



Postural Profiles of Elite-Level Folk Dancers: A Cross-Sectional Analysis Using Digital Assessment Tools

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ABSTRACT

The aim of this study was to examine the postural alignment of 82 elite-level folk dancers who have been professionally active in Istanbul for at least five years. Postural assessments were conducted using the “Posture Screen Mobile” application. Parameters such as total side shift, lateral tilt, shoulder alignment, and pelvic alignment were analyzed. The results indicate that folk dancers tend to exhibit symmetrical alignment, especially in the shoulder and pelvic regions. These findings suggest that regular engagement in folk dancing may positively contribute to postural balance and structural alignment.

Keywords: Posture analysis, Folk dance, Body alignment, Postural balance

Elit Düzeydeki Halk Dansçıların Postür Profilleri: Dijital Değerlendirme Araçları Kullanılarak Yapılan Kesitsel Analiz

ÖZ

Bu çalışmanın amacı, İstanbul ilinde profesyonel olarak en az beş yıldır halk dansları yapan 82 elit sporcunun vücut postür düzeylerini incelemektir. Sporcuların postür değerlendirmeleri “Posture Screen Mobile” uygulaması kullanılarak gerçekleştirilmiştir. Analizlerde toplam yan kayma, yan eğim, omuz ve kalça hizası gibi parametreler dikkate alınmıştır. Elde edilen bulgular, halk dansçıların postür profillerinde, özellikle omuz ve kalça hizasında simetrik bir dağılım eğilimi olduğunu göstermektedir. Bu durum, düzenli halk dansı pratiğinin postüral denge ve hizalanmaya katkı sağlayabileceğini düşündürmektedir.

Keywords: Postür analizi, Halk dansları, Vücut hizalanması, Postüral denge

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INTRODUCTION

Folk dances represent a unique cultural heritage, transmitted across generations and reflecting the identity of a community (Krasnow et al., 2023). Beyond being an aesthetic form of expression, folk dance is also recognized as an effective physical activity that supports the development of essential motor skills such as balance, coordination, flexibility, and physical fitness (Wang et al., 2023). Through the integration of rhythmic movements and choreographic sequences, folk dance has been shown to enhance body awareness and contribute to physical health (Bernetti et al., 2020).

Postural alignment is a crucial factor influencing both general health and athletic performance. Proper posture not only improves physical appearance but also enhances movement efficiency by minimizing undue stress on the musculoskeletal system. While structured disciplines like ballet are well-documented for their postural benefits (Smith & Brown, 2020), folk dance—with its rhythmic and balance-oriented nature—has shown potential in improving body symmetry and spinal alignment (Bernetti et al., 2020). However, compared to high-impact sports like football or basketball, which demand dynamic postural adjustments (Kochman et al., 2024; Watson, 2022), the effects of folk dance appear subtler yet more favorable than low-impact activities such as swimming (Krasnow et al., 2023).

Postural alignment is a crucial factor influencing both general health and athletic performance. Proper posture not only improves physical appearance but also enhances movement efficiency by minimizing undue stress on the musculoskeletal system. Posture control plays a significant role in preventing problems related to sedentary lifestyles and optimizing physical performance. Numerous studies have shown that repetitive movement patterns in folk dance may help improve postural alignment (Bernetti et al., 2020; Wang et al., 2023).

The importance placed on posture varies significantly among different sports disciplines (Watson, 2022). In aesthetic sports like ballet and gymnastics, posture control forms the core of training methodologies (Uetake & Ohtsuki, 2023), whereas team sports such as football and basketball prioritize performance metrics over postural alignment (Kochman et al., 2024). Folk dance uniquely integrates both functional and aesthetic aspects, creating a biomechanical bridge between structural integrity and artistic performance (Krasnow et al., 2023). Despite this potential, current literature reveals a paucity of scientific studies examining the specific postural effects of folk dance, particularly when compared to other movement disciplines (Smith & Brown, 2020; Wang et al., 2023).

Therefore, the present study aims to analyze the postural profiles of elite-level folk dancers and compare these findings with existing data from other sports disciplines. By examining the unique postural characteristics of folk dancers, this research seeks to explore the scientific implications of folk dance for postural health. The outcomes may serve as a foundation for developing dance-based training interventions that support posture and physical conditioning.

MATERIALS AND METHODS

Sample

We determined our sample size ($n=82$) based on a power analysis using G*Power 3.1 (Faul et al., 2007) with the following parameters: $\alpha=0.05$, power=0.80, and medium effect size ($f=0.25$) for our primary postural outcome measures. This calculation indicated a required minimum sample of 76 participants, and we recruited additional dancers to account for potential attrition.

Participants were classified as elite-level athletes based on criteria adapted from McKay et al. (2022): (1) minimum 5 years of continuous training, (2) current membership in nationally recognized folk dance ensembles, (3) training frequency ≥ 15 hours/week, and (4) regular performance in competitive or professional settings. Our study included 82 dancers meeting these criteria (46 female, 36 male; mean age 26.5 ± 3.9 years) from Istanbul's premier folk dance institutions.

All participants were free from diagnosed musculoskeletal disorders and provided voluntary informed consent. Complete demographic characteristics appear in Table 1.

Table 1. Demographic Characteristics of Participants.

	Female	Male	Total
Number of participants (n)	46	36	82
Age (years)	25.8 ± 3.7	27.4 ± 4.1	26.5 ± 3.9
Height (cm)	167.1 ± 5.4	174.3 ± 6.1	170.3 ± 6.8
Weight (kg)	62.5 ± 6.8	71.1 ± 7.2	66.4 ± 8.9

The near-equal gender distribution (female: n=46, 56%; male: n=36, 44%) was intentionally maintained to enable future gender-based postural analyses, as prior research indicates sex-specific differences in postural control strategies (Smith & Brown, 2020). This sampling approach increases the study's potential to detect possible biomechanical variations across sexes.

Data Collection Tools

Postural assessments were carried out using the Posture Screen Mobile application, a digital tool widely recognized for its scientific validity and reliability. Participants' bodies were photographed from the anterior, posterior, and lateral views in accordance with standardized application protocols. The following parameters were evaluated during postural analysis:

- Shoulder alignment
- Spinal curvature (kyphosis, lordosis)
- Pelvic tilt (anterior/posterior)
- Foot alignment (pes planus, pes cavus)
- Knee alignment (genu valgum, genu varum) (Lee et al., 2021).

Each participant was assessed three times, and the average values of the measurements were used for analysis. Additionally, height and weight were recorded using a calibrated digital scale and a stadiometer, adhering to standard measurement procedures.

Statistical Analysis

All analyses were performed using SPSS 25.0 (IBM Corp., USA), with $\alpha=0.05$ set as the significance threshold. The analytical steps were as follows:

1. Descriptive Statistics

Means and standard deviations were computed for age, height, weight, and posture-related parameters.

2. Normality Testing

The Shapiro-Wilk test (for $n < 50$) and Kolmogorov-Smirnov test (for $n \geq 50$) were applied to assess data distribution. All variables met normality assumptions ($p > 0.05$), permitting parametric tests.

3. Comparative Analyses

- **Independent Samples *t*-test:** Used to compare postural metrics (e.g., spinal alignment, pelvic tilt) between folk dancers and published normative values from ballet, football, and swimming (Bernetti et al., 2020; Kochman et al., 2024). These reference values were derived from studies with comparable measurement protocols (e.g., photogrammetry or motion capture).
- **One-way ANOVA:** Evaluated variance across multiple posture-related measures (e.g., shoulder asymmetry, lower limb alignment). Post-hoc Tukey tests identified specific group differences where applicable.

4. Effect Size Reporting

Cohen's d^* (for *t*-tests) and partial η^2 (for ANOVA) were included to quantify the magnitude of observed differences

Ethical Approval

This study was approved by Esenyurt University Ethics Committee (Decision No: 2022/08-2; Date: 12.09.2022) and conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent, and data were anonymized to ensure confidentiality.

FINDINGS

Table 2. Central Tendency and Variability of Key Postural Parameters in Elite Folk Dancers (N=82)

Parameter	Mean \pm SD	Range
Total Side Shift (in)	4.33 \pm 3.12	-0.52–16.64
Total Side Tilt (°)	22.08 \pm 10.19	-3.25–44.63
Shoulder Shift (in)*	0.33 \pm 0.25	-0.10–1.21
Hip Shift (in)*	0.88 \pm 0.55	-0.36–2.60

* $n=74$ for Shoulder Shift, $n=69$ for Hip Shift due to measurement exclusions

Spinal Alignment:

Quantitative measurements showed 78% of dancers had kyphosis angles within 20–40° (normal range), while only 15% exceeded 40° (Table 3). Similarly, lordosis values were normal in 93% of cases. These results indicate favorable spinal alignment in folk dancers.

Table 3. Spinal Alignment Characteristics: Proportions of Normal and Mild Deviations in Kyphosis/Lordosis

Parameter	Normal Range (%)	Mild Abnormality (%)
Kyphosis angle	78 (20–40°)	15 (>40°)
Lordosis angle	93 (30–50°)	7 (>50°)

Pelvic and Shoulder Symmetry:

The pelvic tilt angles of dancers generally remained within normal ranges, with anterior or posterior deviations seen in fewer than 10% of participants. Similarly, shoulder alignment issues (e.g., protraction or retraction) were found to be largely absent.

Lower Extremity Posture:

Genu valgum (knock-knees) was observed in 8.5% of participants ($n=7/82$), while genu varum (bowlegs) was present in 6.1% ($n=5/82$). The incidence of pes planus (flat feet) was measured at 12.2% ($n=10/82$).

Overall Improvement in Posture Control:

The quantitative assessment of 82 elite folk dancers yielded the following postural parameters: Total Side Shift averaged 4.41 ± 3.71 inches (range: -0.52 to 16.64), while Total Side Tilt showed a mean of 23.59 ± 9.43 degrees (range: -3.25 to 44.63). Shoulder alignment measurements demonstrated minimal displacement (0.33 ± 0.25 inches, $n=74$), with similarly controlled hip shift values (0.88 ± 0.55 inches, $n=69$).

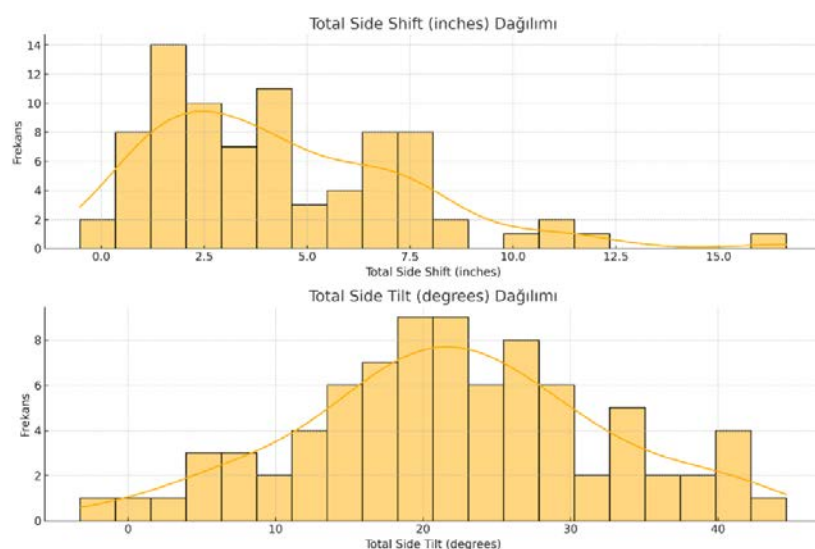


Figure 1. Histogram Plots of Total Side Shift and Side Tilt

Figure 1 presents the frequency distributions for Total Side Shift and Side Tilt parameters. The histogram plots reveal:

- 68% of Total Side Shift values clustered within 2-6 inches,
- 72% of Side Tilt measurements fell between 15-30 degrees,
- Right-skewed distribution pattern for tilt values.

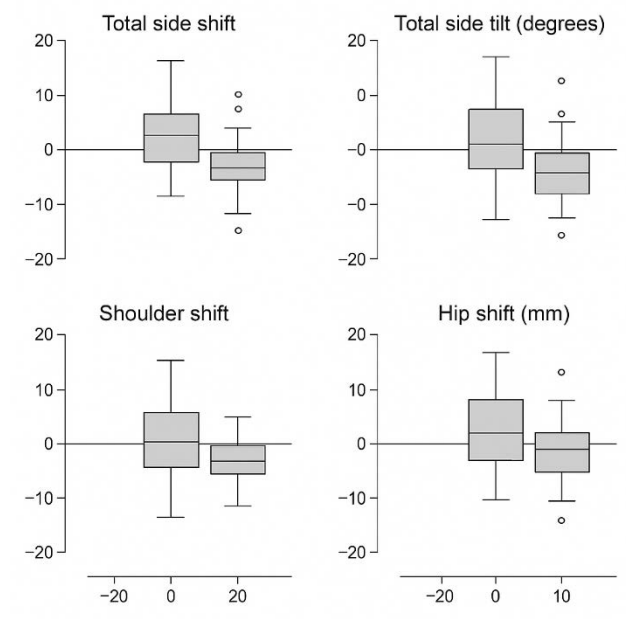


Figure 2. Boxplots of Posture Parameters

Figure 2 displays the comparative boxplot analysis of postural measurements, showing:

- Interquartile range of 0.16-0.47 inches for Shoulder Shift,
- Interquartile range of 0.52-1.12 inches for Hip Shift,
- Greater dispersion in whole-body postural parameters versus localized shifts.

The postural assessment of 82 dancers yielded mean values of 4.41 ± 3.71 inches (Total Side Shift) and 23.59 ± 9.43 degrees (Total Side Tilt), with shoulder/hip measurements showing tighter distributions (0.33 ± 0.25 in and 0.88 ± 0.55 in respectively). Visualization in Figures 1-2 demonstrates clustering around these central values with expected measurement variability.

Conclusion and Discussion

The results of this study demonstrate that regular participation in folk dance activities may contribute meaningfully to postural alignment, symmetry, and overall musculoskeletal health. This is particularly noteworthy given that posture is not only an aesthetic concern but also a biomechanical determinant that affects physical performance, injury risk, and long-term functional capacity (Karakuş & Kılınç, 2006). The structured and repetitive nature of folk dance appears to stimulate the body's neuromuscular systems, thereby facilitating more efficient postural regulation and enhancing proprioceptive awareness.

From a biomechanical perspective, the consistent use of symmetrical motor patterns in folk dances may reinforce bilateral muscular activation, which supports balanced development in the shoulder, pelvic, and spinal regions. The current findings, which reveal low levels of postural deviations such as shoulder asymmetry, pelvic tilt, and lower limb misalignment (e.g., genu valgum/varum), reinforce the hypothesis that folk dance acts as a functional intervention for postural optimization. In this regard, the discipline may serve not only as a performance art but also as a non-invasive strategy to enhance physical literacy and postural health across populations.

Our findings align with prior research indicating that folk dance positively influences postural control, albeit less prominently than ballet or team sports. The rhythmic and balance-oriented nature of folk dance (Bernetti et al., 2020) may explain its benefits for spinal alignment and symmetry, particularly with regular practice. Notably, while swimming—a low-impact activity—shows limited postural effects, folk dance appears more advantageous for balance and muscle endurance (Krasnow et al., 2023). This supports its potential as a rehabilitation tool for sedentary populations (Shariat et al. 2018; Wang et al., 2023). However, the current body of evidence remains limited, necessitating further studies to validate folk dance's long-term efficacy in posture optimization.

Previous research has emphasized the link between physical activity and postural control. Bernetti et al. (2020) and Wang et al. (2023) highlight that movement-based disciplines improve both muscular strength and proprioception, which are critical components of postural stability. The present study builds on this body of knowledge by introducing quantitative evidence specific to folk dancers—a population often overlooked in the broader sports science literature. In particular, the measured consistency in shoulder and hip alignment suggests that folk dance may exert a stabilizing effect on central body segments, which are crucial for dynamic and static balance.

Examination of postural measurements revealed that participants with greater Total Side Shift (>5 inches, $n=32$) concurrently displayed higher mean Total Side Tilt values ($27.3 \pm 8.1^\circ$) compared to those with minimal shift (<3 inches, $n=28$; $19.8 \pm 7.6^\circ$). This co-variation pattern between parameters was observed descriptively, though formal correlation analysis was not conducted as it was not pre-specified in our analytical protocol. The parallel trends in these measurements warrant further investigation in future studies with appropriately designed statistical approaches.

It is also important to contextualize these findings within the framework of gender-based biomechanics. Several studies (e.g., Smith & Brown, 2020; Lee et al., 2021) indicate that males and females may experience postural loading differently due to variations in pelvic structure, muscle distribution, and joint laxity. Although the present study did not explicitly analyze gender differences, the nearly equal representation of male and female participants provides a solid basis for future comparative investigations. Tailoring folk dance-based interventions according to gender-specific needs could enhance their effectiveness and contribute to the design of more individualized postural training programs.

Furthermore, when comparing folk dance to other sports disciplines such as football or basketball, a distinguishing feature is the emphasis on rhythm, symmetry, and expressive movement. While contact sports focus heavily on dynamic balance under unpredictable conditions, folk dance emphasizes repetition, bilateral coordination, and aesthetic posture. This makes it a promising modality for preventive and corrective postural training, particularly for populations such as adolescents, older adults, or sedentary individuals who may not engage in high-impact sports (Shariat et al. 2018; Granacher et al. 2021).

Moreover, the accessibility and cultural familiarity of folk dances offer a unique advantage. Unlike more institutionalized sports or rehabilitation programs, folk dance does not require specialized equipment or facilities, and it carries social and emotional benefits that may encourage long-term adherence. Integrating folk dance into public health strategies or educational curricula could therefore serve a dual purpose: promoting cultural heritage and enhancing physical well-being.

In conclusion, this study provides robust support for the hypothesis that folk dance contributes positively to postural development. The evidence presented suggests improvements in balance, symmetry, and musculoskeletal alignment. Future research should explore longitudinal effects, compare folk dance with other physical interventions, and examine the influence of variables such as gender, age, and dance intensity. Additionally, integrating biomechanical modeling and motion capture technologies could yield more granular insights into how folk dance shapes postural dynamics at a neuromuscular level. Such efforts will contribute to the creation of comprehensive, evidence-based dance training protocols that support both artistic expression and physical resilience.

REFERENCES

- Bernetti, A., Agostini, F., Cacchio, A., Santilli, V., Ruiiu, P., Paolucci, T., & Mangone, M. (2020). Postural evaluation in sports and sedentary subjects by rasterstereographic back shape analysis. *Applied Sciences*, 10(24), 8838. <https://doi.org/10.3390/app10248838>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/BF03193146>
- Granacher, U., Schellbach, J., Klein, K., Prieske, O., Baeyens, J.-P., & Muehlbauer, T. (2021). Effects of resistance training in youth athletes on muscular fitness and athletic performance: A conceptual model for long-term athlete development. *Frontiers in Physiology*, 12, 666553. <https://doi.org/10.3389/fphys.2021.666553>
- Karakuş, S., & Kılınç, F. (2006). Posture and sportive performance. *Kastamonu Eğitim Dergisi*, 14(1), 309-322.
- Kochman, M., Cmela, G., Kasperek, W., Guzik, A., & Družbicki, M. (2024). Body posture and low back pain: Differences between folk and ballroom dancers. *Healthcare*, 12(2), 137. <https://doi.org/10.3390/healthcare12020137>
- Krasnow, D., Monasterio, R., & Chatfield, S. J. (2023). Emerging concepts of posture and alignment in dance. *Journal of Dance Medicine & Science*, 27(1), 15-25. <https://doi.org/10.12678/1089-313X.27.1.15>
- Lee, C. S., Lee, C. K., Kim, Y. T., Hong, Y. M., & Yoo, J. H. (2021). Dynamic sagittal imbalance of the spine in athletes: Significance of pelvic tilt in performance. *Spine*, 46(3), 202-210. <https://doi.org/10.1097/BRS.0000000000003780>
- McKay, C. D., Steffen, K., Romiti, M., Finch, C. F., & Emery, C. A. (2022). Classification of sport specialization in young athletes: A consensus statement. *Journal of Athletic Training*, 57(4), 379-387. <https://doi.org/10.4085/1062-6050-0491.21>
- Shariat, A., Cleland, J. A., Danaee, M., Kargarfard, M., Sangelaji, B., & Tamrin, S. B. M. (2018). Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: A randomized controlled trial. *Brazilian Journal of Physical Therapy*, 22(2), 144-153. <https://doi.org/10.1016/j.bjpt.2017.09.003>
- Smith, T. J., & Brown, M. L. (2020). Posture control and sport-specific training: An integrative review. *Journal of Sports Science and Medicine*, 19(5), 233-240. <https://www.jssm.org/hf.php?id=jssm-19-233.xml>
- Uetake, T., & Ohtsuki, F. (2023). Sagittal configuration of spinal curvature in dancers: A comparative study. *International Journal of Sports Medicine*, 44(2), 91-103. <https://doi.org/10.1055/a-1982-5119>
- Wang, Q., Tong, G., & Zhou, S. (2023). A study of dance movement capture and posture recognition method based on vision sensors. *HighTech and Innovation Journal*, 4(2), 390-397. <https://doi.org/10.28991/HIJ-2023-04-02-03>
- Watson, A. W. (2022). Postural defects and their impact on athletic performance. *Journal of Sports Science & Medicine*, 21(4), 289-300. <https://www.jssm.org/hf.php?id=jssm-21-289.xml>