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Postural habits and postural awareness in spinal pain, spinal function, and quality of life in resident physicians

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ABSTRACT

Aims: Evaluation of postural habits and awareness scale (PHAS), Spinal Functional Index (SFI), and Nottingham Health Profile (NHP) scores, and spinal pain presence (location, intensity, and duration) in resident physicians.

Methods: This cross-sectional study was conducted on resident physicians. Whether participants experienced spinal pain, location (neck, back, low-back), as well as the duration, were recorded. They were asked to mark pain intensity at rest and during movement, in spinal pain areas on a 0-10 cm visual analog scale (VAS). Afterwards, the PHAS, SFI, and NHP questionnaires were applied.

Results: A total of 72 resident physicians were included (mean age: 27.81±3.98 years); 41 (56.9%) were female. In the neck pain group, the PHAS-stance habits and awareness (SHA) score was moderately negatively correlated with neck pain duration (r=-0.44, p=0.006) and low to moderately positively correlated with the SFI score (r=0.33, p=0.05). The PHAS-ergonomic awareness (EA) score showed a moderate negative correlation with neck pain intensity-movement VAS (r=-0.39, p=0.02). In the back pain group, PHAS-SHA (r=0.52, p=0.004) and PHAS-postural habit (PH) scores (r=0.37, p=0.05) were positively correlated with SFI score at moderate and low moderate levels. In the low-back pain group, PHAS-PH (r=-0.47, p=0.006) and PHAS-EA (r=-0.45, p=0.01) were negatively and moderately correlated to VAS for pain intensity during movement. PHAS-positional awareness score correlated moderately positively with SFI score (r=0.41, p=0.02). PHAS-SHA correlated moderately negatively with pain intensity-movement VAS (r=-0.40, p=0.02), and low to moderately positively with SFI (r=0.37, p=0.04).

Conclusions: Poor PH and awareness are associated with more severe and prolonged spinal pain, worse spinal function, and poorer quality of life.

Introduction

Postural control, whether in static or dynamic settings, is a fundamental necessity for executing daily activities (1). Posture denotes the alignment and positioning of the limbs, spine, and head, and any imbalance in this alignment, positioning, or weight distribution may lead to postural asymmetry. Postural asymmetry may contribute to hyperactivity and tightness in one muscle group, while generating elongation and weakening in the opposing muscles, resulting in muscle imbalance that imposes excessive load on the joints and skeletal system during movement, hence inducing discomfort (2). In this sense, good posture is the alignment that exerts minimal stress on each joint. Poor posture entails improper alignment of body segments, resulting in heightened stress on joints (3) and may induce musculoskeletal pain (2).

Postural awareness (PA), a crucial aspect of recognizing the difference between good and poor posture, has recently acquired prominence in the health sciences. PA emphasizes an individual's capacity to recognize postural alterations in everyday life (3). Body posture can be affected by multiple factors, including physical, physiological, emotional, and environmental influences. Daily and behavioral habits are frequently developed that may neglect healthy body positioning, resulting in postural changes, as these habits significantly influence posture (3,4). Poor postural practices can alter muscle tone and body alignment, ultimately leading to detrimental posture patterns and overall body asymmetry. To avert musculoskeletal impairments linked to poor posture, it is essential to understand optimal ergonomics. PA is essential for sustaining healthy postural habits (PHs) in daily life. Additionally, individual PH influences the degree of PA, necessitating assessments that incorporate these habits to inform health science professionals about treatment options and lifestyle modifications (3).

Alterations in posture are frequently seen as a risk factor for the development of spine pain (2). Low back pain is a prevalent condition linked to postural imbalance. Spinal postural assessment is crucial in understanding low back pain, as incorrect postural behavior frequently serves as a risk factor for low back pain and lumbar injury. Suboptimal posture elevates mechanical strain in the lower back, adversely impacting spinal alignment and flexibility; persistent poor posture may be associated with chronic nonspecific low back pain. Lumbar discomfort and injury can consequently exacerbate postural issues, including diminished muscle strength, inadequate stability of the deep core muscles, prolonged maintenance of static positions, and reduced muscle flexibility (5). This has resulted in the belief that upholding proper posture and movement in daily tasks is essential for the prevention and treatment of low back pain (2).

Postural abnormalities, particularly forward head posture resulting from excessive neck flexion, are a significant risk factor for neck pain (6,7). Maintaining a pronounced flexion angle of the neck while labor increases the weight of the head, imposing additional strain on the spine and resulting in alterations to ligaments, tendons, and muscles, which may eventually induce permanent postural changes, namely forward head posture (7). The literature underscores the need for postural rehabilitation in managing chronic neck pain (6).

The research have investigated the correlation between inadequate posture and spinal pain across several occupational categories (8-11). Physicians frequently suffer from spine pain due to many postural factors, including demanding work schedules, shift patterns, and prolonged periods spent seated or standing in a static position (11,12). There are studies in the literature on musculoskeletal problems caused by poor posture among physicians across medical specialties and the positive effects of ergonomic principles on these problems. Recent data support the idea that work-related musculoskeletal pain often begins during residency (11,13,14). Since it is known that persistent poor posture is also an important factor contributing to the chronicity of spinal pain, evaluating the PA and habits of resident physicians at the beginning of their professional lives and providing training will help prevent musculoskeletal problems related to their profession This precaution is especially valuable in avoiding chronic spine-related issues tied to their profession (5). The objective of the study is to assess the PHs and awareness scale (PHAS), Spinal Functional Index (SFI), and Nottingham Health Profile (NHP) scores, and spinal pain presence (location, intensity, and duration) in resident physicians.

Methods

Study design and participants

This cross-sectional, observational study was conducted between February 2023 and April 2023 at Ufuk University, Ankara, Türkiye. The study included 72 volunteer participants aged between 20 and 50 years, all of whom were working as resident physicians. Of the participants, 35 (48.6%) were resident physicians in internal medicine departments and 37 (51.4%) were resident physicians in surgical medicine departments. All resident physicians had a daytime work schedule between 08:00-17:00, and in addition, worked night shifts from 17:00-08:00 for 8 days a month-they were exempt from daytime work after the night shift. Participants with a history of previous trauma or surgery that could cause pain or postural disorders in the spine and known systemic, neurological, psychiatric, infectious, inflammatory, rheumatic, tumoral, or degenerative diseases were excluded from the study. The study was approved by the Ufuk University of Non-interventional Clinical Research Evaluation Ethics Committee (decision number: 23.01.12.01/01, date: 24.01.2023) and written informed consent were obtained. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data collection and instruments

Participants' age, gender, height, and weight, accompanying diseases, whether there is spinal pain, if there is spinal pain, the pain area (neck, back, low-back), and the duration of pain in the relevant area were recorded. Additionally, whether there is a regular exercise habit and if so, the frequency, and whether regular posture exercises are performed and if so, the frequency, were recorded. Participants were asked to mark their average pain intensity on a 0-10 cm visual analog scale (0 = no pain, 10 = most unbearable pain) at rest and with movements related to the spine or requiring spinal support in daily life activities (walking, personal care, work life, etc.) in the areas of spinal pain (15). Participants were then asked to answer questions on the PHAS (3), SFI (16), and NHP (17) questionnaires. It took an average of 30 minutes for each participant to fill out the data collection form and the questionnaires.

Postural habits and awareness scale

It is a five-point Likert-type scale (1 = I completely disagree, 5 = I completely agree) developed to evaluate PHs and posture awareness, which consists of 7 items on PHs and 12 items on PA (3). The scale includes two main scores-PH and PA and four sub-scores: stance habits and awareness (SHA), awareness of factors that impair stance, positional awareness (POA) and ergonomic awareness (EA). Based on the included items, the sub-scores can be interpreted as four different aspects of posture-related awareness and habits. Higher scores on the scale indicate better PHs and awareness levels. The scale developed by Bayar et al. (3) in 2022 underwent a Turkish validity and reliability study. The reliability of the Turkish version of the PA Scale was found to be sufficient (total α value=0.854, factor 1=0.886, factor 2=0.777), and was confirmed with a test-retest conducted two weeks apart (r=0.831). In our study sample, we observed that the scale was easily understandable and applicable.

Spinal Functional Index

It is a 25-item questionnaire developed to evaluate the functions of the spine as a whole. If the statements in the items fully apply to the participant, they give 1 point; if they partially apply, they give half a point; and if the statements do not describe them, they leave the relevant item blank. The total score of the survey is calculated by adding the scores obtained from the items. The percentage score is then determined by calculating four times the total score and subtracting this result from 100. Higher percentile scores indicate better functionality. The scale was developed by Gabel et al. (18) in 2013, and its Turkish validity and reliability study was conducted by Tonga et al. (16) in 2015.

Nottingham Health Profile

It is a scale consisting of a total of 38 questions that evaluates the quality of life. Each question is answered with yes or no. The first part of the questionnaire evaluates, in patients, six subsections: sleep status, energy level, emotional status, social isolation status, physical mobility, and pain. In the second part, it is evaluated whether there are any problems at work, at home, in social activities, and interpersonal relationships. Sub-scores for each section and scores for the first and second sections are calculated by summing the scores of the items answered “yes” (19). Higher scores indicate poorer quality of life (19). The Turkish validity and reliability study was conducted by 17. Kücükdeveci et al. (17) in 2000.

Statistical Analysis

In determining the sample size in the study, power analysis was performed using Gpower 3.1.9.4 software. It was found that a total minimum of 71 patients was sufficient in our analysis according to the effect size standardized by Cohen (with effect size=0.40, α=0.05 for 95% power).

Statistical analyses were performed using SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA). The conformity of numerical variables to normal distribution was examined visually (histogram and probability plots) and with analytical methods (Kolmogorov-Smirnov tests/Shapiro-Wilk tests), and the homogeneity of variances was examined using the Levene test. In descriptive statistics, numerical variables were expressed as mean and standard deviation, and categorical variables were expressed as numbers and percentages. In comparisons of numerical data between groups, the Mann-Whitney U test was used. The Chi-square test was used to compare categorical data between groups. In examining the relationships between variables, Pearson correlation analysis (two-tailed) was used for variables that both conformed to a normal distribution, and Spearman’s test (two-tailed) was used for variables at least one of which did not conform to a normal distribution (correlation coefficient: 0.75 to 1.00 indicates an excellent correlation; 0.70 to 0.75 indicates a very good correlation; 0.60 to 0.70 indicates a good correlation; 0.40 to 0.60 indicates a moderate correlation; 0.30 to 0.40 indicates a low-moderate correlation; 0.05 to 0.30 indicates low or insignificant correlation). The statistical significance level for the analyses was set at p≤0.05.

Results

A total of 72 resident physicians were included in the study (mean age: 27.81±3.98 years), of whom 41 (56.9%) were female. Descriptive statistics for the study variables are presented in Table 1.

In the group without any spinal pain, the SFI score was significantly higher [94 (50-100)/87 (24-100), p=0.02], and NHP-pain [0 (0-29.44)/19.45 (0-46.49), p<0.001], NHP-energy [0 (0-100)/30.40 (0-100), p=0.02], NHP part 1 total [35.87 (0-278.94)/101.74 (0-342.31), p=0.02], and NHP part 2 total [0 (0-1)/0 (0-4), p=0.02] scores were significantly lower compared to the group with spinal pain. No significant differences were observed between the groups in other study variables.

The comparison results of the study variables between the group with neck pain and the group without any spinal pain are presented in Table 2. NHP-pain (p<0.001); NHP-energy (p=0.01); NHP part 1 total (p=0.03); NHP part 2 total (p=0.04) scores, were significantly higher, while height (p=0.04) and SFI score (p=0.01) were significantly lower in the group with neck pain compared to those without any spinal pain.

The comparison results of the study variables between the groups with back pain and the groups without any spinal pain are presented in Table 3. In the group with back pain, age (p=0.04), NHP-pain (p<0.001), NHP-physical activity (p=0.02), NHP-energy (p=0.002), NHP part 1 total (p=0.006), NHP part 2 total (p=0.005) scores were significantly higher, while frequency

Table 1. Descriptive statistics of study variables (n=72)	
Variables	**Values**
Age, year[+]	27.81±3.98 (24-44)
Gender, n (%)	
Female	41 (56.9)
Male	31 (43.1)
Height, cm[+]	170.54±9.4 (150-187)
Weight, kg[+]	69.66±16.74 (43-125)
BMI, kg/cm^2[+]	23.71±3.98 (16.14-37.74)
Presence of systemic disease, n (%)	
No	60 (83.3)
Yes	12 (16.7)
Presence of any spine pain, n (%)	
No	24 (33.3)
Yes	48 (66.7)
Presence of neck pain, n (%)	
No	35 (48.6)
Yes	37 (51.4)
Neck pain duration, month[+]	11.38±27.79 (0-180)
VAS-neck pain intensity at movement, cm[+]	2.17±2.57 (0-9)
VAS-neck pain intensity at rest, cm[+]	1.41±2.01 (0-7)
Presence of back pain, n (%)	
No	43 (59.7)
Yes	29 (40.3)
Back pain duration-month[+]	5.35±11.92 (0-60)
VAS-back pain intensity at movement, cm[+]	1.7±2.29 (0-8)
VAS-back pain intensity at rest, cm[+]	0.96±1.64 (0-6)
Presence of low back pain, n (%)	
No	40 (55.6)
Yes	32 (44.4)
Low back pain duration, month[+]	9.40±21.23 (0-120)
VAS-low back pain intensity at movement, cm[+]	1.72±2.32 (0-9)
VAS-low back pain intensity at rest, cm[+]	1.01±1.7 (0-6)
Regular exercise habit, n (%)	
No	43 (59.7)
Yes	29 (40.3)
Frequency of exercise, n/wk[+]	1.06±1.42 (0-5)
Regular posture exercise habit, n (%)	
No	57 (79.2)
Yes	15 (20.8)
Frequency of posture exercise, n/wk[+]	0.49±1.06 (0-5)
Postural habit score[+]	18.78±5.26 (8-35)
Postural awareness score[+]	38.99±3.72 (30-50)
Stance habits and awareness sub-score[+]	22.51±4.62 (14-34)
Awareness of factors that impair stance sub-score[+]	15.40±2.47 (10-20)
Positional awareness sub-score[+]	11.93±2.82 (7-20)
Ergonomic awareness sub-score[+]	7.96±2.72 (3-15)
Spinal Functional Index score[+]	84.6±15.88 (24-100)

Table 1. Continued

Variables	Values
NHP part 1 scores⁺	
Pain	13.28±15.01 (0-46.49)
Emotional reactions	20.68±24.47 (0-82.31)
Sleep	17.26±24.39 (0-87.43)
Social isolation	10.74±19.75 (0-84.03)
Physical activity	8.50±13.78 (0-88.80)
Energy	29.43±38.15 (0-100)
Total	98.53±92.44 (0-342.31)
NHP part 2 total score⁺	0.47±0.99 (0-4)

⁺Data are expressed as mean±standard deviation (minimum-maximum)
BMI: Body mass index,VAS: Visual analog scale, NHP, Nottingham Health Profile

Table 2. Comparison of study variables according to the presence of neck pain

Variables	Group with neck pain (n=37)	Group without any spinal pain (n=24)	p
Age, year⁺	29 (24-44)	26.5 (24-33)	0.06
Gender, n (%)			
Female	26 (70.3)	11 (45.8)	0.06
Male	11 (29.7)	13 (54.2)	
Height, cm⁺	164 (150-186)	174.5 (160-187)	**0.04***
Weight, kg⁺	60 (43-125)	70 (45-105)	0.29
BMI, kg/cm²⁺	22.60 (17.22-37.74)	23.26 (16.14-30.68)	0.95
Presence of systemic disease, n (%)			
No	28 (75.7)	22 (91.7)	0.18
Yes	9 (24.3)	2 (8.3)	
Regular exercise habit, n (%)			
No	23 (62.2)	12 (50)	0.35
Yes	14 (37.8)	12 (50)	
Frequency of exercise, n/wk⁺	0 (0-4)	1 (0-5)	0.20
Regular posture exercise habit, n (%)			
No	29 (78.4)	19 (79.2)	0.94
Yes	8 (21.6)	5 (20.8)	
Frequency of posture exercise, n/wk⁺	0 (0-3)	0 (0-5)	0.93
Postural habit score⁺	17 (8-35)	19.5 (12-29)	0.07
Postural awareness score⁺	39 (30-50)	38.5 (32-44)	0.42
Stance habits and awareness sub-score⁺	20 (14-34)	23 (16-30)	0.25
Awareness of factors that impair stance sub-score⁺	16 (10-20)	16 (10-20)	0.57
Positional awareness sub-score⁺	12 (8-20)	12 (7-19)	0.54
Ergonomic awareness sub-score⁺	8 (3-15)	8.5 (4-15)	0.29
Spinal Functional Index score⁺	88 (24-100)	94 (50-100)	**0.01***
NHP part 1 scores⁺			
Pain	19.45 (0-46.49)	0 (0-29.44)	**<0.001***
Emotional reactions	15.55 (0-80.77)	3.54 (0-82.31)	0.40
Sleep	12.57 (0-87.43)	0 (0-87.43)	0.26
Social isolation	0 (0-58.63)	0 (0-61.50)	0.56
Physical activity	11.2 (0-88.80)	0 (0-43.29)	0.12
Energy	39.2 (0-100)	0 (0-100)	**0.01***
Total	107.45 (0-342.31)	35.87 (0-278.94)	**0.03***
NHP part 2 total score⁺	0 (0-4)	0 (0-1)	**0.04***

*Statistical significance level p≤0.05
⁺Data are expressed as median (minimum-maximum)
BMI: Body mass index, NHP: Nottingham Health Profile

of exercise (p=0.04) and SFI score (p=0.01) were significantly lower, compared to the group without any spinal pain.

The comparison results of the study variables, between the groups with low back pain and those without any spinal pain, are presented in Table 4. NHP-pain (p<0.001), NHP-energy (p=0.04), NHP part 1 total (p=0.03), and NHP part 2 total (p=0.01) scores were significantly higher, while the SFI score (p=0.007) was significantly lower in the group with low back pain compared to the group without any spinal pain.

The results of the correlation analysis to evaluate the relationships between the PHAS scores and pain-related variables are presented in Table 5. In the group with neck pain, a moderate negative correlation was observed between PHAS-SHA score and neck pain duration (r=-0.44, p=0.006). A low-to-moderate negative correlation was observed between PHAS-EA score and neck pain severity-VAS movement value (r=-0.39, p=0.02). A low-to-moderate positive correlation was observed between PHAS-SHA score and SFI score (r=0.33, p=0.05).

In the group with back pain, a moderate positive correlation was observed between the PHAS-SHA score and the SFI score (r=0.52, p=0.004), and a low to moderate positive correlation

Table 3. Comparison of study variables according to the presence of back pain

Variables	Group with back pain (n=29)	Group without any spinal pain (n=24)	p
Age, year+	29 (24-44)	26.5 (24-33)	**0.04***
Gender, n (%)			
Female	19 (65.5)	11 (45.8)	0.15
Male	10 (34.5)	13 (54.2)	
Height, cm+	168 (150-185)	174.5 (160-187)	0.08
Weight, kg+	65 (43-125)	70 (45-105)	0.80
BMI, kg/cm^{2}+	24.84 (17.22-37.74)	23.26 (16.14-30.68)	0.30
Presence of systemic disease, n (%)			
No	24 (82.8)	22 (91.7)	0.44
Yes	5 (17.2)	2 (8.3)	
Regular exercise habit, n (%)			
No	20 (69)	12 (50)	0.16
Yes	9 (31)	12 (50)	
Frequency of exercise, n/wk+	0 (0-3)	1 (0-5)	**0.04***
Regular posture exercise habit, n (%)			
No	24 (82.8)	19 (79.2)	1
Yes	5 (17.2)	5 (20.8)	
Frequency of posture exercise, n/wk+	0 (0-2)	0 (0-5)	0.56
Postural habit score+	17 (8-29)	19.50 (12-29)	0.10
Postural awareness score+	39 (30-46)	38.5 (32-44)	0.89
Stance habits and awareness sub-score+	20 (14-31)	23 (16-30)	0.33
Awareness of factors that impair stance sub-score+	16 (10-20)	16 (10-20)	0.76
Positional awareness sub-score+	11 (8-17)	12 (7-19)	0.91
Ergonomic awareness sub-score+	8 (3-12)	8.5 (4-15)	0.40
Spinal Functional Index score+	84 (24-100)	94 (50-100)	**0.005***
NHP part 1 scores+			
Pain	20.18 (0-46.49)	0 (0-29.44)	**<0.001***
Emotional reactions	16.84 (0-78.83)	3.54 (0-82.31)	0.30
Sleep	12.57 (0-77.63)	0 (0-87.43)	0.48
Social isolation	0 (0-84.03)	0 (0-61.5)	0.94
Physical activity	11.2 (0-42.83)	0 (0-43.39)	**0.02***
Energy	60.8 (0-100)	0 (0-100)	**0.002***
Total	109.42 (0-295.43)	35.87 (0-278.94)	**0.006***
NHP part 2 total score+	0 (0-4)	0 (0-1)	**0.005***

*Statistical significance level p≤0.05
+Data are expressed as median (minimum-maximum)
BMI: Body mass index, NHP: Nottingham Health Profile

Table 4. Comparison of study variables according to the presence of low back pain

Variables	Group with low back pain (n=32)	Group without any spinal pain (n=24)	p
Age, year⁺	27 (24-35)	26.5 (24-33)	0.26
Gender, n (%)			
Female	18 (56.2)	11 (45.8)	0.44
Male	14 (43.8)	13 (54.2)	
Height, cm⁺	172.5 (154-185)	174.5 (160-187)	0.41
Weight, kg⁺	70.5 (43-125)	70 (45-105)	0.88
BMI, kg/cm^{2+}	23.41 (17.22-37.74)	23.26 (16.14-30.68)	0.64
Presence of systemic disease, n (%)			
No	25 (78.1)	22 (91.7)	0.27
Yes	7 (21.9)	2 (8.3)	
Regular exercise habit, n (%)			
No	20 (62.5)	12 (50)	0.35
Yes	12 (37.5)	12 (50)	
Frequency of exercise, n/wk⁺	0 (0-4)	1 (0-5)	0.11
Regular posture exercise habit, n (%)			
No	27 (84.4)	19 (79.2)	0.73
Yes	5 (15.6)	5 (20.8)	
Frequency of posture exercise, n/wk⁺	0 (0-2)	0 (0-5)	0.46
Postural habit score⁺	18 (8-35)	19.5 (12-29)	0.41
Postural awareness score⁺	40 (32-50)	38.5 (32-44)	0.21
Stance habits and awareness sub-score⁺	21.5 (14-34)	23 (16-30)	0.51
Awareness of factors that impair stance sub-score⁺	16 (11-20)	16 (10-20)	0.43
Positional awareness sub-score⁺	12 (7-20)	12 (7-19)	0.54
Ergonomic awareness sub-score⁺	8 (3-15)	8.5 (4-15)	0.96
Spinal Functional Index score⁺	84 (24-100)	94 (50-100)	**0.007***
NHP part 1 scores⁺			
Pain	19.82 (0-46.49)	0 (0-29.44)	**<0.001***
Emotional reactions	11.86 (0-80.77)	3.54 (0-82.31)	0.69
Sleep	0 (0-77.63)	0 (0-87.43)	0.59
Social isolation	0 (0-84.03)	0 (0-61.5)	0.95
Physical activity	11.2 (0-42.83)	0 (0-43.39)	0.06
Energy	24 (0-100)	0 (0-100)	**0.04***
Total	102.72 (0-342.31)	35.87 (0-278.94)	**0.03***
NHP part 2 total score⁺	0 (0-4)	0 (0-1)	**0.01***

*Statistical significance level p≤0.05
⁺Data are expressed as median (minimum-maximum)
BMI: Body mass index, NHP: Nottingham Health Profile

was observed between the PHAS-PH score and the SFI score (r=0.37, p=0.05).

In the group with low back pain, a moderate negative correlation was observed between the PHAS-PH score and back pain severity-VAS movement (r=-0.47, p=0.006) and between the PHAS-EA score and back pain severity-VAS movement (r=-0.45, p=0.01). A moderate positive correlation was found between the PHAS-POA score and the SFI score (r=0.41, p=0.02). Additionally, a moderate negative correlation was noted between the PHAS-SHA score and back pain severity-VAS movement (r=-0.40, p=0.02), and a low to moderate positive correlation was observed between the PHAS-SHA score and the SFI score (r=0.37, p=0.04).

Discussion

In this study, we observed that in the group with neck pain, the PHAS-SHA score was related to neck pain duration and SFI score, and the PHAS-EA score was related to the movement-related VAS value for neck pain severity. In the group with back pain, PHAS-SHA and PHAS-PH scores were associated with

Table 5. Correlations between postural habits and awareness scale scores and pain-related variables

	Neck pain duration	Neck pain intensity-VAS movement	Neck pain intesity-VAS rest	Back pain duration	Back pain intensity-VAS movement	Back pain intesity-VAS rest	Low back pain duration	Low back pain intensity-VAS movement	Low back pain intesity-VAS rest
PHAS-PH	r=-0.24 p=0.16	r=-0.27 p=0.11	r=-0.21 p=0.21	r=-0.18 p=0.36	r=-0.10 p=0.61	r=-0.04 p=0.85	r=-0.05 p=0.79	**r=-0.47 p=0.006****	r=-0.18 p=0.34
PHAS-PA	r=-0.17 p=0.33	r=-0.08 p=0.65	r=-0.07 p=0.70	r=0.02 p=0.93	r=0.17 p=0.37	r=-0.03 p=0.87	r=0.11 p=0.55	r=-0.29 p=0.10	r=0.06 p=0.73
PHAS-SHA	**r=-0.44 p=0.006****	r=-0.16 p=0.35	r=-0.18 p=0.29	r=0.05 p=0.78	r=0.13 p=0.52	r=-0.14 p=0.49	r=-0.14 p=0.45	**r=-0.40 p=0.02***	r=-0.14 p=0.44
PHAS-AFIS	r=0.18 p=0.28	r=0.09 p=0.59	r=0.08 p=0.66	r=0.28 p=0.15	r=0.23 p=0.23	r=-0.05 p=0.82	r=-0.02 p=0.91	r=0.02 p=0.90	r=0.12 p=0.53
PHAS-POA	r=-0.10 p=0.55	r=-0.16 p=0.36	r=-0.08 p=0.65	r=-0.11 p=0.57	r=0.03 p=0.88	r=-0.002 p=0.99	r=0.10 p=0.59	r=-0.18 p=0.32	r=0.09 p=0.61
PHAS-EA	r=-0.09 p=0.58	**r=-0.39 p=0.02***	r=-0.32 p=0.05	r=-0.16 p=0.41	r=-0.11 p=0.55	r=-0.04 p=0.84	r=0.27 p=0.13	**r=-0.45 p=0.01****	r=-0.17 p=0.34

*The statistical significance level of the correlation is p≤0.05 (two-tailed)
**The statistical significance level of the correlation is p≤0.01 (two-tailed)
VAS: Visual analog scale, PHAS: Postural habits and awareness scale, PH: Postural habit score, PA: Postural awareness score, SHA: Stance habits and awareness score, AFIS: Awareness of factors that impair stance subscore, POA: Positional awareness subscore, EA: Ergonomic awareness subscore

the SFI score. In the group with low back pain, we observed that the PHAS-PH score and PHAS-EA score were related to the low back pain severity-movement VAS value; the PHAS-POA score was related to the SFI score; and the PHAS-SHA score was related to the low back pain severity-movement VAS value and SFI score.

It is known that postural problems are an important triggering factor in the emergence and chronicity of many musculoskeletal problems, especially spinal pain (3). Consistent with this information, our study also found that components related to PHs and awareness were effective on spinal pain, chronicity, and functionality. Similar to our study, many studies in the literature evaluating the effects of postural factors on musculoskeletal pain report that PHs are effective on musculoskeletal pain and dysfunction (8-11). In this context, spinal problems and their relationship with poor posture are among the most researched and reported problems (2,5-7,11,20-27). In a meta-analysis conducted by Sugavanam et al. (2) in 2024, where they evaluated the effects of postural asymmetry in low back pain and examined 46 studies, it was reported that increased pelvic tilt, increased pelvic incidence, decreased lumbar lordosis, and sacral slope were commonly observed postural abnormalities in patients with low back pain. In their study evaluating the relationship between low back pain and spinal postural assessment, Du et al. (5) reported that the most frequently reported abnormalities in low back pain due to poor posture were lumbar lordosis, sway-back, round back, flat back, and scoliosis. In the meta-analysis conducted by Mahmoud et al. (7) in 2019, which examined 15 studies evaluating the relationships between neck pain and forward neck posture, it was reported that the most common postural disorder associated with neck pain was forward neck posture, and that neck pain assessment criteria were correlated with an increase in forward neck posture. In their systematic review published in 2019, Hesby et al. (21) examined 36 studies evaluating the relationships between electronic measurements based on posture and neck movements and neck pain. They reported decreased active joint range of motion and speed of movement, along with correct positioning of the head in patients with neck pain.

On the other hand, the presence of pain is an important factor that disrupts optimal postural control. This two-way relationship between posture and pain is an important risk factor for pain to become chronic (1). In our study, the two-way relationship observed in the correlation analyses between various components of PHs and awareness and the severity and duration of pain in the spine is consistent with the aforementioned information. Therefore, a person's awareness of good and bad posture and the ability to maintain appropriate PHs during daily life activities are an important factor in preventing this vicious circle (3). There are many studies reporting that postural education and postural rehabilitation have positive effects on posture awareness, PHs, and chronic low back and neck pain (6,24-26,28). In our study, it was observed that the exercise frequency was significantly lower in those with back pain compared to the group without back pain. However, the same situation was not observed in the groups with neck pain and low back pain. It was observed that the frequency of posture exercises did not change according to the pain status. We think that this situation, which seems to be different from what is generally reported in the literature, is due to the low exercise habits in both the pain and non-pain groups.

It has been reported in the literature that posture abnormalities, especially due to occupational conditions, are associated with musculoskeletal problems-low back and neck pain-in many occupational groups. Ergonomic ergonomic and postural training and rehabilitation have a positive effect on pain, functionality, and quality of life (8-11). It is known that musculoskeletal complaints are quite common among physicians and resident physicians (12). Many studies in various branches of medicine report that musculoskeletal problems are detected quite frequently (29-31). These problems can lead to negative consequences such as lower work efficiency, burnout, decreased job satisfaction, absenteeism, and early retirement (11,14,32). In our study, we observed that spinal pain was quite common among resident physicians, consistent with the literature.

We observed that resident physicians' PA and PHs were generally suboptimal, and that this situation had a negative effect on spinal pain and function. Good PHs are directly related to good ergonomic knowledge. Studies have shown that the areas where occupational pain is most frequently described by doctors are the low back and neck regions, which are directly related to posture (29,30). Ergonomic risk, which is an important cause of musculoskeletal pain among doctors, is a concept that is often overlooked in education (11,30). The most frequently emphasized risk factors are postural risks such as repetitive movements, excessive movements, working in a non-neutral static body position, standing, and neck flexion for long periods (11,29,31). Many studies have investigated various interventions to deal with poor ergonomics. These include preoperative planning aimed at reducing surgical time, breaks during surgery, the use of anti-fatigue standing mats or wearable posture correction sensors, and stretching and other exercises during surgery. These approaches appear to be effective but require further study. Beyond all approaches, posture and ergonomic training, which is a simpler and more accessible approach, remains underexplored (11).

It is reported in the literature that musculoskeletal complaints in doctors often begin during their residency training (11,14,30). In some studies, pain prevalence rates of up to 90% have been reported in resident physicians (11,30). Resident physicians typically work longer hours than attending physicians, have less time for recovery, and are subject to ergonomic risks similar to those of attending physicians. Additionally, resident physicians tend to adopt occupational postures based on observation of their mentors and personal preference rather than ergonomic principles (30).

The residency period is an ideal time to teach the concepts of proper work ergonomics (14). Given that resident physicians continue to develop their PHs and ergonomic practice skills throughout their residency training, there is an opportunity to correct poor habits through early intervention (11). In their study conducted in 2023, Gold et al. (11) reported that some of the resident physicians were trained in ergonomic principles and positions during otologic microscopic surgery while others were not and that those who received training adopted better lumbar posture. Interestingly, this study found that teaching ergonomic principles to senior resident physicians did not make a significant difference in posture. These findings suggest that younger resident physicians who have not yet developed their natural surgical posture may be more likely to change their procedural habits. This emphasize es the importance of early teaching and intervention.

On the other hand, witnessed both in practice and reported in the literature that most medical branches do not provide formal or informal ergonomics training in their residency training programs (29-31,33). Numerous surveys have revealed that most respondents report having little or no prior training in ergonomic principles (11,30). This suggests that resident physicians do not have access to evidence-based ergonomics training that could reduce their risk of experiencing work-related musculoskeletal disorders throughout their careers (29)

This information indicates that, as we did in our study, one of the first steps to be taken in preventing posture-related spine problems is to question the habits and awareness of maintaining correct posture. In this perspective, monitoring and training with posture feedback via photographs, electronic sensors, or tele-rehabilitation methods as part of postural rehabilitation are applications that have been shown to be beneficial in the literature (34-36). The success of posture and ergonomics training programs can most practically be defined by the increase in the individual's knowledge and awareness regarding their own posture habits and the benefits perceived. Apart from this, serial photographs and video reviews will further increase this awareness (29).

Strengths and limitations of the study

The primary contribution of our study to the literature is that the PHAS, a new questionnaire providing easy inquiry about PHs and awareness, is a low-cost method. This scale, which has not been used in the literature before, was utilized to confirm the relationships between spine pain, functionality, and scale parameters, in accordance with existing literature. Another contribution is that it emphasizes that even among doctors, who are the direct managers of health, poor PA and habits that can lead to spinal problems are quite common. There are few studies using objective data to analyze PHs in physicians and even fewer studies investigating the PHs of resident physicians. Our study contributes to the literature in this respect. Limitations of our study include the inability to assess changes in parameters related to study variables after postural rehabilitation and training due to the cross-sectional nature of the study and the relatively small sample size. We believe that prospective studies with larger samples will contribute significantly to the literature on the subject and that strategies that will increase PA in clinical practice will become one of the cornerstones in the prevention and treatment of spine problems.

We believe that training programs, such as lectures and workshops on posture, ergonomics, or musculoskeletal problems, should be included in resident education programs, as these problems may be encountered by resident physicians during their specialization programs at medical schools. Although it is difficult to conduct studies that evaluate posture, ergonomics, and related musculoskeletal problems in the long term, such studies will make important contributions to the literature and clinical practice.

Conclusion

Poor PHs and poor PA are associated with more severe and prolonged spinal pain, worse spinal function, and poorer quality of life. This supports the important role of postural education in the prevention and management of spinal problems.

Ethics

Ethics Committee Approval: The study was approved by the Ufuk University of Non-interventional Clinical Research Evaluation Ethics Committee (decision number: 23.01.12.01/01, date: 24.01.2023).

Informed Consent: Consent form was filled out by all participants.

Footnotes

Conflict of Interest: The author declared no conflict of interest.

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