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Araştırma Makalesi

Evaluation of Postural Habits and Awareness in Young Adults with Generalized Joint Hypermobility

Genel Eklem Hipermobilitesi Olan Genç Erişkinlerde Postüral Alışkanlıkların ve Farkındalığın Değerlendirilmesi

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ÖZ

Amaç: Bu çalışmanın amacı Genel Eklem Hipermobilitesi (GEH) olan kişilerde postüral alışkanlık ve farkındalığın değerlendirilmesiydi. **Gereç ve Yöntem:** Çalışmaya 86 katılımcı (GEH olan 44 katılımcı ve GEH olmayan 42 katılımcı) dahil edildi. GEH, Beighton skoruyla belirlenirken, postüral farkındalık Postüral Alışkanlık ve Farkındalık Ölçeği (PAFÖ) ile değerlendirildi. **Sonuçlar:** PAFÖ'nün üç alt ölçeği olan, postüral alışkanlıklar ve farkındalık, pozisyonel farkındalık ve ergonomik farkındalık puanları GEH olan bireylerde daha düşüktü (p<0,05). Postürü bozan faktörlerin farkındalığı alt testindeki puanlar GEH grubu lehine daha yüksekti (p<0,05). **Tartışma:** Postüral alışkanlık ve farkındalık sonuçları, eklem hipermobilitesi olan 18-25 yaş arası genç bireylerde GEH olanlara göre anlamlı derecede farklıydı. Genel eklem hipermobilitesi olan bireylerde postüral egzersizler ve postür eğitimi, postüral farkındalığın geliştirilmesinde faydalı olabilir.

Anahtar Kelimeler: Farkındalık; Eklem Hipermobilitesi; Postür.

ABSTRACT

Purpose: The aim of this study was to evaluate postural habits and awareness in individuals with generalized joint hypermobility (GJH). **Material and Methods:** 86 participants (44 participants with GJH and 42 participants without GJH) were included in the study. Generalized joint hypermobility was determined with the Beighton score, while postural awareness was evaluated with the Postural Habits and Awareness Scale (PHAS). **Results:** In the three subscales of PHAS, postural habits and awareness, positional awareness, and ergonomic awareness scores were lower in individuals with GJH (p<0.05). The GJH group had higher scores in the awareness of factors disrupting posture subtest (p<0.05). **Discussion:** Postural habits and awareness results were significantly different in young individuals aged 18-25 with joint hypermobility compared to those without GJH. Postural exercises and posture re-education of individuals with generalized joint hypermobility may be beneficial in the development of postural awareness.

Keywords: Awareness; Joint Hypermobility; Posture.

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Generalized joint hypermobility (GJH) is a prevalent, asymptomatic condition characterized by an excessive range of motion in multiple joints (Hakim & Grahame, 2003). Those who score six or higher on the Beighton score, which evaluates the passive range of motion of the joints, are considered to have GJH (Castori & Hakim, 2017).

Individuals with GJH may experience a decrease in participation in daily activities and muscle strength (Scheper et al., 2014; Jindal et al., 2016). Impaired proprioception at the knee and proximal interphalangeal joints has been observed in both children and adults with joint hypermobility. Additionally, individuals with GJH have been reported to experience impaired tactile and proprioceptive sensations at the foot and ankle (Verma & Dipti Patkar, 2018; Fonseka et al., 2021; Akkaya et al., 2023). Decreased sensory feedback in these individuals can lead to biomechanically abnormal limb alignment and abnormal posture. Additionally, individuals with joint hypermobility may be more susceptible to injury due to their increased range of motion, altered neuromuscular reflexes, and diminished joint position sense (Jessee et al., 1980). As a result of repetitive microtraumas, widespread musculoskeletal pain can be observed in hypermobile patients (Fitzcharles, 2000). Pain and repetitive traumas in joints can affect other joints and disrupt the person's general posture due to the body's compensation mechanisms.

It is widely accepted that posture is maintained through feedback mechanisms that produce corrective torques based on body sway, which is detected mainly by visual, vestibular, and proprioceptive sensory systems (Winter et al., 1990). Postural awareness is provided by proprioceptive feedback from the periphery to the central nervous system (Cramer et al., 2018). Postural awareness is crucial for sustaining healthy posture habits in daily life. Poor posture habits can lead to muscle tone and body alignment alterations, resulting in unfavorable posture patterns and overall body asymmetry.

A limited number of studies in the literature examine the relationship between joint hypermobility and body posture. In a study examining posture and pain in individuals with benign joint hypermobility syndrome, a form of joint hypermobility, it was reported that there were significant postural deviations in terms of posture compared to the normal population. (Booshanam et al., 2011). Previous studies have emphasized that postural disorders are frequently observed in individuals with benign joint hypermobility and that these disorders may have negative effects on the musculoskeletal system in the long term (Wolf et al., 2011). The range of motion and flexibility of these individuals may negatively affect the efficiency of the muscles required to ensure postural stability (Juul-Kristensen et al., 2016). Knowledge of postural awareness and habits in individuals with joint hypermobility may help these individuals develop appropriate posture and movement strategies, which may reduce the risk of pain and injury. Therefore, examining postural habits and awareness in individuals with GJH may be an important step for individuals to achieve healthier motor control and body posture. However, there is no study in the literature on postural habits and awareness in individuals with GJH. Considering the long-term harmful effects of joint hypermobility on the musculoskeletal system, postural evaluations are also important in individuals with GJH. Therefore, this study aimed to evaluate postural habits and awareness in individuals with GJH.

MATERIAL and METHODS

Participants

Ethical approval for the study was received from the Erzurum Technical University ethics committee. The study was conducted at Erzurum Technical University, Department of Physiotherapy and Rehabilitation between July 2024 and August 2024. University students aged 18-25 were included in the study. Those who had upper/lower extremity fractures or surgeries in the past year, those who had upper/lower extremity treatments in the last three months, and those diagnosed with other connective tissue disorders were not included in the study. A total of 86 students were included in the study, 44 with joint hypermobility and 42 without joint hypermobility. All individuals participating in the study were informed about the study, and their consent was obtained.

Power analysis was calculated using G-Power software (Version 3.1.9.7, University of Dusseldorf, Dusseldorf, Germany). According to post hoc power analysis, when a total of 86 subjects (44 with GJH and 42 without GJH) were included in the study, it was determined that 82% power (effect size = 0.63) could be achieved with 95% confidence. Total Postural Habit and Awareness Questionnaire values were used for post hoc analyses conducted during the study.

Measures

The demographic details of the individuals, including age, gender, height, weight, and parents' educational background, were documented.

Hypermobility assessment

Generalized joint hypermobility was assessed according to the Beighton score (Juul-Kristensen et al., 2017). The Beighton consists of five maneuvers: 1) passive dorsiflexion of the little fingers, 2) passive placement of the thumbs, 3) hyperextension of the elbows, 4) hyperextension of the knees, and 5) forward flexion of the trunk. Each positive test, as described, was given a score for maneuvers 1-4 bilaterally (Junge et al., 2013; Juul-Kristensen et al., 2017). Participants with a Beighton score of 5 and above were included in the GJH group, and those with a score below five were included in the control group (Juul-Kristensen et al., 2017; Malfait et al., 2017).

Evaluation of Postural Awareness

The participants' postural awareness was evaluated using the Postural Habits and Awareness Scale (PHAS), which consisted of 19 items. Each item of the scale is scored between 1 and 5. A high score indicates good posture and awareness. The items related to postural habits include statements regarding the posture preferred by the individual during daily activities. PHAS also provides four-factor scores: postural habits and awareness, awareness of factors disrupting posture, positional awareness, and ergonomic awareness (Bayar et al., 2023).

Statistical Analysis

Statistical analysis was performed using SPSS version 25 (SPSS Inc., Chicago, IL, USA), with significance determined at a p-value of less than 0.05. Categorical variables were presented as frequencies and percentages. Continuous variables were reported as means with standard deviations or as medians with interquartile ranges, depending on the normality test results. The bivariate analysis involved Pearson's chi-squared test or Fisher's exact test for categorical data and either the Student's t-test or the Mann-Whitney U test for continuous data.

RESULTS

A total of 86 individuals participated in this study, with 44 in the GJH group and 42 in the non-GJH group. Both groups were comparable in terms of age, body weight, height, gender, dominant side, and parental education ($p > 0.05$) (Table 1). The median (IQR) Beighton total score for participants with GJH was 7 (6–8), while for those without GJH, it was 0 (0–2). The joint laxity based on the Beighton score for both groups is detailed in Table 2. Hypermobility rates of joints such as right and left knee (70.46% and 59.09%, respectively), right and left little finger (84.09% and 86.36%), right and left thumb (86.36% and 90.90%), right and left elbow (95.45% and 90.90%), and spine (61.36%) were significantly higher in participants with GJH assessed using the Beighton score compared to participants without GJH ($p< 0.05$).

When the scores of the PHAS of the groups were compared, the total PHAS score was higher in the group without GJH ($p<0.05$). In the subtests of PHAS, postural habits and awareness, positional awareness, and ergonomic awareness scores were higher in favor of participants without GJH ($p<0.05$). In the awareness of factors disrupting posture subtest, scores were higher in the GJH group ($p < 0.05$) (Table 3)

Table 1. Characteristics of the groups

	Individuals with GJH (n=44)	**Individuals without GJH (n=42)**	**p**
Age (years) (Mean ± SD)	22.52 ± 2.37	22.14 ± 6.55	0.719[a]
Gender (F/M) n (%)	38/6 (86.4/13.6)	32/10 (76.2/23.8)	0.226[b]
Body weight (kg) (Mean ± SD)	63.57 ± 8.44	65.08 ± 7.61	0.781[c]
Height (cm) (Mean ± SD)	164.60 ± 8.41	168.08 ± 9.04	0.279[a]
Dominant side (R/L) n (%)	40/4 (90.9/9.1)	39/3 (92.9/7.1)	0.741[b]
Mother's educational status n (%)			0.658[b]
Primary school	4 (9.1)	7 (16.7)	
High school	21 (47.7)	20 (47.6)	
University	15 (34.1)	13 (31)	
Master's Degree	4 (9.1)	2 (4.8)	
Father's educational status n (%)			0.104[b]
Primary school	2 (4.5)	6 (14.3)	
High school	8 (18.2)	13 (31)	
University	31 (70.5)	19 (45.2)	
Master's Degree	3 (6.8)	4 (9.5)	

SD: Standard Deviation; g: Gram; cm: Centimeter; C: Cesarian section; N: Normal; F: Female; M: Male; GJH: Generalized joint hypermobility a: Student's t-test, b: Chi-Square test, c: Mann-Whitney U Test.

Table 2. Participants' joint hypermobility evaluations according to Beighton Score

	Individuals with GJH (n=44)	Individuals without GJH (n=42)
Right knee n (%)	31 (70.46)	6 (14.29)
Left knee n (%)	26 (59.09)	6 (14.29)
Right little finger n (%)	38 (86.36)	1 (2.38)
Left little finger n (%)	37 (84.09)	1 (2.38)
Right thumb n (%)	38 (86.36)	4 (9.52)
Left thumb n (%)	40 (90.90)	2 (4.76)
Right elbow n (%)	42 (95.45)	6 (14.29)
Left elbow n (%)	40 (90.90)	6 (14.29)
Spine n (%)	27 (61.36)	8 (19.04)
Beighton total score Median (IQR)	7 (6-8)	0 (0-2)

GJH: Generalized joint hypermobility; IQR: Interquartile Range; n: Number of participants.

Table 3. Comparison of postural habits and awareness scale in participants with and without GJH

Factors of PHAS	**Individuals with GJH (n=44) (Mean ± SD)**	**Individuals without GJH (n=42) (Mean ± SD)**	**p**
Postural habits and awareness	23.20 ± 4.10	26.33 ± 4.83	0.003
Awareness of factors disrupting posture	15.02 ± 3.31	13.17 ± 3.82	0.013
Positional awareness	12.11 ± 2.48	13.83 ± 2.68	0.008
Ergonomic awareness	8.36 ± 2.34	10.6 ± 2.65	< 0.001
Total	58.70 ± 4.92	63.92 ± 10.70	0.042

PHAS: Postural Habits and Awareness Scale; GJH: Generalized joint hypermobility; SD: Standard Deviation. p<0.05 highlighted in bold. Mann-Whitney U test.

DISCUSSION

The study was conducted to examine the postural habits and awareness of individuals with GJH. Although proprioception, sensation, pain, and posture in individuals with GJH have been examined in the literature, no study has been found examining postural habits and awareness. This is the first study to examine postural habits and awareness in individuals with GJH and compare them with healthy individuals. This study showed that participants with GJH had lower awareness in the areas of postural habits and awareness, positional awareness, and ergonomic awareness than those without GJH. It was also observed that individuals with GJH had a higher awareness of factors disrupting posture.

GJH is a condition that affects specific joints, especially the hand, elbow, knee, and spine. In our study, hypermobility rates assessed using the Beighton score were higher in people with gjh than in people without GJH in all joints and these rates were even higher in small joints. In a study by Remvig et al., it was emphasized that the definition of hypermobility based on the Beighton score had high sensitivity, especially in evaluating smaller and mobile joints such as the hand and elbow (Remvig et al., 2007). Likewise, in another study by Clinch et al., it was reported that GJH was observed more frequently in the knee and elbow joints in childhood, and this decreased with age (Clinch et al., 2011). In this context, the data obtained in our study support the existing scientific literature that GJH primarily affects smaller and mobile joints.

Posture, defined as the position in standing and walking, is affected by various internal and external factors. The sensory system, the central nervous system, and the musculoskeletal system play key roles in providing postural control (Ivanenko & Gurfinkel, 2018).

Research indicates that individuals with GJH and hypermobility syndrome exhibit impaired proprioceptive and tactile sensations (Fatoye et al., 2009; Akkaya et al., 2023). Impaired knee and proximal interphalangeal joint proprioception have been reported in hypermobile patients. (Mallik et al., 1994; Hall et al., 1995). Proprioceptive information is very important for postural stability and joint stability (Riemann & Lephart, 2002), and the lower postural habits and awareness in individuals with GJH can be explained by the impairment of proprioceptive sense.

In joint hypermobility, the musculoskeletal system can allow for extra ranges of movement and positioning, leading to more abnormal positions that are adapted and habituated at a subconscious level. When sitting unsupported, hypermobile individuals are often reported to hunch over and rest in a posterior pelvic tilt position (Simmonds & Keer, 2007). Booshanam et al. reported that posture problems in the sagittal plane are more common in individuals with joint hypermobility compared to the normal population (Booshanam et al., 2011). In addition, individuals with joint hypermobility also have reduced joint position sense (Hall et al., 1995). It has also been reported that lower extremity isometric muscle strength and muscle torque are low in hypermobile individuals (Fatoye et al., 2009; Ituen et al., 2024). Decreased sensory feedback and muscle strength deficiencies seen in individuals with GJH may make it difficult for individuals with GJH to resist gravity, leading to the adoption of biomechanically unstable limb positions and abnormal postures. These conditions may be related to lower positional and ergonomic awareness in individuals with GJH.

Joint hypermobility can affect individuals' ability to accurately perceive their joint position. Studies show that these individuals have a reduced sense of joint position compared to the normal population (Hall et al., 1995). This reduction may lead the individual to subconsciously adapt and habituate to abnormal postures. For example, it has been observed that hypermobile individuals often slouch and rest in the posterior pelvic tilt position when sitting without support (Simmonds & Keer, 2007). In joint hypermobility, the musculoskeletal system can allow for extra ranges of movement and positioning, leading to more abnormal positions that are adapted and habituated at a subconscious level. Such positions challenge the body's natural balance mechanisms and may lead to postural disorders in the long term. In addition, reduced positional awareness can lead to more unstable musculoskeletal movement and predispose to joint injuries. Therefore, training and rehabilitation programs to increase positional awareness in individuals with joint hypermobility should be considered as an important component in preventing postural disorders and improving movement safety.

Ergonomic awareness refers to individuals' conscious efforts to optimize their posture in relation to environmental factors. Individuals with joint hypermobility often have difficulty maintaining their posture against gravity due to low muscle strength and lack of isometric muscle strength (Fatoye et al., 2009; Ituen et al., 2024). This can lead to individuals adopting more ergonomically inefficient and potentially harmful positions in daily life. In addition, it is known that chronic pain is commonly observed in individuals with GJH (Kumar & Lenert, 2017). In these individuals, the effort to reduce pain may direct individuals to positions that are not ergonomic but provide comfort in the short term. This may make it difficult to gain ergonomic awareness. Low ergonomic awareness can disrupt the body's natural postural balance and negatively affect muscle and joint health. In this context, individuals with joint hypermobility need to be more careful and pay more attention to environmental factors, especially in activities such as sitting, standing or carrying.

Individuals with Joint Hypermobility tend to adopt an end-joint range of motion in a resting position to gain balance. This faulty resting position, along with abnormal movement patterns and decreased proprioception, causes the supporting joint structures to be subjected to excessive stress and strain, leading to fatigue and pain (Nijs et al., 2006; Keer & Simmonds, 2011). Studies have reported that joint pain is more common in people with joint hypermobility (Booshanam et al., 2011; Akkaya et al., 2022). Sohrbeck-Nøhr et al. suggested a possible link between GJH and joint pain in the adolescent population (Sohrbeck-Nøhr et al., 2014). The subtest of awareness of factors that impair posture, which generally consists of items related to pain and fatigue, was found to be higher in the GJH group. Considering that pain and fatigue complaints are more common in individuals with GJH, it was thought that pain and fatigue, which are among the awareness of factors disrupting posture, may have increased awareness in this area in individuals with GJH.

Although this study was the first to examine postural habits and awareness in individuals with GJH, it had some limitations. One of the limitations was that symptoms such as fatigue and pain were not evaluated in this study, although they were problems affecting postural habits and awareness. Another limitation is that the study was a cross-sectional study conducted in a single center. Therefore, multicenter and comprehensive longitudinal studies are needed to support the results.

As a result, there was a significant difference in terms of postural habits and awareness in individuals with GJH compared to the normal population. The general awareness of individuals with GJH was lower. Increasing the postural awareness of these individuals and re-education of posture may be beneficial in preventing negative musculoskeletal system problems that may be caused by poor posture.

Ethical Approval

Ethical approval for the study was received from Erzurum Technical University ethics committee (Decision no: 2024/08-16).

Authors' Contribution

Idea/Concept: RY, AY; Design: RY, AY; Control/Supervision: AY; Data collection and/or Processing: RY, AY; Analysis and/or interpretation: AY; Literature review: RY; Writing the Article: RY; Critical Review: RY, AY

Conflicts of Interest Statement

None of the authors report having a conflict of interest.

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