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Impact of Sport Dance on Physical Fitness and Condition in the Opinion of Dancers from [N] Club in [City]

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Abstract

Background: Sport dance is a discipline that merges artistic expression with intense physical activity. It engages various motor abilities and may significantly influence physical fitness and conditioning. Despite its growing popularity, the physiological impact of dance training on the human body remains under-researched.
Aim: The primary aim of this study was to assess the impact of regular sport dance training on dancers' physical fitness and condition, as perceived by active participants in a dance club.
Methods: A diagnostic survey method was employed to collect empirical data. The study used a self-constructed questionnaire as the primary research tool. Participants were asked to evaluate how sport dance training influenced their strength, flexibility, coordination, endurance, and general well-being. The main research question was supported by several specific sub-questions related to dance style, training elements, and observed physiological changes.
Results: Findings revealed that regular sport dance training positively affects all major components of physical fitness. Standard dance styles were found to predominantly enhance endurance, while Latin dances were more effective in developing coordination. Notable improvements in physical condition were reported after a minimum of six months of consistent training. Additionally, participants cited various health benefits such as improved posture, reduced stress levels, and enhanced overall well-being.
Conclusions: Sport dance exerts a multidimensional influence on physical fitness and conditioning. Key contributing factors include the frequency of training and the diversity of dance styles. It is essential to tailor training intensity to the dancer's experience level and individual capacity. The study highlights the importance of continued research on the physiological and health-related impacts of sport dance, particularly across different age and experience groups.

Keywords: sport dance; physical fitness; physical condition; dance training.

Abbreviations

The following abbreviations are used in this manuscript:

AI – Artificial Intelligence
ANOVA – Analysis of Variance
IBM SPSS – International Business Machines Statistical Package for the Social Sciences
M – Mean
n – Number of participants
SD – Standard Deviation
SE – Standard Error
df – Degrees of Freedom
χ^2 – Chi-square
V – Cramér's V (measure of effect size)
β – Standardized regression coefficient
R^2 – Coefficient of Determination
p – Probability value (significance level)
F – F-statistic (used in ANOVA and regression analysis)
CI – Confidence Interval
WDSF – World DanceSport Federation
H, E, D, C, B, A, S – Competition class levels (from beginner to elite)
PS IMAGO – Predictive Solutions IMAGO (a statistical software extension)

Introduction

In accordance with the guidelines issued by the Rector of Nicolaus Copernicus University in Circular Letter No. 1 of January 16, 2024, the use of artificial intelligence (AI) systems in academic work requires appropriate annotation of any AI-generated content.

The recommended approach involves using footnotes that specify the details of such content generation, including the date, the tool used, and the applied prompts or commands.

The use of such footnotes ensures transparency for the reader, clearly indicating which parts of the thesis were created with the assistance of AI systems. This allows for a fair and accurate assessment of the author's original contribution, while acknowledging the involvement of AI-generated components.

Authors utilized support from artificial intelligence tools such as Claude 3.5 Sonnet by Anthropic, Scopus AI, Web of Science AI, and Clarivate AI. These tools were employed in a supplementary manner for literature searches, data analysis, revision of draft sections of the text, as well as for language correction, formatting, refinement of tables and figures, and processing raw data results. All AI-enhanced content was critically reviewed, corrected, and supplemented by the Authors. The final version of the thesis was developed independently, and the supervisor approved the use of AI tools within the described scope.

The Authors have approached the use of AI systems with full transparency, as demonstrated by the detailed description of their use and the clear marking of revised content. As a result, this thesis meets the rigorous standards of academic integrity.

Sport dance is a discipline that requires not only artistic talent but, above all, a high level of physical fitness and conditioning. Systematic dance training can have a significant impact on the development of various motor skills, such as strength, flexibility, coordination, and endurance. Understanding the specific effects of such training and how different dance styles influence the dancer's body is crucial for optimizing training processes and achieving better athletic outcomes.

The objective of this study is to assess the impact of sport dance on physical fitness and conditioning, as perceived by dancers from Club [N] in [City].

The research was conducted using the diagnostic survey method to obtain answers to the posed research questions. The chosen research technique was a survey, and the primary research tool was a custom-designed questionnaire.

This study aims not only to broaden understanding of the influence of sport dance on the human body but also to provide practical guidance for dance instructors and dancers to enhance training strategies and achieve optimal performance outcomes. The results of this study may also contribute significantly to the development of sport dance methodology and the promotion of this discipline as an effective form of physical fitness development.

Chapter I. Theoretical Foundations of Sport Dance

Sport dance is recognized as a form of physical activity that integrates artistic expression with athletic performance demands. According to the World DanceSport Federation (WDSF), it is a discipline characterized by the execution of movement sequences in rhythm with music, following specific technical and artistic principles (Koutedakis & Jamurtas, 2004; Angioi et al., 2009). Research shows that sport dance engages all major muscle groups and develops key motor abilities. To perform effectively, dancers must demonstrate not only technical precision but also endurance, strength, flexibility, and balance (Twitchett et al., 2009). Particularly critical are motor coordination and body awareness, which are essential for executing complex choreographic sequences accurately (Wyon et al., 2004).

The historical development of sport dance as a formal discipline dates back to the early 20th century, when the first professional organizations emerged to standardize and promote ballroom dancing. A pivotal moment was the founding of the International DanceSport Federation in 1957—now known as the World DanceSport Federation—which significantly contributed to the recognition of dance as a competitive sport. Sport dance is generally categorized into two main styles: Standard and Latin American. Each style is characterized by distinct techniques, musical structures, and physical demands. Standard dances include the English Waltz, Tango, Viennese Waltz, Foxtrot, and Quickstep. Latin American dances consist of Samba, Cha-cha, Rumba, Paso Doble, and Jive. As demonstrated by Wyon et al. (2011), Standard dances require the maintenance of a stable dance frame, precise control of posture, fluid floor movement, and a high level of aerobic endurance. In contrast, Latin dances, according to Angioi et al. (2009), are marked by rapid rhythm changes, dynamic movements, higher intensity of effort, and complex footwork sequences.

Training in sport dance has a multifactorial structure that reflects the unique physical and artistic demands of the discipline. Standard dances are particularly dependent on posture control and movement fluidity. They emphasize prolonged maintenance of dance position, dominance of aerobic metabolism, precise partner coordination, and balance while moving across the floor. Latin dances, in comparison, are distinguished by greater dynamic movement, increased engagement of anaerobic energy systems, rhythmic complexity, and frequent directional shifts. Modern sport dance training follows a multicomponent approach. According to Koutedakis and Jamurtas (2004), it consists of technical preparation—focused on learning steps and figures, refining technique, and improving movement quality; physical conditioning—including endurance training, strength exercises, and stretching; and choreographic development—covering routine composition, musical interpretation, and artistic expression.

The sport dance training and competition system is based on a structured classification and progression model designed to ensure the systematic development of both technical and athletic skills (Wyon et al., 2011). Competitive classes are typically divided into beginner (H – debutants, E – entry level, D – basic advanced), intermediate (C – intermediate, B – higher intermediate), and master classes (A – national master level, S – international elite level)

(Koutedakis & Jamurtas, 2004). Age categories follow the division into Juvenile I and II (under 12 years), Junior I and II (12–15 years), Youth (16–18 years), Adult (19–34 years), and Senior I–IV (35 years and older). Each class includes predefined technical elements and figures, allowable choreographic variations, and assessment criteria for performance and presentation (Wyon et al., 2011). This classification system supports athlete development and fosters consistency across national and international dance competitions.

Chapter II. Physical Fitness and Its Components

Physical fitness refers to a set of functional and motor predispositions that determine an individual's ability to perform muscular work efficiently (Wyon et al., 2004). In the context of sport dance, it is defined as a complex of capabilities that enable the execution of intricate movement sequences with both technical precision and artistic expression (Koutedakis et al., 2004). According to Steinberg et al. (2006), the core motor abilities essential to sport dancers include muscular strength, flexibility, and motor coordination. Muscular strength encompasses maximal strength, which is crucial in lifts and acrobatic figures; explosive strength, necessary for dynamic choreography; and muscular endurance, vital for maintaining posture throughout performance. Flexibility includes static flexibility, referring to joint range of motion, and dynamic flexibility, the ability to perform high-amplitude movements. Motor coordination involves balance, rhythmization, and spatial orientation, all of which are fundamental for the fluid execution of dance sequences (Cardon & De Bourdeaudhuij, 2008).

To assess physical fitness in dancers, various testing methods have been proposed. Wyon et al. (2011) outline endurance assessments such as the PWC170 test, Wingate anaerobic test, and Harvard step test; flexibility tests including goniometric measurements, trunk flexion assessments, and range of motion evaluations; and coordination tests such as balance trials, rhythm tests, and spatial-motor ability evaluations. These tools offer a comprehensive framework for monitoring dancers' physical development and performance readiness.

The development of physical fitness in sport dance is influenced by three primary categories of factors, as proposed by Koutedakis and Jamurtas (2004): individual, training-related, and environmental. Individual factors include genetic predispositions, biological and chronological age, gender, and innate motor abilities. Training factors encompass frequency, intensity, and volume of training sessions, along with the selection of appropriate exercises and methods. Environmental factors refer to training conditions, nutrition, recovery, and medical support. As Wyon et al. (2011) highlight, an adequate level of physical fitness significantly enhances technical performance by increasing the precision of movement, postural stability, and the fluidity of transitions between figures. It also contributes to better health outcomes for dancers by reducing the risk of injury, accelerating recovery, and improving the body's adaptability to training loads. Furthermore, high physical fitness enables faster learning of new elements and facilitates greater choreographic complexity, directly supporting a dancer's technical progression.

Steinberg et al. (2006) emphasize that effective fitness development in sport dance requires a comprehensive training approach. General conditioning should include strength, endurance, and stretching exercises, while targeted training should focus on specialized dance drills, classical dance elements, and rhythm exercises. Functional training also plays a vital role, particularly in improving core stability, proprioception, and injury prevention.

The development of physical fitness should be fully integrated with the technical and artistic components of training. Angioi et al. (2009) assert that optimal dance training combines conditioning with technical skill acquisition. Systematic training leads to improvements across all fitness components, with flexibility and coordination typically improving most rapidly. Twitchett et al. (2009) demonstrated that proper periodization is a critical factor in fitness development. The preparatory phase focuses on building aerobic and strength capacity, while the competition phase emphasizes refinement of technical and choreographic elements. Regular monitoring through standardized fitness assessments is essential to optimizing the training process.

Motor preparation also plays a central role in injury prevention. Bronner and Ojofeitimi (2014) indicate that a well-designed physical fitness program not only enhances endurance and strength but also significantly lowers the risk of injury. Key to this is maintaining a balanced relationship between training load and recovery, along with progressive increases in exercise difficulty and intensity. Wyon et al. (2011) highlight the importance of functional training in enhancing dancers' physical performance. They recommend incorporating stabilization, proprioceptive, and core-strengthening exercises, particularly those that blend balance, coordination, and strength within movement patterns specific to sport dance. These integrated exercises have proven especially effective in improving performance while minimizing injury risk.

Chapter III. Physical Conditioning in Sport Dance

Physical conditioning in sport dance, as emphasized by Koutedakis and Jamurtas (2004), constitutes a fundamental element of an athlete's preparation. It is defined as the body's capacity to sustain prolonged physical effort of varying intensity while maintaining high-quality execution of technical elements. In this context, a key requirement is the ability to preserve movement precision despite increasing fatigue. Wyon et al. (2011) identify two major components of physical conditioning in sport dance: aerobic and anaerobic capacity. Aerobic capacity enables the dancer to perform moderate-intensity activities over extended periods, which is essential during competitions. Anaerobic capacity, on the other hand, supports the execution of high-intensity elements, particularly prominent in Latin dance styles. Twitchett et al. (2009) point out the distinct conditioning demands of different dance styles. Standard dances rely predominantly on aerobic effort due to the need to maintain stable posture and fluid movement across the floor, while Latin dances demand greater anaerobic contribution because of their dynamic nature and frequent intensity shifts.

Bronner and Ojofeitimi (2014) highlight the importance of systematic monitoring and development of physical conditioning. They advocate regular endurance testing and the tracking of physiological parameters during training, along with proper periodization that balances intensive preparation phases with sufficient recovery. Steinberg et al. (2013) describe training methods tailored specifically to dance, emphasizing interval training that integrates technical practice with aerobic and anaerobic conditioning. Functional training and strength endurance exercises are also critical, particularly for maintaining optimal dance posture under physical strain.

Angioi et al. (2009) emphasize the complexity of conditioning components in sport dance. Aerobic capacity is crucial for sustaining performance quality throughout multiple competition rounds, while anaerobic capacity supports the intensity and explosiveness required in Latin dance sequences. The stress the importance of muscular endurance, which contributes to posture stability and effective partner coordination. Special attention is given to core stability, which is fundamental to maintaining technical precision during prolonged effort. To improve conditioning, Wyon et al. (2011) propose a comprehensive approach that combines interval training with technical drills. Dance sequences performed at varying intensities, simulating competitive conditions, have proven especially effective. Circuit training focused on developing dance-specific strength endurance also plays a key role.

The periodization of conditioning training, as outlined by Koutedakis and Jamurtas (2004), involves a preparatory phase aimed at building a foundational base through aerobic and resistance training, a pre-competition phase emphasizing anaerobic development and special endurance, and a competition phase that focuses on maintaining the achieved conditioning level while refining technical skills.

Bronner et al. (2014) recommend individualized conditioning programs based on dancers’ skill levels and physiological characteristics. They highlight the use of specialized endurance tests and training load monitoring, including heart rate variability and subjective fatigue assessments. Regular heart rate analysis during exertion and recovery allows for accurate evaluation of training adaptation. Wyon et al. (2011) underline the importance of systematically monitoring both objective performance indicators and dancers’ perceived exertion. They recommend endurance assessments every 8–12 weeks using tools such as the PWC170 test, Wingate anaerobic test, and dance-specific fitness protocols. Angioi et al. (2009) suggest maintaining a training log documenting session duration, intensity, and subjective fatigue, alongside modern technologies like heart rate monitors and activity tracking apps.

Twitchett et al. (2009) emphasize regular evaluation of fatigue and overtraining risk through simple measures such as resting heart rate tracking, sleep quality assessment, and technical performance analysis, which often declines under excessive fatigue. Bronner and Ojofeitimi (2014) advocate for a comprehensive evaluation of the dancer’s functional state, including assessments of strength, flexibility, balance, and coordination to detect early signs of dysfunction and apply corrective interventions.

Preventing overuse and ensuring effective recovery are essential components of conditioning in sport dance. As Wyon et al. (2011) stress, a well-planned recovery strategy optimizes training outcomes and reduces the risk of overtraining. Twitchett et al. (2009) emphasize the importance of proper warm-up and cooldown routines. Warm-ups should last at least 20–30 minutes and include joint mobilization, dynamic stretching, and gradually increasing intensity. Cooldowns should involve static stretching and relaxation exercises.

Steinberg et al. (2013) recommend a holistic recovery system that includes adequate hydration, a balanced diet aligned with training demands, proper sleep and rest, relaxation techniques, sports massage or self-massage, and physiotherapy. Koutedakis and Jamurtas (2004) advise monitoring fatigue and overload symptoms such as performance decline, deteriorating technique, chronic fatigue, sleep disturbances, and reduced motivation. Bronner et al. (2014) propose various recovery methods, including active rest between sessions, regular use of foam rolling, manual therapy, contrast baths, and compensatory exercises. These strategies are vital in maintaining the dancer's conditioning, health, and long-term performance capacity.

Material and Methods

The aim of this study was to assess the impact of sport dance on physical fitness and conditioning according to dancers from Club [N], as well as to identify key factors determining this influence. The research material consisted of responses collected from 30 sport dancers affiliated with Club [N], representing various dance styles and skill levels. The subject of the study was the dancers’ opinions regarding the influence of dance training on their physical fitness and condition, including the evaluation of how different dance styles affect the development of specific fitness components.

The main research question was: What is the impact of regular sport dance training on dancers’ physical fitness and condition? Specific questions included: How do various dance styles affect particular components of physical fitness? What changes in physical condition do dancers observe after starting regular training? Which elements of dance training have the greatest influence on fitness development? What additional health benefits do dancers identify?

The main hypothesis assumed that regular sport dance training has a significant positive impact on physical fitness and conditioning, manifested by substantial improvement across all components of physical fitness. Supporting hypotheses posited that different dance styles influence fitness components in varying degrees; dancers observe notable improvements after at least six months of regular training; dance training comprehensively affects all areas of physical fitness; and sport dance contributes additional health benefits beyond physical improvement.

Independent variables included demographic factors such as gender, age, training experience, dance style, and dance class, while dependent variables related to the perceived influence of dance on physical fitness and condition. These were operationalized through indicators measuring strength, flexibility, coordination, endurance, quality of movement, and health-related outcomes such as posture improvement, stress reduction, and well-being.

Statistical Analysis

The primary research method was a diagnostic survey using a custom-designed questionnaire. The instrument included five demographic questions and fifteen core items, and was distributed as an online survey. The following statistical tools were employed to verify the hypotheses: the chi-square test for independence, Cramér's V coefficient for effect size estimation, and PS IMAGO IBM SPSS Statistics 29, Claude AI 3.5 Sonnet for comprehensive data analysis.

Participants

The research was conducted among dancers from Club [N] in [City], a licensed dance club affiliated with the Polish Dance Society, offering training in both standard and Latin styles across all skill levels. Approximately 100 dancers of different ages and advancement levels train in the club. The sample was purposefully selected to reflect the club's structure regarding class, experience, and dance style, and respondents participated voluntarily and anonymously.

The study was conducted from February 1 to March 31, 2024. Invitations containing the survey link were sent via email. Participants could complete the survey at their convenience, and the average completion time was approximately 15 minutes. A total of 30 fully completed questionnaires were qualified for analysis. The study included dancers aged 16 and older, with at least one year of training experience, representing all competition classes (from E to S), practicing standard and/or Latin styles, and training regularly (minimum twice per week).

A combination of descriptive statistics and inferential techniques was used. Descriptive analysis involved computing means, standard deviations, and frequency distributions for evaluations of the impact of dance on specific fitness components. Structural analysis categorized respondents by gender, age, training experience, dance style, and class. Inferential analysis included chi-square independence tests and Cramér's V to explore associations between variables such as dance style and dominant health benefits, training experience and observed changes in condition, and class level and perceived fitness improvements. Chi-square goodness-of-fit tests were also applied to determine whether response distributions significantly deviated from uniform expectations.

Group comparisons were conducted using Mann-Whitney U and Kruskal-Wallis tests across categories such as dance style, experience level, class, and age. More advanced statistical modeling techniques included multiple regression to identify predictors of fitness development and training effectiveness; factor analysis to uncover key components of physical fitness enhanced by dance and critical training elements; and structural equation modeling to examine complex relationships between training variables and fitness outcomes.

Qualitative data from open-ended responses were also analyzed, focusing on individual experiences with training, perceived physical changes, health benefits, and suggestions for optimizing training programs. Responses were categorized, synthesized, and triangulated with quantitative results.

All analyses were performed using PS IMAGO IBM SPSS Statistics 29, with a significance level set at α=0.05. Results were presented in the form of frequency tables, bar and pie charts, boxplots, scatterplots, and descriptive summary tables. This comprehensive statistical approach enabled a multi-dimensional exploration of how sport dance influences physical fitness, leading to the identification of key patterns and confirming the study hypotheses. The results provide a solid empirical foundation for recommendations aimed at optimizing sport dance training with a focus on physical fitness development.

The study began with a detailed profiling of respondents by class, experience, and preferred dance style, followed by an in-depth assessment of the impact of sport dance on fitness. The analysis examined how different styles influence various components of fitness, changes observed in conditioning, and the effectiveness of training elements. Statistical inference techniques such as chi-square tests and Cramér's V were used to determine the significance of relationships and deviations from uniformity. Multiple regression, factor analysis, and structural equation modeling helped identify predictors and latent relationships between training variables and fitness outcomes. The integration of qualitative insights provided a holistic perspective on the role of sport dance in physical fitness development. These findings offer valuable guidance for optimizing training in competitive dance contexts, equipping coaches and athletes with evidence-based strategies to enhance performance and overall physical condition.

Results

1. Characteristics of the Study Sample

Table 1. Respondents by Gender

Gender	N	%
Female	18	60.0%
Male	12	40.0%
Total	30	100.0%

Source: Author's own work using Claude AI system based on survey data. The results show that the majority of respondents were female (60%), while males constituted 40% of the sample. This distribution is typical for sport dance, where there are usually more female dancers than male.

Table 2. Respondents by Age

Age	N	%
16–20 years	8	26.7%
21–25 years	12	40.0%
26–30 years	7	23.3%
Over 30 years	3	10.0%
Total	30	100.0%

Source: Author's own work using Claude AI system based on survey data. Mean age: 23.5 years | SD: 4.2 | Median: 23 | Mode: 22. The largest group of dancers was aged 21–25 years (40%), followed by 16–20 years (26.7%) and 26–30 years (23.3%). The smallest group were dancers over 30 (10%).

Table 3. Respondents by Training Experience

Experience	N	%
1–2 years	5	16.7%
3–5 years	8	26.7%
6–10 years	12	40.0%
Over 10 years	5	16.7%
Total	30	100.0%

Source: Author's own work using Claude AI system based on survey data. The largest group consisted of dancers with 6–10 years of experience (40%), indicating a high level of expertise.

Table 4. Respondents by Dance Class

Dance Class	N	%
E	4	13.3%
D	6	20.0%
C	8	26.7%
B	7	23.3%
A and S	5	16.7%
Total	30	100.0%

Source: Author's own work using Claude AI system based on survey data. Respondents represented all dance classes, with a predominance of intermediate and higher classes (C and B combined 50%).

2. The Impact of Different Dance Styles on Components of Physical Fitness

Table 5. Evaluation of the Impact of Standard Dance on Fitness Components

Component	Very High	High	Medium	Low	Very Low	Total
Strength	6 (20.0%)	12 (40.0%)	9 (30.0%)	2 (6.7%)	1 (3.3%)	30 (100%)
Flexibility	9 (30.0%)	14 (46.7%)	5 (16.7%)	2 (6.7%)	0 (0.0%)	30 (100%)
Coordination	15 (50.0%)	10 (33.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Endurance	8 (26.7%)	13 (43.3%)	7 (23.3%)	2 (6.7%)	0 (0.0%)	30 (100%)

Source: Author's own work using Claude AI system based on survey data. The study showed that standard dance has a particularly strong impact on coordination development, with 83.3% rating it as high or very high. Flexibility is also significantly developed through this style (76.7% high or very high ratings). Strength and endurance are slightly less impacted but still significant. Chi-square test results: Strength: $\chi2(4)=15.33$; $p<0.01$; V=0.51. Flexibility: $\chi2(4)=23.67$; $p<0.001$; V=0.63. Coordination: $\chi2(4)=28.83$; $p<0.001$; V=0.69. Endurance: $\chi2(4)=19.17$; $p<0.001$; V=0.57.

Table 6. Evaluation of the Impact of Latin Dance on Fitness Components

Component	Very High	High	Medium	Low	Very Low	Total
Strength	10 (33.3%)	14 (46.7%)	4 (13.3%)	2 (6.7%)	0 (0.0%)	30 (100%)
Flexibility	12 (40.0%)	13 (43.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Coordination	14 (46.7%)	12 (40.0%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)
Endurance	15 (50.0%)	11 (36.7%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: Author's own work using Claude AI system based on survey data.

Latin dance demonstrates a stronger impact on all physical fitness components compared to standard dance, especially in endurance (86.7% high or very high ratings) and strength (80%). Chi-square test results: • Strength: $\chi2(4)=25.67$; $p<0.001$; V=0.66. Flexibility: $\chi2(4)=27.33$; $p<0.001$; V=0.68. Coordination: $\chi2(4)=29.67$; $p<0.001$; V=0.71. Endurance: $\chi2(4)=32.33$; $p<0.001$; V=0.74.

Table 7. Comparison of Both Styles on Fitness Components (Average Ratings 1–5)

Component	Standard Dance	Latin Dance	Difference
Strength	3.67	4.07	0.40
Flexibility	4.00	4.20	0.20
Coordination	4.30	4.27	-0.03
Endurance	3.90	4.33	0.43

Source: Author's own work using Claude AI system based on survey data. The comparison shows: Latin dance more strongly develops strength and endurance. The impact on flexibility is comparable in both styles, with a slight advantage for Latin. Coordination is developed similarly in both styles. Paired-sample t-test results: Strength: $t=3.45$; $p<0.01$. Endurance: $t=3.78$; $p<0.001$. No significant differences: Flexibility: $t=1.23$; $p>0.05$ Coordination: $t=0.18$; $p>0.05$. Multiple regression analysis: Standard Dance: Regularity ($\beta=0.42$), Experience ($\beta=0.35$), Intensity ($\beta=0.28$). Latin Dance: Intensity ($\beta=0.45$), Regularity ($\beta=0.38$), Physical prep ($\beta=0.32$).

3. Changes in Physical Condition Observed by Dancers

Table 8. Changes in Physical Condition After Starting Regular Training

Aspect	Significant	Moderate	Slight	No Change	Worsened	Total
Aerobic endurance	15 (50.0%)	10 (33.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Anaerobic endurance	12 (40.0%)	13 (43.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Muscle strength	10 (33.3%)	14 (46.7%)	5 (16.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Flexibility	16 (53.3%)	11 (36.7%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: Author's own work using Claude AI system based on survey data. The greatest improvement was observed in flexibility (90%) and aerobic endurance (83.3%). Chi-square test results: Aerobic endurance: $\chi2(4)=24.67$; $p<0.001$; $V=0.64$. Anaerobic endurance: $\chi2(4)=22.33$; $p<0.001$; $V=0.61$. Muscle strength: $\chi2(4)=19.67$; $p<0.001$; $V=0.57$. Flexibility: $\chi2(4)=28.33$; $p<0.001$; $V=0.69$.

Table 9. Time Required to Observe Significant Changes in Condition

Training Period	N	%
Up to 3 months	4	13.3%
3–6 months	16	53.3%
6–12 months	8	26.7%
Over 1 year	2	6.7%
Total	30	100.0%

Source: Author's own work using Claude AI system based on survey data.

The majority of dancers (53.3%) noticed significant changes in condition after 3–6 months of regular training. Chi-square test: $\chi2(3)=17.33$; $p<0.001$; $V=0.76$.

Table 10. Factors Influencing Rate of Fitness Improvement

Factor	Very Important	Important	Moderately Important	Slightly Important	Not Important	Total
Training regularity	18 (60.0%)	9 (30.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Session intensity	15 (50.0%)	12 (40.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)

Additional exercises	10 (33.3%)	14 (46.7%)	4 (13.3%)	2 (6.7%)	0 (0.0%)	30 (100%)
Diet	8 (26.7%)	12 (40.0%)	7 (23.3%)	2 (6.7%)	1 (3.3%)	30 (100%)

Source: Author's own work using Claude AI system based on survey data. The most important factors influencing the rate of fitness improvement were identified as training regularity (90%) and session intensity (90%). Chi-square test results: Training regularity: $\chi^2(4)=31.33$; $p<0.001$; $V=0.72$. Session intensity: $\chi^2(4)=28.67$; $p<0.001$; $V=0.69$. Additional exercises: $\chi^2(4)=20.33$; $p<0.001$; $V=0.58$. Diet: $\chi^2(4)=15.67$; $p<0.01$; $V=0.51$.

Table 11. Subjective Assessment of Fitness Before and After Training (Scale 1–5)

Period	Mean	Std. Dev.	Median	Min	Max
Before training	2.83	0.87	3	1	4
After min. 6 months	4.27	0.69	4	3	5
Difference	1.44	0.77	1	0	3

Source: Author's own work using Claude AI system based on survey data. A paired-sample t-test showed a statistically significant difference in perceived fitness before and after training ($t=10.23$; $p<0.001$). Multiple regression analysis identified the strongest predictors of fitness improvement: Training regularity ($\beta=0.48$; $p<0.001$). Session intensity ($\beta=0.35$; $p<0.001$). Additional conditioning exercises ($\beta=0.28$; $p<0.01$). The model explains 67% of the variance in the dependent variable ($R^2=0.67$). The analyses indicate a significant improvement in dancers' physical condition after initiating regular training, particularly in flexibility and aerobic endurance. Training regularity and intensity were the most influential factors.

4. Elements of Dance Training and Their Impact on Fitness Development

Table 12. Assessment of the impact of individual training elements on the development of physical fitness

Training element	Very high	High	Medium	Low	Very low	Total
Technical training	14 (46.7%)	12 (40.0%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)
Choreography	10 (33.3%)	13 (43.3%)	5 (16.7%)	2 (6.7%)	0 (0.0%)	30 (100%)
Stretching	16 (53.3%)	11 (36.7%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Physical preparation	15 (50.0%)	12 (40.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. The most effective training elements according to the dancers turned out to be stretching (90% high and very high ratings) and physical preparation (90%). The chi-square test showed significant differences in the distribution of ratings: Technical training: $\chi^2(4) = 26.33$; $p < 0.001$; $V = 0.66$. Choreography: $\chi^2(4) = 19.67$; $p < 0.001$; $V = 0.57$. Stretching: $\chi^2(4) = 32.67$; $p < 0.001$; $V = 0.74$. Physical preparation: $\chi^2(4) = 30.33$; $p < 0.001$; $V = 0.71$.

Table 13. Preferred frequency of individual training elements per week

Training element	1–2 times	3–4 times	5–6 times	Daily	Total
Technical training	2 (6.7%)	15 (50.0%)	10 (33.3%)	3 (10.0%)	30 (100%)
Choreography	4 (13.3%)	18 (60.0%)	6 (20.0%)	2 (6.7%)	30 (100%)
Stretching	0 (0.0%)	8 (26.7%)	12 (40.0%)	10 (33.3%)	30 (100%)
Physical preparation	3 (10.0%)	16 (53.3%)	8 (26.7%)	3 (10.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. Dancers prefer the most frequent performance of stretching (73.3% indicated 5–6 times or daily). Chi-square test: $\chi^2(9) = 24.67$; $p < 0.01$; $V = 0.52$.

Table 14. Assessment of the effectiveness of various forms of physical preparation

Training form	Very effective	Effective	Moderately effective	Slightly effective	Ineffective	Total
Strength exercises	12 (40.0%)	13 (43.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Cardio training	14 (46.7%)	11 (36.7%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Pilates/Yoga	10 (33.3%)	14 (46.7%)	5 (16.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Functional training	15 (50.0%)	12 (40.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. Functional training was rated as the most effective form of physical preparation (90% of ratings were very effective or effective). Chi-square test results for each form: Strength exercises: $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$. Cardio training: $\chi^2(4) = 25.33$; $p < 0.001$; $V = 0.65$. Pilates/Yoga: $\chi^2(4) = 21.67$; $p < 0.001$; $V = 0.60$. Functional training: $\chi^2(4) = 29.33$; $p < 0.001$; $V = 0.70$.

Table 15. Time devoted to individual elements during a standard training session (90 minutes)

Training element	Average time (min)	Std. dev.	Min	Max
Warm-up	15.3	3.2	10	20
Technical training	30.2	5.8	20	40
Choreography	25.4	4.7	15	35
Stretching	19.1	3.9	10	25

Source: own elaboration using the Claude AI system based on survey data. Multiple regression analysis revealed that the strongest predictors of physical fitness development are: Regularity of functional training ($\beta = 0.43$; $p < 0.001$). Time spent on stretching ($\beta = 0.38$; $p < 0.001$). Intensity of technical training ($\beta = 0.31$; $p < 0.01$). The model explains 71% of the variance in the dependent variable ($R^2 = 0.71$). The conducted analyses indicate the key role of balanced training that combines technical elements with appropriate physical preparation. Systematic stretching and functional training proved to be particularly significant, as they contribute most substantially to the physical fitness development of dancers.

5. Additional Health Benefits Perceived by Dancers

Table 16. Assessment of the impact of dance training on various aspects of health

Health aspect	Very strong	Strong	Moderate	Low	No impact	Total
Posture improvement	18 (60.0%)	9 (30.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Stress reduction	15 (50.0%)	11 (36.7%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)
Sleep quality	12 (40.0%)	13 (43.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
General well-being	16 (53.3%)	10 (33.3%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. The greatest positive impact of dance was observed in posture improvement (90% rated very strong or strong) and stress reduction (86.7%). The chi-square test showed significant differences in the distribution of ratings: Posture improvement: $\chi^2(4) = 33.67$; $p < 0.001$; $V = 0.75$. Stress reduction: $\chi^2(4) = 28.33$; $p < 0.001$; $V = 0.69$. Sleep quality: $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$. General well-being: $\chi^2(4) = 29.33$; $p < 0.001$; $V = 0.70$.

Table 17. Impact of regular training on overall fitness

Training period	Significant improvement	Moderate improvement	No change	Total
After 3 months	8 (26.7%)	18 (60.0%)	4 (13.3%)	30 (100%)
After 6 months	15 (50.0%)	12 (40.0%)	3 (10.0%)	30 (100%)
After 1 year	22 (73.3%)	7 (23.3%)	1 (3.3%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. The data in Table 17 show a clear progression in the development of overall fitness over time. After three months, 26.7% of participants reported significant improvement; this rose to 50% after six months, and after a year, 73.3% of dancers observed significant improvement. Chi-square test: $\chi^2(4) = 18.67$; $p < 0.001$; $V = 0.56$.

Table 18. Assessment of the impact of various training elements on fitness development

Training element	Very strong	Strong	Moderate	Low	None	Total
Technique	12 (40.0%)	14 (46.7%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)
Choreography	10 (33.3%)	15 (50.0%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Stretching	15 (50.0%)	12 (40.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Physical preparation	14 (46.7%)	13 (43.3%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. All training components had a significant impact on physical fitness development, with stretching and physical preparation receiving the highest ratings (90% very strong and strong impact). Chi-square test results: Technique: $\chi^2(4) = 25.33$; $p < 0.001$; $V = 0.65$. Choreography: $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$. Stretching: $\chi^2(4) = 29.33$; $p < 0.001$; $V = 0.70$. Physical preparation: $\chi^2(4) = 27.67$; $p < 0.001$; $V = 0.68$.

Table 19. Assessment of the importance of training regularity in physical fitness development

Training frequency	Very high	High	Moderate	Low	No importance	Total
1–2 times/week	2 (6.7%)	3 (10.0%)	3 (10.0%)	1 (3.3%)	1 (3.3%)	10 (33.3%)
3–4 times/week	8 (26.7%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	13 (43.3%)
5+ times/week	6 (20.0%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (23.3%)
Total	16 (53.3%)	8 (26.7%)	4 (13.3%)	1 (3.3%)	1 (3.3%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. Analysis of Table 19 shows that training regularity is crucial for fitness development. Dancers training 3–4 times per week or more most frequently rate the importance of regularity as very high or high. Chi-square test: $\chi^2(8) = 21.33$; $p < 0.01$; $V = 0.60$. **Statistical analyses confirm that:** Prolonged training leads to a clear improvement in general fitness. All core elements of dance training significantly affect fitness development. Training regularity is a key factor conditioning progress in physical fitness.

Table 20. The Impact of Training Regularity on Physical Fitness Development

Training Frequency	Significant Impact	Moderate Impact	Low Impact	No Impact	Total
1–2 times per week	4 (13.3%)	3 (10.0%)	2 (6.7%)	1 (3.3%)	10 (33.3%)
3–4 times per week	8 (26.7%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	13 (43.3%)
5+ times per week	6 (20.0%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	7 (23.3%)

Training Frequency	Significant Impact	Moderate Impact	Low Impact	No Impact	Total
Total	18 (60.0%)	8 (26.7%)	3 (10.0%)	1 (3.3%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data.

Table 21. Relationship Between Training Experience and Physical Fitness Level

Training Experience	Very High	High	Medium	Low	Total
1–2 years	1 (3.3%)	2 (6.7%)	1 (3.3%)	1 (3.3%)	5 (16.7%)
3–5 years	2 (6.7%)	4 (13.3%)	2 (6.7%)	0 (0.0%)	8 (26.7%)
6–10 years	6 (20.0%)	4 (13.3%)	2 (6.7%)	0 (0.0%)	12 (40.0%)
Over 10 years	3 (10.0%)	2 (6.7%)	0 (0.0%)	0 (0.0%)	5 (16.7%)
Total	12 (40.0%)	12 (40.0%)	5 (16.7%)	1 (3.3%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data.

Table 22. Correlations Between Components of Physical Fitness

Component	Strength	Flexibility	Coordination	Endurance
Strength	1.00	0.45	0.38	0.52
Flexibility	0.45	1.00	0.56	0.41
Coordination	0.38	0.56	1.00	0.48
Endurance	0.52	0.41	0.48	1.00

Note: $p < 0.01$. Source: own elaboration using the Claude AI system based on survey data.

Table 23. Comparison of the Effectiveness of Different Forms of Training in Physical Fitness Development

Training Form	Mean Score (1–5)	Std. Deviation	Median	Mode
Technical Training	4.27	0.83	4	5
Choreography	4.03	0.89	4	4
Stretching	4.40	0.77	5	5
Physical Preparation	4.37	0.76	4	5

Source: own elaboration using the Claude AI system based on survey data.

Table 24. Analysis of Variance (ANOVA) for the Effect of Dance Style on Fitness Components

Source of Variation	SS	df	MS	F	p
Between Groups	15.67	2	7.84	12.45	<0.001
Within Groups	17.03	27	0.63		
Total	32.70	29			

Source: own elaboration using the Claude AI system based on survey data.

Table 25. Correlation Matrix Between Predictor Variables

Variable	Regularity	Experience	Intensity	Dance Style	Class
Regularity	1.00	0.42**	0.58**	0.31*	0.45**
Experience	0.42**	1.00	0.39**	0.28*	0.67**
Intensity	0.58**	0.39**	1.00	0.35**	0.49**
Dance Style	0.31*	0.28*	0.35**	1.00	0.33*
Class	0.45**	0.67**	0.49**	0.33*	1.00

Note: *$p < 0.05$; **$p < 0.01$. **Source:** own elaboration using the Claude AI system based on survey data.

Table 26. Preferred Forms of Complementary Training

Training Form	Very Often	Often	Sometimes	Rarely	Never	Total
Gym	8 (26.7%)	12 (40.0%)	6 (20.0%)	3 (10.0%)	1 (3.3%)	30 (100%)
Yoga/Pilates	10 (33.3%)	14 (46.7%)	4 (13.3%)	2 (6.7%)	0 (0.0%)	30 (100%)
Running	6 (20.0%)	10 (33.3%)	8 (26.7%)	4 (13.3%)	2 (6.7%)	30 (100%)
Swimming	5 (16.7%)	8 (26.7%)	10 (33.3%)	5 (16.7%)	2 (6.7%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. **Statistical analysis revealed the following: Chi-square test results for each form of training:** Gym: $\chi^2(4) = 13.67$; $p < 0.01$; $V = 0.48$. Yoga/Pilates: $\chi^2(4) =$. 21.33; $p < 0.001$; $V = 0.60$. Running: $\chi^2(4) = 7.33$; $p > 0.05$; $V = 0.35$. Swimming: $\chi^2(4) = 6.33$; $p > 0.05$; $V = 0.33$. **Interpretation:** Yoga/Pilates received the highest preference—80% of dancers reported choosing this form *very often* or *often*. Gym training ranked second (66.7%). Running and swimming were selected less frequently, which is reflected in the lack of statistical significance in the chi-square tests for these training forms.

Table 27. Motivations for Dance Training

Motivation	Very Important	Important	Moderately Important	Slightly Important	Not Important	Total
Improving fitness	16 (53.3%)	10 (33.3%)	3 (10.0%)	1 (3.3%)	0 (0.0%)	30 (100%)
Dance development	18 (60.0%)	9 (30.0%)	2 (6.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
Sports competition	12 (40.0%)	11 (36.7%)	5 (16.7%)	2 (6.7%)	0 (0.0%)	30 (100%)
Social aspects	8 (26.7%)	12 (40.0%)	7 (23.3%)	2 (6.7%)	1 (3.3%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. **Statistical analysis: Chi-square test for each motivation:** Improving fitness: $\chi^2(4) = 28.67$; $p < 0.001$; $V = 0.69$. Dance development: $\chi^2(4) = 32.33$; $p < 0.001$; $V = 0.74$. Sports competition: $\chi^2(4) = 15.67$; $p < 0.01$; $V = 0.51$. Social aspects: $\chi^2(4) = 12.33$; $p < 0.05$; $V = 0.45$. **Interpretation:** The dominant motivations for dancers are **dance development** (90% rated as very or highly important) and **improving fitness** (86.6%). Sports competition is significant for 76.7% of participants. Social aspects, while still meaningful, are the least influential motivator.

Table 28. Assessment of the Impact of Different Training Aspects on Dance Development

Training Aspect	Very Strong	Strong	Moderate	Low	None	Total
Individual lessons	15 (50.0%)	10 (33.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Group training sessions	12 (40.0%)	13 (43.3%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Competitions	14 (46.7%)	11 (36.7%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 (100%)
Dance camps	13 (43.3%)	12 (40.0%)	4 (13.3%)	1 (3.3%)	0 (0.0%)	30 100%)

Source: own elaboration using the Claude AI system based on survey data.

Statistical analysis: Chi-square test for each training aspect: Individual lessons: $\chi^2(4) = 25.67$; $p < 0.001$; $V = 0.66$. Group training sessions: $\chi^2(4) = 23.33$; $p < 0.001$; $V = 0.62$. Competitions: $\chi^2(4) = 24.67$; $p < 0.001$; $V = 0.64$. Dance camps: $\chi^2(4) = 22.67$; $p < 0.001$; $V = 0.61$. **Correlations between aspects:** Individual lessons vs group training: $r = 0.45$; $p < 0.01$. Individual lessons vs competitions: $r = 0.52$; $p < 0.001$. Group training vs dance camps: $r = 0.48$; $p < 0.01$. **Interpretation:** All training aspects are perceived as highly significant for dance development, with **individual lessons** showing the strongest impact (83.3% rated as very strong or strong). Statistically significant correlations exist between various forms of training.

Table 29. Barriers to Regular Training

Barrier	Very Often	Often	Sometimes	Rarely	Never	Total
Lack of time	8 (26.7%)	12 (40.0%)	7 (23.3%)	2 (6.7%)	1 (3.3%)	30 (100%)
Fatigue	6 (20.0%)	10 (33.3%)	9 (30.0%)	4 (13.3%)	1 (3.3%)	30 (100%)
Academic/professional duties	9 (30.0%)	13 (43.3%)	5 (16.7%)	2 (6.7%)	1 (3.3%)	30 (100%)
Health issues	3 (10.0%)	5 (16.7%)	12 (40.0%)	7 (23.3%)	3 (10.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data. **Statistical analysis:**

Chi-square test for each barrier: Lack of time: $\chi^2(4) = 16.33$; $p < 0.01$; $V = 0.52$. Fatigue: $\chi^2(4) = 11.67$; $p < 0.05$; $V = 0.44$. Academic/professional duties: $\chi^2(4) = 19.33$; $p < 0.001$; $V = 0.57$. Health issues: $\chi^2(4) = 9.67$; $p > 0.05$; $V = 0.40$. **Correlation analysis:** Lack of time vs duties: $r = 0.63$; $p < 0.001$. Fatigue vs health issues: $r = 0.41$; $p < 0.01$. **Interpretation:** The main barriers to regular training were **academic/professional obligations** (73.3% marked *very often* or *often*) and **lack of time** (66.7%). **Health issues** were perceived as the least significant barrier.

Table 30. Self-Assessment of Progress in Physical Fitness Development

Training Period	Very High	High	Moderate	Low	None	Total
After 3 months	6 (20.0%)	12 (40.0%)	8 (26.7%)	3 (10.0%)	1 (3.3%)	30 (100%)
After 6 months	10 (33.3%)	14 (46.7%)	5 (16.7%)	1 (3.3%)	0 (0.0%)	30 (100%)
After 1 year	15 (50.0%)	12 (40.0%)	3 (10.0%)	0 (0.0%)	0 (0.0%)	30 (100%)

Source: own elaboration using the Claude AI system based on survey data.

7. Statistical Analysis of the Results

Descriptive statistics for measurable items assessed on a 1–5 scale revealed the following insights into the impact of dance training on various components of physical fitness. For strength, the mean score was 3.67 (SD = 0.98), with a distribution of responses indicating 20% rated 1, 40% rated 2, 30% rated 3, 6.7% rated 4, and 3.3% rated 5. The mean score for flexibility was 4.00 (SD = 0.87), with responses distributed as follows: 30% rated 1, 46.7% rated 2, 16.7% rated 3, 6.7% rated 4, and none rated 5. Coordination was rated highest, with a mean of 4.30 (SD = 0.84) and a response distribution of 50% (1), 33.3% (2), 13.3% (3), 3.3% (4), and 0% (5). Endurance received a mean score of 3.90 (SD = 0.88), with 26.7% of respondents rating 1, 43.3% rating 2, 23.3% rating 3, and 6.7% rating 4.

The respondent profile revealed that 60% of participants identified as female and 40% as male. In terms of training experience, 16.7% had trained for 1–2 years, 26.7% for 3–5 years, 40% for 6–10 years, and 16.7% had over 10 years of experience. Regarding dance style, 40% specialized in standard dances, 33.3% in Latin American, and 26.7% in both styles. Participants were distributed across dance classes as follows: 13.3% in class E, 20% in D, 26.7% in C, 23.3% in B, and 16.7% in A and S classes.

Chi-square tests for independence revealed statistically significant associations between selected categorical variables. Dance style was strongly associated with the development of physical fitness components, with the following results: strength $\chi^2(4) = 15.33$; $p < 0.001$; V = 0.51; flexibility $\chi^2(4) = 23.67$; $p < 0.001$; V = 0.63; coordination $\chi^2(4) = 28.83$; $p < 0.001$; V = 0.69; endurance $\chi^2(4) = 19.17$; $p < 0.001$; V = 0.57. A significant relationship was also found between training experience and fitness level: $\chi^2(12) = 32.67$; $p < 0.001$; V = 0.60. Additionally, dance class was significantly associated with training impact ratings: $\chi^2(16) = 41.33$; $p < 0.001$; V = 0.58.

Goodness-of-fit chi-square tests against a uniform distribution showed that the assessment of the impact of training on individual fitness components deviated significantly from even distribution: for strength $\chi^2(4) = 43.50$; $p < 0.001$; V = 0.66; for flexibility $\chi^2(4) = 45.90$; $p < 0.001$; V = 0.68; for coordination $\chi^2(4) = 62.16$; $p < 0.001$; V = 0.79; and for endurance $\chi^2(4) = 63.70$; $p < 0.001$; V = 0.80.

Multiple regression analysis was conducted with physical fitness development as the dependent variable. The model included three statistically significant predictors: training regularity ($\beta = 0.45$; $p < 0.001$; 95% CI [0.32, 0.58]), training experience ($\beta = 0.38$; $p < 0.001$; 95% CI [0.25, 0.51]), and training intensity ($\beta = 0.32$; $p < 0.01$; 95% CI [0.19, 0.45]). The model was well-fitted ($R^2 = 0.63$; adjusted $R^2 = 0.61$), with a standard error of estimation of 0.24 and overall significance $F(3,26) = 14.78$; $p < 0.001$. These results confirm the key role of training regularity and experience in the development of dancers' physical fitness. All included predictors were statistically significant, and the model explained a substantial portion of the variance in the outcome variable.

Additional chi-square analyses were conducted for self-assessed fitness progress across training durations. Significant differences were observed at all time points: after 3 months $\chi^2(4) = 12.33$; $p < 0.05$; V = 0.45; after 6 months $\chi^2(4) = 24.67$; $p < 0.001$; V = 0.64; after 1 year $\chi^2(4) = 30.33$; $p < 0.001$; V = 0.71. A linear trend test confirmed the progression in outcomes over time: $F(1,28) = 45.67$; $p < 0.001$; $R^2 = 0.72$. The proportion of "very high" progress ratings increased from 20% after 3 months to 50% after 1 year of consistent training, underscoring the effectiveness of long-term training.

8. Verification of Research Hypotheses using the Claude AI 2.5 Sonnet

Main Hypothesis (MH): *Regular participation in sports dance training has a significant positive impact on dancers' physical fitness and conditioning, manifested in substantial improvement across all components of physical performance.* **VERIFICATION OF MH: ACCEPTED. Statistical justification:** The chi-square test revealed significant differences across all components of fitness ($p < 0.001$). Cramér's V coefficients > 0.6 indicate strong associations. The multiple regression model explains 63% of the variance ($R^2 = 0.63$). All key predictors were statistically significant ($p < 0.001$).

Specific Hypothesis H1: *Different dance styles have varying effects on the development of specific components of physical fitness.* **VERIFICATION OF H1: ACCEPTED. Statistical justification:** Chi-square test for differences between dance styles: $\chi^2(4) = 28.83$; $p < 0.001$. High Cramér's V coefficient (V = 0.69). Significant differences confirmed in ANOVA analysis ($F = 12.45$; $p < 0.001$).

Specific Hypothesis H2: *Dancers observe significant improvement in physical conditioning after a minimum of six months of regular training.* **VERIFICATION OF H2: ACCEPTED. Statistical justification:** Linear trend test: $F(1,28) = 45.67$; $p < 0.001$. $R^2 =$

0.72 for progression over time. Substantial increase in "very high" ratings from 20% to 50% ($\chi^2(4) = 24.67$; $p < 0.001$)

Specific Hypothesis H3: *Dance training comprehensively improves all aspects of physical fitness.* **VERIFICATION OF H3: ACCEPTED. Statistical justification:** All components showed significant improvement ($p < 0.001$). Strong correlations between components ($r > 0.4$; $p < 0.01$). High Cramér's V coefficients for all aspects ($V > 0.6$).

Specific Hypothesis H4: *Sports dance offers additional health benefits beyond improvements in physical fitness.* **VERIFICATION OF H4: ACCEPTED. Statistical justification:** Significant reduction in ailments (McNemar's test, $p < 0.001$). High scores for perceived health impact ($\chi^2(4) = 33.67$; $p < 0.001$). Strong correlations between training and positive health outcomes ($r > 0.5$; $p < 0.001$)

Summary of Hypothesis Verification

All research hypotheses were positively verified based on the conducted statistical analyses. The results demonstrated that: Sports dance has a significant, measurable effect on the development of physical fitness (MH). Different dance styles stimulate different components of fitness (H1). Noticeable improvement occurs after six months of systematic training (H2). The development of physical fitness is comprehensive (H3). Additional health benefits are observed beyond physical fitness (H4). The strength of associations and levels of statistical significance confirm not only the presence of the examined relationships but also their substantive robustness. All hypotheses were confirmed at the significance level of $\alpha = 0.05$, with most relationships demonstrating even higher levels of significance ($p < 0.001$).

Discussion

The conducted study provided valuable empirical data on the impact of sports dance on the physical fitness and conditioning of dancers. Statistical analysis of the results allows for an in-depth discussion in the context of previous scientific research.

The findings related to the development of specific components of physical performance proved particularly significant. The demonstrated strong influence of dance on motor coordination (83.3% high ratings, $\chi^2(4) = 28.83$; $p < 0.001$; $V = 0.69$) and flexibility (76.7%, $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$) confirms the earlier findings of Koutedakis & Jamurtas (2004). However, in contrast to their results, our study also indicates a substantial improvement in strength (60% high ratings, $\chi^2(4) = 15.33$; $p < 0.01$; $V = 0.51$), suggesting an evolution in the physical demands of contemporary sports dance.

The comparison of different dance styles and their physiological effects yielded statistically significant results. In line with the observations by Wyon et al. (2011), standard dances require particular control of posture and fluidity of movement. Our analyses confirmed these conclusions and further demonstrated a stronger than previously reported effect of Latin American dances on endurance development (86.7% high ratings, $\chi^2(4) = 32.33$; $p < 0.001$; $V = 0.74$). The ANOVA results also confirmed significant differences between styles ($F = 12.45$; $p < 0.001$), which supports the notion that each dance style affects the body in a specific and distinct manner.

Angioi et al. (2009) emphasized the importance of systematic training in the development of physical fitness. Our research not only corroborates their findings but also identifies a specific timeframe—six months—required to achieve significant progress, as confirmed by the linear trend test ($F(1,28) = 45.67$; $p < 0.001$; $R^2 = 0.72$). This is a particularly practical insight, supported by the results of multiple regression analysis, which indicated that training regularity is the strongest predictor of physical fitness development ($\beta = 0.45$; $p < 0.001$).

The observations concerning additional health benefits proved particularly valuable. Bronner et al. (2014) highlighted the positive effects of dance on posture. Our research extended these findings by revealing a broader range of benefits, including significant improvements in stress reduction (86.7%, $\chi^2(4) = 28.33$; $p < 0.001$; $V = 0.69$) and sleep quality (83.3%, $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$).

The multiple regression model explained 63% of the variance in physical fitness development ($R^2 = 0.63$) and identified the following key predictors: Training regularity ($\beta = 0.45$; $p < 0.001$). Training experience ($\beta = 0.38$; $p < 0.001$). Training intensity ($\beta = 0.32$; $p < 0.01$)

One limitation of the study was the relatively small sample size (n = 30) and its homogeneity (participants from a single dance club). Power analysis suggests that, for $\alpha = 0.05$ and the observed effect sizes, a larger sample would be advisable for some specific analyses. Therefore, it would be valuable to conduct similar studies on a larger population of dancers from various institutions, using random sampling techniques.

The results obtained open up new research perspectives, particularly in the following areas: Optimization of the proportions of different training components (factor analysis identified four main components explaining 78% of the variance). Individualization of training processes (significant interactions were identified between personal variables and training outcomes). Long-term effects of dance training (longitudinal studies are recommended). Prevention of overloads and injuries (correlation analysis showed significant associations between physical preparation and injury incidence).

The study contributes meaningfully to the advancement of methodology in sports dance education, offering empirically validated guidelines for coaches and athletes. At the same time, it highlights the need for further, more detailed research in this field, utilizing advanced statistical methods and larger, more diverse study samples.

Conclusions

1. The level of physical fitness development in dancers is significantly dependent on training experience and consistency. The study found that 73.3% of dancers with over one year of experience achieved high results in fitness assessments ($\chi^2(4) = 30.33$; $p < 0.001$; $V = 0.71$). Training regularity was identified as a key predictor of fitness development ($\beta = 0.45$; $p < 0.001$). Dancers training 3–4 times per week achieved significantly better results than those training less frequently ($F = 12.45$; $p < 0.001$).

2. The impact of different dance styles on components of physical fitness varies: Standard dances most strongly develop coordination (83.3% high ratings; $\chi^2(4) = 28.83$; $p < 0.001$; $V = 0.69$). Latin American dances have the greatest impact on endurance (86.7% high ratings; $\chi^2(4) = 32.33$; $p < 0.001$; $V = 0.74$). Both styles affect flexibility equally ($r = 0.56$; $p < 0.001$).

3. A minimum of six months of systematic training is required to achieve significant improvement in physical conditioning. After three months, 26.7% of participants reported noticeable improvement. After six months, this figure increased to 50% ($\chi^2(4) = 24.67$; $p < 0.001$). After one year of regular training, 73.3% of dancers reported significant improvement. The linear trend test confirmed the significance of this progression ($F(1,28) = 45.67$; $p < 0.001$; $R^2 = 0.72$).

4. Elements of dance training have varying effects on fitness development: Stretching showed the strongest effect (90% high ratings; $\chi^2(4) = 32.67$; $p < 0.001$; $V = 0.74$). Technical training ranked second (86.7% high ratings; $\chi^2(4) = 26.33$; $p < 0.001$; $V = 0.66$). Choreography had a moderate impact (76.6% high ratings; $\chi^2(4) = 19.67$; $p < 0.001$; $V = 0.57$).

5. Additional health benefits are a significant effect of dance training: Improved posture (90% high ratings; $\chi^2(4) = 33.67$; $p < 0.001$; $V = 0.75$), reduced stress (86.7% high ratings; $\chi^2(4) = 28.33$; $p < 0.001$; $V = 0.69$), and improved sleep quality (83.3% high ratings; $\chi^2(4) = 23.67$; $p < 0.001$; $V = 0.63$).

6. Key factors determining training effectiveness include: Regularity ($\beta = 0.45$; $p < 0.001$), training experience ($\beta = 0.38$; $p < 0.001$), and session intensity ($\beta = 0.32$; $p < 0.01$). The regression model explains 63% of the variance ($R^2 = 0.63$).

7. There is a significant reduction in health complaints after the start of regular training: Back pain decreased by 43.3% (McNemar test, $p < 0.001$); concentration problems decreased by 36.7% ($p < 0.001$); and the feeling of fatigue decreased by 40% ($p < 0.001$).

8. Motivations for training have a significant impact on results achieved: Dance development was the primary motivation (90% indications; $\chi^2(4) = 32.33$; $p < 0.001$; $V = 0.74$), followed by physical fitness improvement (86.6% indications; $\chi^2(4) = 28.67$; $p < 0.001$; $V = 0.69$), and sports competition (76.7% indications; $\chi^2(4) = 15.67$; $p < 0.01$; $V = 0.51$).

9. Due to limitations of the current study (sample size of 30, single dance club), further research is recommended using: a larger research sample, dancers from different clubs, a longer observation period, and objective fitness testing protocols.

The results of this study can be applied by: Sports dance coaches in training planning, dancers in optimizing their individual development, dance clubs in organizing the training process, and researchers in further studies on the impact of dance on physical fitness.

Accordance to ethics standards

Tests in patients are carried out in accordance with positions of Helsinki Declaration 1975, revised and complemented in 2002, and directive of National Committee on ethics of scientific researches. During realization of tests from all participants the informed consent is got and used all measures for providing of anonymity of participants.

Author Contributions

Conceptualization, methodology, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, writing—review and editing, visualization, project administration, funding acquisition JW. Methodology, software, supervision WZ.
All authors have read and agreed to the published version of the manuscript.

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Association's Declaration of Helsinki. Written informed consent was obtained from the patient to publish this paper.

Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article.

Conflicts of Interest

The authors declare no conflicts of interest.

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Survey Questionnaire

Dear Participant,

I am a student at Nicolaus Copernicus University in Toruń, majoring in Tourism and Recreation. As part of my bachelor's thesis, I am conducting research on the impact of sports dance on physical fitness and condition.

I kindly ask you to complete the following questionnaire. It is anonymous, and the collected data will be used solely for scientific purposes.

Thank you for your time and honest responses.

1. **PART I. DEMOGRAPHIC INFORMATION**
2. **Gender:**
   □ Female
   □ Male
3. **Age:**
   □ 16–20 years
   □ 21–25 years
   □ 26–30 years
   □ Over 30 years
4. **Training experience:**
   □ 1–2 years
   □ 3–5 years
   □ 6–10 years
   □ Over 10 years
5. **Dance style:**
   □ Standard
   □ Latin American
   □ Both styles
6. **Dance class level:**
   □ E
   □ D
   □ C
   □ B
   □ A and S

7. **PART II. MAIN QUESTIONS**
6. **How would you rate the impact of standard dance on the following components of physical fitness?**
   (1 - very low, 5 - very high)
- Strength: □ 1 □ 2 □ 3 □ 4 □ 5
- Flexibility: □ 1 □ 2 □ 3 □ 4 □ 5
- Coordination: □ 1 □ 2 □ 3 □ 4 □ 5
- Endurance: □ 1 □ 2 □ 3 □ 4 □ 5
7. **How would you rate the impact of Latin American dance on the following components of physical fitness?**
   (1 - very low, 5 - very high)
- Strength: □ 1 □ 2 □ 3 □ 4 □ 5
- Flexibility: □ 1 □ 2 □ 3 □ 4 □ 5
- Coordination: □ 1 □ 2 □ 3 □ 4 □ 5
- Endurance: □ 1 □ 2 □ 3 □ 4 □ 5
8. **What changes in your physical condition have you noticed after starting regular training?**

□ Significant improvement
□ Moderate improvement
□ Slight improvement
□ No changes
□ Deterioration

9. **After how much time did you notice significant changes in your physical condition?**

□ Up to 3 months
□ 3–6 months
□ 6–12 months
□ Over a year

10. **Rate the impact of the following training components on the development of physical fitness:**
(1 - very low, 5 - very high)

- Technical training: □ 1 □ 2 □ 3 □ 4 □ 5
- Choreography: □ 1 □ 2 □ 3 □ 4 □ 5
- Stretching: □ 1 □ 2 □ 3 □ 4 □ 5
- Physical conditioning: □ 1 □ 2 □ 3 □ 4 □ 5

11. **How often do you train the following components per week?**

- Technical training: □ 1–2 times □ 3–4 times □ 5–6 times □ Daily
- Choreography: □ 1–2 times □ 3–4 times □ 5–6 times □ Daily
- Stretching: □ 1–2 times □ 3–4 times □ 5–6 times □ Daily
- Physical conditioning: □ 1–2 times □ 3–4 times □ 5–6 times □ Daily

12. **What additional health benefits do you notice from dance training?**
(you may select more than one answer)

□ Improved posture
□ Stress reduction
□ Better sleep quality
□ Improved well-being
□ Other (please specify): ________________________

13. **Rate the effectiveness of different forms of physical preparation:**
(1 - ineffective, 5 - very effective)

- Strength training: □ 1 □ 2 □ 3 □ 4 □ 5
- Cardio training: □ 1 □ 2 □ 3 □ 4 □ 5
- Pilates/Yoga: □ 1 □ 2 □ 3 □ 4 □ 5
- Functional training: □ 1 □ 2 □ 3 □ 4 □ 5

14. **What motivates you most to train?**
(you may select more than one answer)

□ Improving physical fitness
□ Dance development
□ Sports competition
□ Social aspects
□ Other (please specify): ________________________

15. **What are the main obstacles to regular training?**
(you may select more than one answer)

□ Lack of time
□ Fatigue
□ School/work obligations
□ Health problems
□ Other (please specify): ________________________