DETERMINANTS OF LOW BACK PAIN IN SEMI-PROFESSIONAL AND PROFESSIONAL DANCERS OF VARIOUS DANCE STYLES: A CROSS-SECTIONAL STUDY

DETERMINANTES DEL DOLOR LUMBAR EN BAILARINES SEMIPROFESIONALES Y PROFESIONALES DE DIVERSOS ESTILOS DE DANZA: ESTUDIO TRANSVERSAL

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Abstract

Non-specific low back pain is highly prevalent among dancers due to the physical demands of their discipline. This study aimed to identify factors associated with this condition in semi-professional and professional dancers from various styles, examining its functional impact. A cross-sectional study was conducted with dancers over 18 years old from the province of Llanquihue. Assessments included interviews, dance background, body composition via DEXA, deep abdominal muscle function using pressure biofeedback (Stabilizer®), and functional measures using VAS and the Oswestry Disability Index. Low back pain was reported by 57.7% of participants, with higher prevalence in classical and urban styles. Functional disability was low (1.46%), although tasks requiring higher biomechanical load, such as standing or lifting, showed greater impact. Significant correlations were found between post-practice pain and body composition parameters, particularly visceral fat. Semi-professional dancers demonstrated greater motor control inefficiency compared to professionals. Results suggest that technical and physical demands specific to each dance style contribute to the occurrence of pain, while motor control deficits and functional asymmetries represent additional relevant factors. Although overall body composition was favorable, certain fat distribution patterns were associated with higher pain levels. These findings highlight key factors that should be considered when designing preventive and management strategies for low back pain in dancers.

Keywords: Dancers, low back pain, body composition, DEXA.

Resumen

El dolor lumbar inespecífico es frecuente en bailarines debido a las altas demandas físicas de la disciplina. Este estudio identificó factores determinantes de este dolor en bailarines semiprofesionales y profesionales de diversos estilos, analizando su impacto funcional. Se realizó un estudio transversal con bailarines mayores de 18 años de la provincia de Llanquihue. La evaluación incluyó entrevista, antecedentes de práctica, composición corporal mediante DEXA, control motor y fuerza abdominal profunda con biorretroalimentación (Stabilizer®), y funcionalidad con EVA y Oswestry. El 57,7% reportó dolor lumbar, observándose mayor prevalencia en los estilos clásico y urbano. La discapacidad funcional fue baja (1,46%), pero actividades de alta carga biomecánica, como estar de pie o levantar peso, mostraron mayor afectación. Se identificaron correlaciones entre dolor post práctica y parámetros de composición corporal, especialmente grasa visceral. Los semiprofesionales presentaron mayor ineficiencia en el control motor comparados con los profesionales. Los resultados sugieren que las demandas técnicas específicas de cada estilo influyen en la aparición del dolor, mientras que las asimetrías funcionales y déficits de control motor constituyen factores relevantes. Aunque la composición corporal global fue favorable, ciertas distribuciones de grasa podrían aumentar el riesgo de dolor. Estos hallazgos destacan la necesidad de abordar control motor, biomecánica y composición corporal como elementos clave en la prevención y manejo del dolor lumbar en bailarines.

Palabras clave: Bailarines, dolor lumbar, composición corporal, DEXA.

Introduction

Dancers from different styles may be classified into three main categories: amateur, semi-professional, and professional dancers. Amateur dancers engage in dance as a recreational activity, without the pressure of competition, primarily for personal enjoyment. The pathologies observed in this population are usually associated with factors external to dance practice itself. Semi-professional dancers, in contrast, have formal dance training and participate in paid performances, although dance is not their primary occupation. Finally, professional dancers engage in dance in a formal, continuous, and remunerated manner, making it their main occupation and source of income.

Currently, dancers are required to achieve an exceptional level of physical capacity, developing athletic attributes such as strength, endurance, postural control, flexibility, and coordination (Russell, 2013). These high physical demands increase the risk of injuries, including non-specific low back pain (NSLBP), one of the most common complaints among dancers across different genres and technical levels (Angoules et al., 2018). This condition negatively affects quality of life and may limit artistic performance, highlighting the importance of understanding its underlying causes and associated factors. In this context, the lack of multifactorial studies in this population should be emphasized, reinforcing the essential role of physical therapists in the performing arts for injury prevention and preservation of the body as an instrument of expression.

In clinical practice, NSLBP is commonly associated with biomechanical alterations of the lumbar spine (Casado Morales et al., 2008), which may manifest as either acute or chronic pain. However, beyond mechanical dysfunctions and motor control impairments, recent evidence suggests that body composition particularly fat mass distribution and the presence of visceral adipose tissue (VAT) may influence both the perception and persistence of low back pain (Cholewicki et al., 2019). These parameters are especially relevant in physically active populations, in which performance demands and repetitive loading may interact with metabolic and structural factors.

Based on these observations, interest has emerged in identifying the determinants of NSLBP in dancers and determining whether these factors differ according to specific dance styles. Therefore, the aim of this study is to identify factors associated with NSLBP in dancers from different dance styles and levels of professionalization, and to analyze their functional consequences on performance and overall health status.

A descriptive cross-sectional study was conducted in classical, urban, ballroom, and folk dancers from the Llanquihue province during 2024 who have experienced NSLBP within the last year without a specific medical diagnosis. Sociodemographic data, dance practice history, and body composition variables (fat mass, lean mass, bone mineral density, and regional DEXA-derived parameters) will be collected, together with assessments of pain, motor control, and functionality using the Visual Analog Scale (VAS), the Oswestry Disability Index, and pressure biofeedback evaluations. This study will provide a more comprehensive understanding of the factors associated with NSLBP in dancers, distinguishing them from those commonly observed in the general population, and may contribute to the development of more effective preventive strategies tailored to the specific demands of dance practice.

Materials and Methods

Data collection was carried out during a face-to-face assessment session through a self-report questionnaire and standardized physical evaluations. Variables were classified into the following categories: demographic variables (age, sex, experience, dance style, and professional level); health- and training-related variables (low back pain, training hours, Visual Analog Scale [VAS] score, and Oswestry Disability Index percentage); and objective assessment variables (body composition assessed by DEXA and motor control evaluated using the Stabilizer® device). Additional variables were also included, such as training surface, recovery strategies, and participation in competitions.

Participants

The study population consisted of professional and semi-professional dancers from the province of Llanquihue. A census sampling strategy was implemented through invitations directed to dance companies, academies, and independent dancers. The study included both female and male dancers practicing different dance styles, including classical dance (ballet,

contemporary, jazz, and lyrical), ballroom dance (ballroom, tango, heels, salsa, and bachata), urban dance (hip-hop, breaking, reggaeton, and K-pop), and folk dance (national and international).

Participants aged over 18 years, actively engaged in dance practice, and who had experienced one or more episodes of dance-related low back pain during the previous 12 months were included. The main exclusion criteria were: age under 18 years, confirmed spinal injuries, and previous spinal surgery within the 12 months prior to evaluation.

The identification of non-specific low back pain (NSLBP) was performed using a mixed procedure combining self-report and clinical screening by exclusion. Initially, participants reported the presence and characteristics of pain, including its relationship with dance practice, duration, recurrence, and previous medical diagnosis. Subsequently, a targeted questionnaire was administered to exclude specific spinal conditions. Participants reporting confirmed diagnoses such as disc herniation, discopathy, spondylolisthesis, vertebral fractures, inflammatory disorders, or previous spinal surgery were excluded. In doubtful cases, additional information regarding associated symptoms (pain irradiation, neurological deficits, red flags, previous trauma, or recent medical consultation) was obtained. Only dancers presenting symptoms consistent with low back pain without an identifiable structural etiology were included. Episodes of lumbago without a specific diagnosis were considered within the inclusion criteria.

Participant recruitment and assessment were conducted between November 7 and December 23, 2024. During this period, a total of 89 participants were evaluated, of whom 11 were excluded due to the presence of a specific low back pain diagnosis, resulting in a final sample of 78 dancers.

Sample Size Justification

The sample was obtained through convenience sampling and included active semi-professional and professional dancers from academies and dance groups in the province of Llanquihue. Although no formal *a priori* power analysis was performed before recruitment, sample size estimations were based on previous studies conducted in dance populations (Swain et al., 2018; Roussel et al., 2013), which suggest that a sample size exceeding 70 participants is adequate to detect moderate associations ($r \geq 0.30$) with 80% statistical power and a 95% confidence level. Consequently, the final sample of 78 dancers was considered sufficient to address the analytical objectives of the study and to support the validity of the reported correlations.

Instruments

The following assessments and scales were applied: A) A self-report questionnaire covering different aspects relevant to the study, including demographic data, characteristics of dance practice, and variables related to lumbar spine injuries. B) The Oswestry Disability Index (ODI), administered to identify low back pain-related disability by evaluating limitations in activities of daily living caused by lumbar pain. C) The Visual Analog Scale (VAS), used to objectively assess the intensity of low back pain through a numerical or graphical rating provided by the dancers. D) Pressure biofeedback assessment using the Stabilizer® device, which evaluated muscular function and motor control in the lumbar region through specific exercises designed to measure transversus abdominis muscle contraction and lumbopelvic motor control. E) Dual-energy X-ray absorptiometry (DXA), used to assess body composition in dancers.

Procedure

Participating dancers attended a single evaluation session at Research Laboratory #450 of the Universidad de Los Lagos, located on Guillermo Gallardo Street, Puerto Montt, Los Lagos Region, Chile. This process was carried out under the supervision and authorization of the laboratory coordinator, the Director of the Physical Therapy Program, and the Director of the Department of Health at Universidad de Los Lagos. During theevaluationsession, dancers:

1. Completed a self-report questionnaire to collect detailed information regarding medical history, dance practice, and previous injuries.
2. Completed the Oswestry Disability Index and the Visual Analog Scale to assess low back pain and its effects on functionality, when applicable in dancers who reported low back pain.
3. Underwent a physical evaluation using the Stabilizer® pressure biofeedback device to assess the muscular function of the deep abdominal stabilizing muscles and lumbopelvic motor control.

4. Underwent DXA assessment to measure body composition.

Whole-body and specific segment measurements (lumbar spine) were performed to identify potential imbalances. All assessments were conducted by the same primary examiner, who had specialized training in motor control and body composition assessment, thereby minimizing inter-rater bias. Prior to data collection, the examiner participated in a technical training process regarding the use of the Stabilizer® device and the iDXA densitometer. All assessments were conducted according to standardized operating procedures established for each instrument. The examiner was not blinded to the professional level of the participants, as this information was obtained during the initial interview; however, all measurements were performed following a consistent assessment protocol to minimize bias.

Statistical Analysis

Data were initially organized in Microsoft Excel and subsequently exported to SPSS (Statistical Package for the Social Sciences) for analysis. A descriptive analysis was performed for continuous variables —such as age, years of dance experience, weekly training hours, low back pain intensity (VAS), percentage of functional disability (Oswestry), body composition parameters (DEXA), and lumbar stabilization efficiency (Stabilizer®) using measures of central tendency and dispersion (mean, standard deviation, minimum, and maximum). For categorical variables such as sex, dance style, professional level, presence of low back pain, level of functional disability, and stabilization efficiency— absolute frequencies and percentages were calculated.

The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Variables with normal distribution were analyzed using parametric tests (such as Student's t-test for group comparisons), whereas non-normally distributed variables were analyzed using non-parametric tests (such as the Mann–Whitney U test).

To explore relationships between variables, Pearson correlation coefficients were used when continuous variables presented normal distribution, while Spearman correlation coefficients were applied for ordinal variables or variables with non-normal distribution. For example, relationships between years of experience and muscle mass, as well as between functional disability and training hours, were analyzed. In addition, 95% confidence intervals for Pearson correlation coefficients were calculated using Fisher's z transformation in order to improve statistical precision and transparency. The reported correlations corresponded to unadjusted bivariate analyses; partial correlations controlling for professional level were also performed.

Furthermore, contingency tables and chi-square tests were applied to evaluate associations between categorical variables, such as the relationship between professional level and the presence of low back pain, or between lumbar stabilization efficiency and level of functional disability.

This approach allowed for a comprehensive characterization of the sample and the analysis of relevant associations between biomechanical, clinical, and professional factors in dancers.

Results

Demographic Results and General Characteristics

Data from 78 dancers were analyzed, of whom 74.4% were women, with a mean age of 28.6 ± 7.7 years (range: 18–56 years). Mean body mass index (BMI) was 24.7 ± 3.6 kg/m², with 59% classified within the normal range, 29.5% as overweight, 10.3% as obese, and 1.3% as underweight. Regarding professional level, 30.8% identified as professional dancers and 69.2% as semi-professional dancers.

The mean age of dance initiation was 13.5 ± 6.6 years, with an average of 14.8 ± 7.8 years of dance experience and 10.9 ± 9.3 weekly training hours. Regarding dance style, 30.8% practiced classical dance, 25.6% ballroom dance styles, 24.4% folk dance, and 19.2% urban dance, reflecting considerable technical diversity within the sample.

A total of 57.7% of participants reported low back pain, demonstrating a high prevalence of this symptom among the evaluated dancers (Table 1).

Table 1

Characteristics of the Study Population (n=78)

Variable	Mean ± SD or n(%)	Minimum	Maximum
Age (years)	28.61 ± 7.66	18.00	56.00
Sex, n (%) - Female - Male	58 (74.4%) 20 (25.6%)		
Body mass (kg)	65.15 ± 10.67	42.00	98.70
Height (cm)	162.19 ± 7.80	145.00	185.00
Body mass index (kg/m2) Normal weight Overweight Obesity Underweight	24.72±3.59 46 (59%) 23(29.5%) 8 (10.3%) 1 (1.3%)	18.10	38.60
Dance Level, n (%) Professional Semi-professional	24 (30.8%) 54 (69.2%)		
Age at start of dance (years)	13.46 ± 6.59	4.00	30.00
Years of dance practice	14.83 ± 7.77	2.00	38.00
Hours per week of training	10.85 ± 9.31	1.00	49.00
Dance style, n (%) Urban Ballroom Classical Folk	15 (19.2%) 20 (25.6%) 24 (30.8%) 19 (24.4%)		
Presence of low back pain, n (%) Yes No	45 (57.7%) 33 (42.2%)		

Note. SD = Standard deviation

Dancers' Habits

Most participants reported following an omnivorous diet (48.7%), followed by a Mediterranean diet (28.2%), vegetarian diet (12.8%), and vegan diet (2.6%). Only 9% reported receiving nutritional counseling, despite 88.5% considering nutrition to directly influence their performance.Regarding substance use, 64.1% reported alcohol consumption and 41% reported smoking. More than half of the dancers (56.4%) engaged in complementary physical activity, with gym-based training being the most frequently reported modality (17.9%). Regarding warm-up routines, 96.2% reported performing a warm-up before rehearsals, predominantly consisting of joint mobility exercises (70.5%) and stretching (52.6%). Inaddition, 75.6% reported using post-rehearsalrecovery strategies, mainly stretching (53.8%) and self-myofascial release or self-massage techniques (32.1%).

Competitions and Preparation

A total of 55% of dancers had participated in competitions, with greater participation in international (37.2%) and national events (32.6%). The median competitive experience was 6 years, with an average of one competition per year. Only 15% reported engaging in specific preparation for competitions, mainly by increasing rehearsal hours (41.8%) and general physical training (34.8%). Additionally, 47% included mental training strategies, such as visualization and anxiety management, whereas 53% did not consider this dimension in their preparation. Most dancers participated in an average of two dance styles per competition, with a maximum of five, indicating high physical demands and versatility.

Psychological Aspects

A total of 48.7% of dancers considered that stress negatively affected their performance, while 62.8% associated stress with physical complaints such as low back pain. Although 57.7% implemented self-care and stress-management strategies, 42.3% reported having no coping strategies. Furthermore, 73.1% reported that physical or emotional pain had affected their motivation to continue dancing.

Medical History and Low Back Pain

A total of 65.4% of participants reported dance-related injuries, and 38.5% reported experiencing non-specific low back pain at the time of evaluation. Only 37.2% had sought professional healthcare for low back pain management, whereas 62.8% relied on self-managed strategies. Although 24.4% reported medication use, most dancers preferred non-pharmacological approaches, and 74.4% followed prevention programs based on self-directed information. In addition, 47.4% attributed

low back pain to technical or training-related errors, and only 21.8% had received formal preventive treatment. The most commonly recognized preventive strategies included muscle strengthening (51.3%) and stretching (48.7%).

Perception of Healthcare Professionals

Although 82.1% of participants reported trusting healthcare professionals, only 26.9% considered that these professionals understood the specific needs of dancers. A total of 33.3% perceived a lack of specialized knowledge, while 23.1% reported experiences of indifference or lack of empathy. Only 15.4% reported positive experiences with professionals trained in dance-related healthcare contexts.

Pain and Functionality

The evaluated dancers demonstrated low levels of functional disability according to the Oswestry Disability Index (Table 2), with a mean score of only 1.46%, indicating that pain did not significantly affect activities of daily living. However, an increase in pain intensity after dancing was observed (mean VAS score pre-dance: 1.13; post-dance: 2.67), suggesting that specific physical demands associated with dance may generate acute discomfort following training or performance.

Pain intensity and its functional impact varied according to dance style and professional level. Semi-professional dancers reported greater discomfort, particularly in physically demanding styles such as classical and urban dance, affecting functions such as lifting heavy objects, walking, and prolonged standing. Activities including sleep and sexual life also showed pain-related impairment, with greater impact observed among less highly trained dancers.

Table 2

Pain and Disability Characteristics of the Study Population

Variable	Mean ± SD	Minimum	Maximum
Oswestry Disability Index (Disability percentage, %)	1.46 ± 1.81	0.00	6.00
Pain Intensity before dancing (NPRS)	1.13 ± 1.63	0.00	6.20
Pain Intensity after dancing (NPRS)	2.67 ± 2.42	0.00	9.10

Note. NPRS= Numeric Pain Rating Scale, SD = Standard deviation

Deep Abdominal Muscle Strength Assessment

Using pressure biofeedback with the Stabilizer® device, activation of deep abdominal muscles, including the transversus abdominis and internal oblique muscles, was evaluated (Table 3). Mean values in the prone position were 75.35 mmHg, while mean values in the supine position were 51.42 mmHg. During bipedal loading and supine assessment, both sides showed similar mean values of approximately 42 mmHg.

When muscular performance efficiency was classified, a higher percentage of professional dancers were categorized as efficient (33.3%) compared with semi-professional dancers (29.6%). In contrast, 31.5% of semi-professional dancers demonstrated inefficient performance, suggesting lower activation and/or reduced motor control of the deep stabilizing musculature.

Table 3

Muscle Strength Values Assessed Using the Stabilizer® Device

Variable	Mean ± SD	Minimum	Maximum
TrA and IO in prone	75.35 ± 14.48	48.00	120.00
TrA in supine	51.42 ± 10.73	40.00	90.00
TrA in bipedal load, right side (D°)	42.46 ± 10.53	20.00	70.00
TrA in bipedal load, left side (I°)	41.12 ± 11.47	0.00	64.00
TrA in supine, right side (D°)	42.35 ± 13.24	20.00	100.00
TrA in supine, left side (I°)	43.79 ± 13.24	20.00	120.00
Hip flexor stretch, right side (D°)	87.97 ± 16.51	30.00	200.00
Hip flexor stretch, left side (I°)	86.71 ± 32.17	30.00	180.00
Rectus femoral stretch test, right side (D°)	40.68 ± 9.454	20.00	70.00
Rectus femoral stretch test, left side (I°)	40.08 ± 9.17	20.00	80.00

Note. Abbreviation: TrA = Transversus abdominis; IO = Internal oblique; D° = Right; I° = Left. Values are presented as mean ± standard deviation.

Body Composition

DEXA analysis showed that 50% of dancers presented normal weight, while 28.6% were classified as overweight and 14.3% as obese. Underweight status was uncommon (1.4%) and was observed only among semi-professional dancers in the classical dance style. Professional dancers from ballroom and classical dance styles tended to present healthier weight profiles, whereas urban dance showed a higher prevalence of overweight status. Among semi-professional dancers, the folk dance style demonstrated a high proportion of normal weight participants, although obesity cases were also identified in classical and folk dance styles (Table 4).

Regarding specific body composition parameters, mean bone mineral density was 1.16 g/cm², reflecting adequate bone health. Lean mass was predominantly distributed in the lower limbs, demonstrating an appropriate functional distribution pattern. Fat mass was mainly concentrated in the gynoid region, which is generally associated with lower metabolic risk. Mean body fat percentage was 32.64%. Visceral adipose tissue (VAT) levels were lower than subcutaneous adipose tissue (SAT) levels, with a VAT/SAT ratio of 0.40, which is considered favorable in terms of cardiovascular risk.

Table 4

Body Composition Results Assessed by DXA

Parameter	Mean ± SD	Minimum	Maximum
Bone mineral density (g/cm²)			
Upper limbs	0.78 ± 0.14	0.55	1.27
Lower limbs	1.18 ± 0.14	0.84	1.53
Spine	1.12 ± 0.14	0.88	1.64
Total body	1.16 ± 0.12	0.87	1.46
Z score	0.55 ± 1.05	-2.40	3.20
Lean mass (g)			
Upper limbs	4588.49 ± 1468.57	2651.00	8239.00
Lower limbs	14537.27 ± 3034.49	9122.00	21828.00
Android region	2803.62 ± 607.12	1887.00	4221.00
Gynoidregion	6534.76 ± 1335.94	4524.00	10312.00
Total body	42146.71 ± 8282.93	27131.00	62740.00
Total percentage (%)	30.19 ± 6.19	18.40	44.00
Fatmass (g)			
Upper limbs	2176.06 ± 775.71	1013.00	4918.00
Lower limbs	6915.36 ± 2461.69	3741.00	16146.00
Android region	1564.21 ± 805.16	422.00	4452.00
Gynoidregion	3665.72 ± 1213.14	1827.00	8031.00
Total body	20371.33 ± 7280.38	10058.00	49475.00
Total percentage (%)	32.64 ± 8.41	18.30	54.60
SAT (g)	141.59 ± 74.26	13.00	427.00
VAT (g)	54.29 ± 48.92	3.00	290.00
VAT/SAT ratio	0.40 ± 0.37	0.03	2.69

Note. Abbreviations: DXA, dual-energy X-ray absorptiometry; SAT, subcutaneous adipose tissue; VAT, visceral adipose tissue; VAT/SAT ratio, visceral adipose tissue to subcutaneous adipose tissue ratio. Values are presented as mean ± standard deviation.

Table 5 presents the correlations between different fat mass parameters and post-dance pain levels. Additionally, 95% confidence intervals are reported to provide greater precision in the estimation of each correlation coefficient.

Table 5

Correlation Between Fat Mass Parameters and Post-Dance Pain Levels (n = 78)

Parameter	r	95% CI	p
Android fatmass	0.29	0.07 to 0.48	0.01
Gynoidfatmass	0.27	0.05 to 0.46	0.02
Total bodyfatpercentage	0.29	0.07 to 0.48	0.01
Total fatmass	0.29	0.07 to 0.48	0.01
SAT	0.23	0.01 to 0.43	0.04
VAT	0.38	0.17 to 0.56	< 0.001
VAT/SAT ratio	0.24	0.02 to 0.44	0.04

Note. Abbreviations: VAT = visceral adipose tissue; SAT = subcutaneous adipose tissue. r = Pearson correlation coefficient; CI = confidence interval.

Body Asymmetry

The asymmetry index (AI) revealed moderate differences between body sides, with higher values observed for bone mass (overall mean: 3.31%), particularly in the upper limbs and trunk regions. Lean mass demonstrated lower asymmetry levels (mean: 1.34%), whereas fat mass showed slightly greater variability, especially in the upper extremities (up to 15.10%). When comparing professional levels, semi-professional dancers exhibited greater muscular imbalance in the upper limbs (4.32% vs. 3.37%), which may be associated with lower levels of specific training or reduced motor control.

Discussion

The sample was predominantly composed of women (74.4%), which is consistent with the trend widely documented in artistic disciplines, particularly dance. This distribution reflects a persistent sociocultural pattern, although increasing male representation was observed in styles such as urban dance. The mean age of participants (28.61 ± 7.66 years) suggests that a large proportion were in a stage of technical maturity, compatible with greater cumulative training loads and a potentially increased risk of injury particularly spinal disorders that have been widely reported in professional dancers (Gottschlich & Young, 2011; Angoules et al., 2018).

The diversity of dance styles included in the study (classical, folk, urban, and ballroom) allowed relevant differences to be identified. Classical dance was associated with a higher proportion of professional dancers, whereas urban and folk dance styles were mainly composed of semi-professional dancers. These differences, together with the variability in weekly training load (10.85 ± 9.31 hours), highlight the need for preventive strategies adapted to both dance style and technical level.

The prevalence of non-specific low back pain (NSLBP) in this population was 57.7%, consistent with previous studies conducted in dancers (Roussel et al., 2013). Similar findings have also been reported in Chilean professional dancers, where low back pain has been identified as one of the most common musculoskeletal complaints (Vergara Quilodrán & Pinto Retamal, 2022).

Pain intensity increased following dance practice (VAS: 2.67 ± 2.42), suggesting a relationship with the mechanical demands of training, particularly in classical and urban dance styles. These disciplines are characterized by repetitive movements, jumps, hyperextensions, and unilateral loading, which may increase spinal stress and contribute to the development of low back pain (Cejudo et al., 2021).

In contrast, folk and ballroom dance styles demonstrated lower pain incidence, possibly due to lower axial loading demands and the use of more protective footwear (Kochman et al., 2024; Van Winden et al., 2019).

Despite the generally low functional impact reported (Oswestry: 1.46 ± 1.81%), pain affected specific daily activities, such as prolonged standing and lifting heavy objects. These findings are consistent with evidence associating deficits in lumbopelvic stabilization with greater functional disability (Roussel et al., 2013). The variation in VAS scores before and after rehearsal reinforces the importance of interventions focused on post-practice recovery and self-care education.

Motor control assessments revealed that professional dancers demonstrated better performance compared with semi-professional dancers. In the transversus abdominis and internal oblique activation test, 54.2% of professionals achieved moderate activation, whereas 31.5% of semi-professionals demonstrated inefficient activation. These findings are consistent with the mean values observed in the instrumental assessments, in which transversus abdominis activation reached a mean increase of 4.03 ± 2.45 mmHg and internal oblique activation 5.62 ± 3.68 mmHg in the overall sample, demonstrating poorer performance among semi-professional dancers.

In the rectus femoris stretching test, both groups showed substantial deficits, with more than 80% classified as inefficient, which may compromise pelvic mechanics and contribute to low back pain. Likewise, in the supine endurance test, the mean time achieved was 43.12 ± 17.45 seconds, reflecting generalized limitations in motor control and lumbopelvic stability. These findings suggest the need to strengthen core training and hip flexor flexibility programs, particularly among dancers at intermediate technical levels.

Body composition assessed through DEXA reflected characteristics consistent with the physical demands of dance practice. Mean bone mineral density (BMD) was 1.16 ± 0.12 g/cm², with higher values observed in the lower extremities and spine, suggesting structural adaptation to sustained training. Lean mass predominated in the lower limbs, and the overall body fat percentage (30.19 ± 6.19%) indicated adequate functional musculature.

The mean VAT/SAT ratio (0.40 ± 0.37) reflected a gynoid fat distribution associated with low metabolic risk.

Bone and lean mass asymmetries were generally low, although greater asymmetries were observed in classical dancers, which may be related to repetitive and style-specific technical movement patterns. Although these differences do not constitute a pathological factor per se, monitoring them is essential for preventing musculoskeletal imbalances that may contribute to low back pain or other dysfunctions.

Overall, these findings provide evidence regarding the relationship between dance style, technical level, body composition, and motor control with the presence of non-specific low back pain. Preventive and therapeutic approaches for this population should consider these variables in an integrated manner, with emphasis on education, self-care, and physical therapy interventions adapted to the performing arts context.

Conclusions

This study provides a comprehensive characterization of factors associated with non-specific low back pain (NSLBP) in dancers from the province of Llanquihue, considering body composition, motor control, and functional asymmetries. The findings demonstrated body composition characteristics consistent with the physical demands of dance, including adequate lean mass distribution and bone mineral density. However, mild asymmetries in bone and lean mass were identified, particularly in dance styles involving greater unilateral technical demands, such as classical and urban dance. Although low back pain did not severely impair overall functionality, it did affect specific activities, highlighting the need for personalized preventive strategies.

Despite the generally positive perception of healthcare professionals, such as physical therapists and physicians, the low frequency of professional consultation suggests the existence of barriers that should be addressed to improve access to specialized care for this population.

Study Limitations

Data collection was conducted during a period of the year characterized by high physical demands, which may have influenced participant availability and physical condition. Dance styles such as folk and urban dance were underrepresented, limiting the generalizability of the findings. In addition, the cross-sectional design prevents the establishment of causal relationships, while self-reported information may introduce reporting bias. Contextual variables such as training surface, footwear type, and warm-up routines were not considered, and barriers to accessing professional healthcare were not explored in depth. From a statistical perspective, the study primarily employed bivariate analyses without incorporating multivariate models or adjustment for relevant covariates such as sex, professional level, or years of experience, thereby limiting the ability to identify independent predictors of pain.

Furthermore, the absence of a control group composed of dancers without low back pain limited direct comparison between clinical profiles and reduced the possibility of establishing stronger causal inferences. Future studies should consider longitudinal designs, adjusted statistical models, and comparative groups to strengthen understanding of the determinants of low back pain in dancers.

Future Recommendations

Future research should focus on the development of longitudinal and experimental studies to evaluate the progression of pain and asymmetries over time, as well as the inclusion of a broader range of dance styles and experience levels. The incorporation of biomechanical assessment tools may provide a more detailed understanding of the functional impact of asymmetries. Additionally, promoting specialized training for healthcare professionals in dance-related health issues is recommended in order to encourage an interdisciplinary approach.

Preventive strategies aimed at optimizing motor control and lumbopelvic stability should be incorporated, particularly in dancers exposed to higher technical demands or presenting functional asymmetries. Preventive programs integrating deep core activation exercises, stabilizing muscle strengthening, postural education, and appropriate load management may contribute to reducing the incidence of low back pain. Likewise, periodic assessments of body composition and motor control are recommended to facilitate the early identification of risk patterns. Interdisciplinary collaboration is essential for designing dance style-specific interventions that promote safe and sustainable practice while supporting long-term performance and health among dancers.

Ethics Committee Statement

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Scientific Ethics Committee of Universidad de La Frontera (Approval No. 104/24), during ordinary session No. 18_24 held on November 5, 2024.

Conflict of Interest

The authors declare no conflicts of interest. The associated institutions had no influence on the study design, data analysis, or interpretation of the results.

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Authors' Contributions

Conceptualization: Carol Ule-Marín; Methodology: Nicole Fritz-Silva, Carol Ule-Marín; Software: N/A; Validation: Nicole Fritz-Silva, Carol Ule-Marín; Formal Analysis: Nicole Fritz-Silva; Investigation: Carol Ule-Marín; Resources: Nicole Fritz-Silva Carol Ule-Marín; Data Curation: Nicole Fritz-Silva, Carol Ule-Marín; Writing – Original Draft Preparation: Carol Ule-Marín; Writing – Review & Editing: Nicole Fritz-Silva, Carol Ule-Marín; Visualization: Carol Ule-Marín; Supervision: Nicole Fritz-Silva; Project Administration: Carol Ule-Marín; Funding Acquisition: N/A. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request at carol.ule@ulagos.cl.

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