conditions of fatigue (McGill, 2010).

Balance and coordination are considered key motor abilities in dance sport. Previous studies have demonstrated that trained dancers exhibit superior postural stability compared to non-dancers, highlighting the role of long-term dance practice in sensory integration and neuromuscular control (Simmons, 2005; Ambegaonkar et al., 2013). However, these abilities require continuous and systematic development, especially during early adolescence, when growth-related changes may influence motor control and movement consistency.

Cardiorespiratory fitness also represents an important determinant of dance performance, particularly in competitive contexts that demand sustained effort across multiple routines. Research has shown that dance practice elicits significant cardiovascular responses and may improve aerobic capacity; however, supplementary physical conditioning is often necessary to achieve optimal adaptations and to prevent early onset fatigue that could compromise technical accuracy and artistic expression (Blanksby & Reidy, 1988; Koutedakis et al., 1999; Rodrigues-Krause et al., 2015).

Injury prevention constitutes a major concern in youth dance training. Epidemiological evidence from ballet and other dance forms indicates that structured physical conditioning programs can significantly reduce injury incidence and severity, while also supporting long-term dancer health and performance sustainability (Allen et al., 2012; Schoene, 2007). Overuse injuries, muscular imbalances, and joint overload are frequently associated with repetitive movement patterns and insufficient physical preparation, emphasizing the need for balanced training approaches that integrate strength, flexibility, coordination, and appropriate recovery strategies (Koutedakis & Jamurtas, 2004).

Given these considerations, there is a growing consensus that physical training should not be regarded as an auxiliary component of dance education, but rather as an essential pillar of performance development in young dancers. The integration of scientifically grounded physical training programs may enhance physical preparedness, support technical execution, and contribute to safer and more efficient movement patterns during a critical stage of athletic development.

Therefore, the purpose of the present study is to examine the role and relevance of structured physical training in optimizing motor and coordinative abilities in Junior II competitive dancers, within a controlled training framework. In addition, the study aims to explore dancers' perceptions regarding the importance of physical training in their overall development, by combining objective performance assessments with data obtained from a structured questionnaire

MATERIALS AND METHODS

Research hypothesis:

It was hypothesized that integrating a structured physical training program into the weekly training routine of Junior II dance sport athletes would result in statistically significant improvements in key motor and coordinative abilities, as well as in increased awareness of the importance of physical training for performance development.

Objectives:

The objectives of the present study were:

- to examine the role of physical training in the development of Junior II dancers based on objective motor test results and subjective perceptions;
- to quantify the impact of physical preparation on motor and coordinative abilities;
- to provide practical guidance for optimizing physical training strategies in dance sport.

Participants:

The study was conducted on a group of 20 competitive dance sport athletes (10 pairs), aged 12–13 years, with a balanced gender distribution. All participants were actively involved in regular dance sport training and competitions at the time of the study. Participation was voluntary, and written informed consent was obtained from parents or legal guardians prior to data collection.

Training intervention:

Participants followed a structured physical training program for a duration of 12 weeks, integrated into their regular dance training schedule. Physical conditioning sessions were conducted three times per week and focused on the development of mobility, muscular strength, speed, endurance, and coordination. Training load (intensity and volume) was progressively increased throughout the intervention period in accordance with age-appropriate training principles.

Testing procedures:

Motor and coordinative abilities were assessed using six standardized field tests:

- Standing long jump (assessment of explosive lower-limb strength);
- Sit-ups performed in 30 seconds (assessment of abdominal muscular endurance);
- Push-ups (assessment of upper body muscular strength);
- Forward trunk flexion test (assessment of flexibility);
- 20-meter sprint (assessment of running speed);
- Star Run test (assessment of coordination and agility).

All tests were administered under standardized conditions at the beginning of the study (pre-test) and at the end of the intervention period (post-test).

Questionnaire:

In addition to physical performance testing, participants completed a structured questionnaire designed to assess their perceptions regarding the usefulness, frequency, and

relevance of physical training in dance sport. Responses were recorded using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Statistical analysis:

Data were analyzed using descriptive statistics (mean ± standard deviation). Inferential statistical analysis was conducted using paired-sample t-tests to compare pre- and post-intervention results. Statistical significance was set at $p < 0.05$. Effect sizes were calculated using Cohen's d to assess the magnitude of the observed changes. All analyses were performed using standard statistical software.

RESULTS

The experimental protocol included six key motor and coordinative tests. Comparative analysis between the initial and final assessments revealed statistically significant improvements across all evaluated indicators. The results are presented in Table 1.

Table 1. Summary of performance indicators (n = 20)

Test	Initial Testing (Mean ± SD)	Final Testing (Mean ± SD)	t-value	p-value
Jump (cm)	170.3 ± 10.2	182.7 ± 9.1	3.27	< 0.01
Sit-ups (30sec)	18.5 ± 2.4	23.1 ± 2.2	5.11	< 0.01
Push-ups	5 12.4 ± 2.8	17.6 ± 2.9	4.89	< 0.01
Trunk Flexion (cm)	1.8 ± 2.1	6.3 ± 2.5	4.52	< 0.01
20m Sprint (sec)	4.32 ± 0.18	4.10 ± 0.15	2.21	< 0.05
Star Run (sec)	14.6 ± 1.1	12.9 ± 0.9	3.72	< 0.01

Standing Long Jump

The standing long jump test was used to assess explosive lower-limb strength. A statistically significant increase was observed between the initial and final assessments, with mean values improving from 170.3 cm to 182.7 cm ($p < 0.01$). These results indicate a clear enhancement in explosive strength following the 12-week physical training intervention.

The comparative graphical representation of the standing long jump performance at pre-test and post-test is presented in Figure 1.

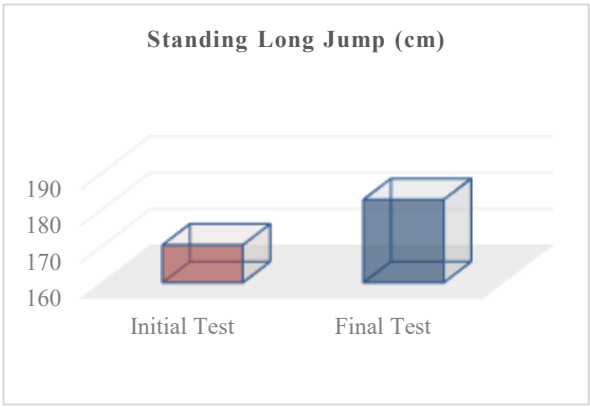

Figure 1 - Comparative graphical presentation of the standing long jump indicator

Abdominal muscular endurance was assessed using the sit-ups test performed over 30 seconds. A statistically significant improvement was observed between the initial and final assessments, with mean values increasing from 18.5 to 23.1 repetitions ($p < 0.01$). This result indicates a significant enhancement in abdominal endurance following the physical training intervention.

The comparative evolution of performance in the sit-ups test between the initial and final testing sessions is illustrated in Figure 2.

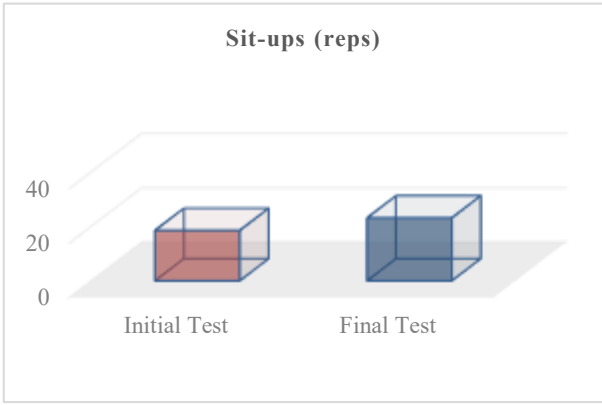

Figure 2 - Comparative graphical presentation of the sit-ups indicator

Push-ups

Upper body muscular strength was assessed using the push-ups test. A statistically significant improvement was observed between the initial and final assessments, with mean values increasing from 12.4 to 17.6 repetitions ($p < 0.01$). These findings indicate a clear enhancement in upper body strength following the physical training intervention.

The progression recorded in the push-ups test is illustrated in Figure 3.

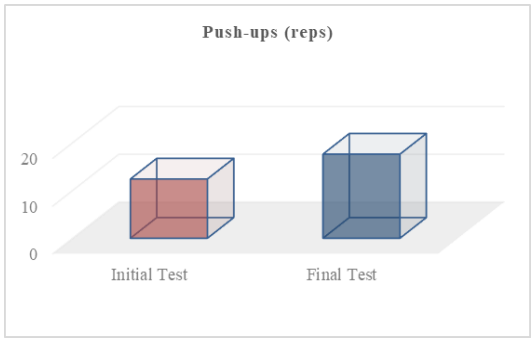

Figure 3 - Comparative graphical presentation of the the push-ups indicator

Trunk Flexion

Trunk flexibility was assessed using the forward trunk flexion test. A statistically significant improvement was observed between the initial and final assessments, with mean values

increasing from 1.8 cm to 6.3 cm beyond the toes ($p < 0.01$). This result indicates a substantial enhancement in trunk and posterior chain flexibility following the physical training intervention.

The evolution of performance in the trunk flexion test between the initial and final assessments is illustrated in Figure 4.

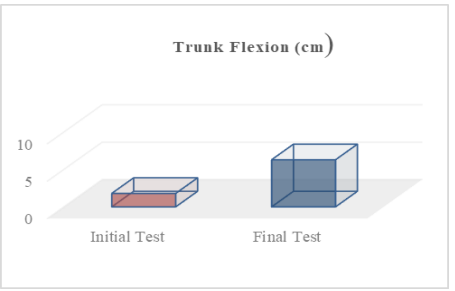

Figure 4 - Comparative graphical presentation of the trunk flexon indicator

20-meter Sprint

Running speed over a short distance was assessed using the 20-meter sprint test. A statistically significant reduction in execution time was observed between the initial and final assessments, with mean values decreasing from 4.32 s to 4.10 s ($p < 0.05$). This result indicates an improvement in short-distance running speed following the physical training intervention.

The changes recorded in the 20-meter sprint test between the initial and final assessments are presented in Figure 5.

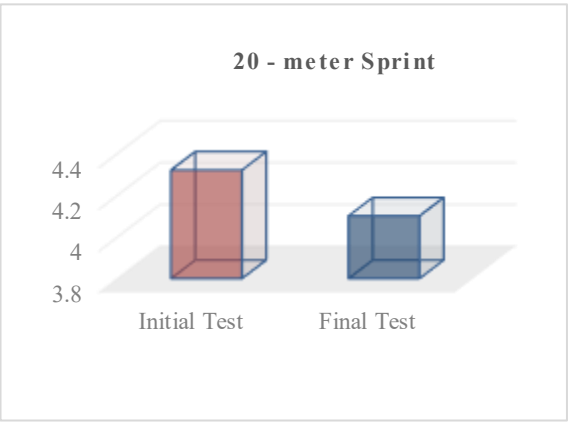

Figure 5 - Comparative graphical presentation of the 20 meter sprint indicator

Star Run

Coordination and agility were assessed using the Star Run test. A statistically significant reduction in completion time was observed between the initial and final assessments, with mean values decreasing from 14.6 s to 12.9 s ($p < 0.01$). This result indicates a significant improvement in multidirectional movement performance following the physical training intervention.

The comparative graphical representation of the Star Run test results obtained at pre-test and post-test is presented in Figure 6.

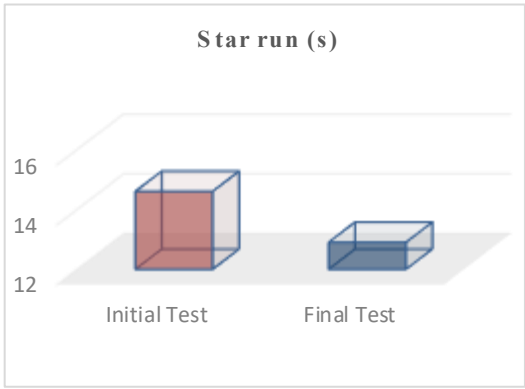

Figure 6- Comparative graphical presentation of star run indicator

Questionnaire

The analysis of questionnaire responses revealed a high level of agreement among participants regarding the perceived benefits of physical training in dance sport. The distribution of responses is presented in Figure 7.

Specifically, 90% of the dancers agreed that physical training improves endurance, while 85% reported perceived increases in strength and mobility. Injury prevention was identified as a benefit by 87% of participants, and 92% indicated that physical training enhances coordination and rhythm. In addition, 80% of the dancers reported enjoyment of the physical training sessions, and 88% expressed a desire to continue participating in such training programs.

The percentage distribution of dancers' agreement with statements related to physical training benefits is illustrated in Figure 7.

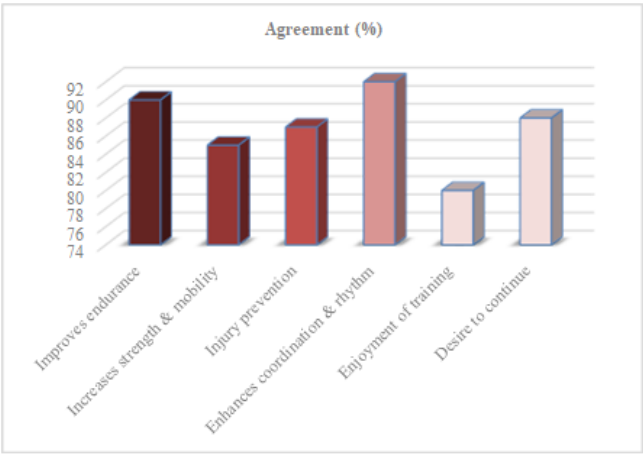

Figure 7- Dancers' agreement (%) with statements on physical training benefit

Figure 8 presents a comparative overview of the initial and final testing results for all assessed motor and coordinative variables.

Figure 8 - Comparison between initial and final testing results

Overall, all analyzed variables demonstrated statistically significant improvements following the 12-week physical training intervention ($p < 0.05$). The largest relative improvements were observed in strength-related measures, particularly in the sit-ups (+24.9%) and push-ups (+41.9%) tests. Substantial gains were also recorded in flexibility, with trunk flexion values increasing by approximately 250%. Moderate but statistically significant improvements were observed in speed and coordination measures, as reflected by reduced execution times in the 20-meter sprint (−5.1%) and Star Run (−11.6%) tests. Effect size analysis using Cohen's d indicated a large effect for strength-related measures and a moderate effect for the speed-related measure.

DISCUSSION

The present study analyzed the effects of a structured physical training program on motor and coordinative abilities in Junior II dance sport athletes. The statistically significant improvements observed across all assessed variables confirm the research hypothesis and support the importance of integrating systematic physical training into the instructional process of young dancers.

The substantial increases recorded in strength-related tests, particularly those assessing abdominal strength and upper-body strength, indicate that structured physical training effectively contributes to the development of essential qualities for dance performance. These findings are consistent with the concept of the "dancer as a performing athlete," which emphasizes the need for supplementary physical preparation in order to meet the high demands of dance performance (Koutedakis & Jamurtas, 2004). The literature highlights that reliance solely on choreographic rehearsals is insufficient for the optimal development of muscular strength and motor control required for efficient technical execution (Fitt, 1981; Koutedakis et al., 2009). Furthermore, the large effect sizes identified for strength variables in the present study reinforce the role of strength training as a fundamental component of performance-oriented training in dance sport.

The improvements observed in trunk flexibility are consistent with previous research demonstrating that well-structured general and specific physical training programs can positively influence joint and muscular mobility in dancers (Bennell et al., 1999). Flexibility constitutes an essential component for achieving the aesthetic amplitude of movements, technical precision, and execution efficiency, while also contributing to the continuity and sustainability of the training process.

Moderate yet statistically significant improvements were also identified in speed and coordination, as evidenced by the 20 m sprint and Star Run tests. These results suggest enhanced neuromuscular control and movement efficiency. Coordination and balance are fundamental motor abilities in dance sport, particularly during adolescence, when growth-related processes may temporarily affect postural stability. Comparative studies have shown that dancers exhibit superior

balance levels compared to non-dancers, underscoring the importance of continuous development of these abilities through specific training (Simmons, 2005; Ambegaonkar et al., 2013). In a related educational context, structured physical activities that emphasize postural control, coordination, and collective movement patterns have been shown to support motor development and movement stability in young participants (Cristea et al., 2021).

In support of these findings, youth sport research has demonstrated that structured physical training programs can effectively improve strength and speed parameters during early developmental stages, regardless of the specific sport discipline (Șandra et al., 2023). Moreover, motor skills have been identified as relevant predictors of performance in various applied physical contexts, highlighting their role in efficient task execution and functional effectiveness (Ștef et al., 2025). Together, these perspectives further reinforce the importance of systematic physical preparation for performance optimization in competitive dance.

Cardiorespiratory demands also play an important role in dance sport performance, especially in competitive contexts involving sustained effort and sequences of high-intensity movements. Research has demonstrated that dance practice elicits relevant cardiovascular responses; however, in order to optimize endurance and delay the onset of fatigue, it is necessary to complement dance-specific training with structured physical preparation (Blanksby & Reidy, 1988). Although aerobic capacity was not directly assessed in the present study, the improvements observed in speed and coordination tests suggest favorable functional adaptations that may support competitive performance.

Injury prevention represents a key aspect of young dancers' training. Previous research has demonstrated that well-structured physical training programs can contribute to reducing injury incidence by improving functional capacity and motor control (Allen et al., 2012). In this context, the information obtained through the questionnaire administered in the present study complements the objective results, with participants acknowledging the role of physical training in improving overall strength, increasing endurance, and supporting injury prevention.

In addition, motivational factors have been shown to positively influence physical and technical performance in young athletes (Hammami et al., 2018). Although motivational strategies were not directly manipulated in the present study, the positive perceptions reported by the dancers may have supported engagement and adherence to the structured physical training program.

Finally, recent studies have emphasized that innovative physical education programs can effectively enhance motor skills and coordination in middle school students (Bulz et al., 2023), further supporting the relevance of targeted physical training interventions during early developmental stages.

Overall, the findings of the present study are consistent with the existing literature and support the integration of structured physical training as an integral part of the training process in dance sport. The development of strength, flexibility, coordination, and motor efficiency provides a solid foundation for technical execution and artistic expressiveness in Junior II dancers, contributing to harmonious, performance-oriented development.

CONCLUSIONS

The present study highlights the essential role of structured physical training in the development of Junior II dance sport athletes, demonstrating that physical preparation represents a necessary pillar of the training process from the early stages of athletic development. The systematic integration of general and specific physical training supports the balanced development of performance-related abilities and facilitates effective adaptation to the technical and artistic demands of dance sport.

The findings underline the importance of approaching physical training as a planned and coherent component that complements technical and choreographic preparation, rather than as an occasional intervention. By strengthening the motor foundation, physical training contributes to improved movement efficiency and supports sustained technical progression within the training process.

In this context, the conclusions of the present study support the inclusion of structured physical training within the weekly training framework for young dancers, as part of a performance-oriented and long-term development model in dance sport.

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