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RESEARCH ARTICLE / ARAŞTIRMA YAZISI

In Patients with Shoulder Pain Due to Shoulder Impingement Syndrome; the Effect of Psychopathology on Quality of Life and Disability

Psikopatolojinin Omuz Sıkışma Sendromu Olan Hastalarda Yaşam Kalitesi ve Engellilik Üzerine Etkisi

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Abstract:

This study aims to examine the relationship between pain and disability symptoms, somatosensory amplification, depression, anxiety, problematic personality traits, and quality of life in patients with Subacromial Impingement Syndrome (SIS). In the study, 100 cases diagnosed with SIS were evaluated using the Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), Toronto Alexithymia Scale (TAS), Somatosensory Amplification Scale (SAS), SF-36 and Eysenck Personality Questionnaire (EPQ). There was a significant positive correlation between DASH scores and SAS ($r=0.57$, $p<0.01$), BAI ($r=0.30$, $p<0.01$), BDI ($r=0.32$, $p<0.01$), and TAS ($r=0.33$, $p<0.01$) scores whereas a significant positive correlation was found between BDAS scores and BAI ($r=0.45$, $p<0.01$), BDI ($r=0.44$, $p<0.01$), TAS ($r=0.56$, $p<0.01$) scores. Besides, DASH and SAS scores were significantly correlated with quality-of-life subscale scores ($p<0.05$). In Hierarchical Regression Analysis, only SF-36 subscales (physical function, bodily pain, mental health) were elucidated to have significant effects in explaining DASH scores ($p<0.05$), and only TAS scores were established to have significant effects in explaining SAS scores ($p<0.05$). Pain and disability symptoms are associated with quality of life in patients diagnosed with SIS when the effects of mental problems are controlled. Somatosensory amplification in patients with SIS is closely related to alexithymic symptoms considering the control of the effects of other mental problems and pain and disability symptoms.

Keywords: Subacromial Impingement Syndrome, Pain, Depression, Anxiety, Alexithymia, Personality, Somatic Symptoms

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Öz:

Bu araştırmanın amacı Subakromiyal Sıkışma Sendromu (SAPS) olan vakalarda ağrı ve yeti yitimi belirtileri, abartılı bedensel duyumlar, depresyon, anksiyete, problemli kişilik özellikleri ve yaşam kalitesi arasındaki ilişkiyi incelemektedir. Araştırmada SAPS tanılı 100 vaka Kol, omuz ve El sorunları Anketi (DASH), Beck Anksiyete Envanteri (BAE), Beck Depresyon Envanteri (BDE), Toronto Aleksitimi Ölçeği (TAÖ), Bedensel Duyumları Abartma Ölçeği (BDAÖ), SF-36 ve Eysenck Kişilik Ölçeği ile değerlendirilmiştir. DASH skorları ile BDAÖ ($r=0,57$, $p<0,01$), BAE ($r=0,30$, $p<0,01$), BDE ($r=0,32$, $p<0,01$), TAÖ ($r=0,33$, $p<0,01$) skorları arasında anlamlı seviyede pozitif korelasyon; BDAÖ skorları ile BAE ($r=0,45$, $p<0,01$), BDE ($r=0,44$, $p<0,01$), TAS ($r=0,56$, $p<0,01$) skorları arasında anlamlı seviyede pozitif korelasyon olduğu bulundu. Buna ek olarak DASH ve BDAÖ skorları ile yaşam kalitesi alt ölçek skorlarının anlamlı korelasyonlar gösterdiği ($p<0,05$) değerlendirildi. Hiyerarşik Regresyon Analizlerinde DASH skorlarını açıklamada sadece SF-36 alt ölçeklerinin (fiziksel fonksiyon, ağrı, ruhsal sağlık) ($p<0,05$), BDAÖ skorlarını açıklamada ise sadece TAÖ skorlarının ($p<0,05$) anlamlı etkilerinin olduğu sonucuna ulaşıldı. SAPS tanılı vakalarda ağrı ve yeti yitimi belirtileri ruhsal sorunların etkisi kontrol edildiğinde yaşam kalitesiyle ilişkilidir. SAPS tanılı vakalarda abartılı bedensel duyumlar ise diğer ruhsal sorunlar ve ağrı yeti yiyimi belirtilerinin etkileri kontrol edildiğinde aleksitimik belirtiler ile yakından ilişkilidir.

Anahtar Kelimeler: Omuz Sıkışma Sendromu, Ağri, Depresyon, Anksiyete, Aleksitimi, Kişilik, Somatik Semptomlar

Introduction

Subacromial Impingement Syndrome (SIS) has been associated with mechanical compression of the rotator cuff and subacromial tissues between the proximal end of the humerus and the coracoacromial arch, but its exact etiopathology has not been fully elucidated (Alizadehkhaiyat, Roebuck, Makki and Frostick, 2017). Especially, the elevation of the arm in the painful arch (70 and 120° abduction) and anterior and anterolateral superior pain that occurs during overhead movements necessary for daily and work/sports activities, gradually lead to functional losses and disability. The prevalence of SIS differs between age groups, and the 1-year prevalence has been reported to range from 4.7 to 46.7%. In the general population, shoulder pain is observed at a rate of 20-33%. Mostly, its symptomatic course develops in the fifth decade, and the age peak is between the ages of 40-60 (Vogel et al., 2022). Only 21–50% of patients with shoulder pain treated in primary health care recover within six months of starting treatment. Recovery rates are slightly higher after physiotherapy, with 60% of patients recovering within six months. These figures clearly show that current treatments are failing for a large group of patients. Shoulder-related complaints take longer than damaged tissue needs to heal, and the severity of local tissue damage is not corresponded to perceived shoulder pain. A potential cause of failure is that treatment focuses primarily on painful or damaged tissue (De Baets, Matheve, Meeus, Struyf and Timmermans, 2019).

A close association between pain and psychosocial functioning has been documented in various musculoskeletalpain disorders. Impaired psychosocial functioning is often seen as a result of pain, but it can also increase the perception of pain (Overbeeket al, 2021). In patients with shoulder pain, inadequate pain management may create a vicious circle of persistent pain perception, such as sleep disturbance, daytime dysfunction, cognitive, behavioral, or emotional changes, depression, and anxiety (Cho, C. Jung, Park, Song and Yu, 2013). Negative affectsare an umbrella term for anxiety, depression, and neuroticism. Neuroticism creates an unstable mood and therefore causes emotional lability, often expressed as a depressed or anxious mood, including concerns about health-related issues. Neuroticism is thus a source of complications in coping with the disease (Vogel et al., 2022). These psychological conditions may affect the effectiveness of treatment and rehabilitation programs (Cho, C. Jung, Park, Song and Yu, 2013). Alexithymia is the difficulty in naming and describing emotions (Tesio et al., 2018). Alexithymic people focus more on their somatic sensations and tend to exaggerate them. They consider bodily sensations as a physical illness (Ghiggia et al., 2022). Alexithymia and neuroticism are personality traits. A neurotic profile has been reported to accompany high alexithymic features. Perceptual self-awareness or bodily awareness is impaired in both personality traits (Gaggero et al., 2022). Alexithymia has been affiliated with many physical and mental disorders such as chronic physical diseases, anxiety, mood disorders, and somatization disorders (Hosoi et al., 2022). Somatosensory amplification is seen as a diseasebehavior in somatoform disorders (Noyes et al., 2003).

While research on SIS has mostly focused on the peripheral pathology of the shoulder, less attention has been paid to psychosocial factors. This study aimed to investigate the relationship between pain and disability symptoms, somatosensory amplification, depression, anxiety, problematic personality traits, and quality of life in patients with a diagnosis of SIS and evaluated in outpatient clinics.

Methods

In this study, 100 participants who applied to the Orthopedics and Traumatology Polyclinic of a private hospital were evaluated. Participants diagnosed with shoulder impingement syndrome as a result of orthopedic examination and shoulder radiographic imaging, over the age of 18, were literate and signed the informed consent form to participate in the research were included in the study. Patients with mental retardation, a history of neurological disease, severe mental disorder, inflammatory arthritis, uncontrolled diabetes, patients with 50% or more ruptures of the rotator cuff, and patients with

neurological deficits were excluded from the study. In order to determine the number of subjects to be included in the study, the data of the first 30 cases evaluated were used. In these data, correlations between DASH scores and SAS (r=0.55), BAI (r=0.31), BDI (r=0.30), and TAS (r=0.31) scores were evaluated. Considering the correlation coefficients examination, the lowest correlation coefficient is 0.30, when α=0.05 and β=0.20 ($N = [(Z\alpha+Z\beta)/C]2 + 3$), it was calculated that the number of cases to be included in the study should be at least 85 people (Hulley et al. 2001).

All participants reviewed the informed consent form and gave their written consent. This study was designed in accordance with the 2013 Brazilian version of the Declaration of Helsinki and approved by the local Ethics Committee (2011-KAEK-25 2021/08-11).

Assessment Tools

The Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH) was used to measure the participants' disability and pain severity. The Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), Toronto Alexithymia Scale (TAS), Somatosensory Amplification Scale (SAS), SF-36, and Eysenck Personality Questionnaire were used to determine the psychological status of patients. A sociodemographic data form prepared by the authors was given to the participants.

Sociodemographic Data Form

It was created to evaluate the participants' sociodemographic characteristics such as age, gender, marital status, education level, medical history, employment and social status, and clinical characteristics such as pain regions and duration of pain.

Disabilities of Arm, Shoulder, and Hand Questionnaire (DASH)

It is a questionnaire that evaluates the pain and disability of the upper extremity. DASH was developed by the American Academy of Orthopedic Surgeons (AAOS) in 1996 (Hudak, Amadio and Bombardier, 1996). The validity and reliability study of the Turkish version was performed by Düger et al. (Düger et al., 2006). The scale consists of 3 parts, and each part is scored between 0-100. It is a self-reported Likert-type scale consisting of 30 questions, scored between 1 and 5. Participants evaluate the questions by giving points between 1 (no difficulty/symptoms) and 5 (extreme difficulty/symptoms). The first 21 questions assess physical function, 3 questions assess social/role function, and 6 questions assess the patient's symptoms. Higher scores point out more pain and disability.

Beck Depression Inventory (BDI)

It was developed by Beck et al. in 1988 (Beck, Ward, Mendelson and Erbaugh, 1961). BDI is a Likert-type self-assessment scale consisting of 21 questions and scored between 0-3. The total score of BDI is between 0-63. The higher the scores indicate the greater the severity of the depression. The Cronbach alpha value of the original scale is 0.86. The validity and reliability study of its Turkish adaptation was performed by Hisli in 1988 (Hisli, 1989).

Beck Anxiety Inventory (BAI)

It was developed by Beck et al. (1988)BAI is a Likert-type self-assessment scale consisting of 21 questions and scored between 0-3. The BAI's overall score is between 0-63. The Cronbach's alpha value for BAI was 0.93 (Beck, Epstein, Brown and Steer,1988). The higher the scorespoint out the higher the anxiety severity. The validity and reliability study of the Turkish version was performed by Ulusoy et al. (Ulusoy, Sahin andErkmen, 1998).

Somatosensory Amplification Scale (SAS)

It was developed by Barsky et al (Barsky, Wyshak and Klerman, 1990). This scale aims to measure individuals' tendency to overstate/exaggerate the physical symptoms noticed in their bodies. It is a five-point Likert-type scale with ten questions. Scale total score overstatement/exaggeration score is obtained. There is no cutoff score. The reliability study of the Turkish version was performed by Sayar et al. (Gulec, Sayar, and Gulec, 1990).

Toronto Alexithymia Scale (TAS-20)

It, developed byBagby et al. in 1994, is widely used to evaluate alexithymic characteristics in individuals (Bagby, Parker and Taylor, 1994; Bagby, Taylor and Parker, 1994). It is a Likert-type self-report questionnaire, frequently used for patients with chronic pain, and consisting of 20 items. Questions are scored between 1-5. A high score on the scale indicates an increase in alexithymic characteristics. The validity and reliability study of the Turkish version of TAS-20 was conducted by Güleç et al. (2009). The total scale Cronbach's alpha value was found to be 0.78, and the subscales were between 0.57 and 0.80.

Eysenck Personality Questionnaire-Revised Abbreviated (EPQR-A)

It is one of the scales developed to measure personality traits and was developed byEysenck and Eysenck (1975). After the personality theory was created by Eysenck, the scale evaluating the characteristics within the scope of the theory was revised by Francis, Brown and Philipchalk, (1992), reduced to 24 items, and named Eysenck Personality Inventory-Revised Abbreviated.The validity and reliability study of the Turkish adaptation was performed by Karanci, Dirik and Yorulmaz (2007). The scale consists of 4 sub-dimensions: extraversion, psychoticism, neuroticism, and lying. Each sub-dimension consists of 6 items, and a maximum of 6 points can be obtained from each sub-dimension.

Short Form Health Survey (SF-36)

SF-36 is a self-report measurement tool developed to obtain information about the health status of individuals and evaluates different sub-dimensions of quality of life (Physical Functioning, Role Physical, Role Emotional, Vitality, Mental Health, Social Functioning, Bodily Pain, and General Health). The Turkish adaptation of the SF-36 was performed on cases with osteoarthritis and chronic low back pain, and Cronbach's alpha values of the subscales were found to be in the range of 0.73-0.76 (Koçyiğit, 1999).

Data analysis

Demographic and clinical characteristics of the cases evaluated in the study were analyzed with descriptive statistical analyzes (number, percentage, mean, standard deviation, etc.). The relationship between DASH, SAS, SF-36, BAI, BDI, TAS, and EPQ was examined by Pearson Correlation Analysis. Hierarchical Linear Regression Analysis was used to determine which of the quality of life, depression, anxiety, personality traits, and alexithymia symptoms were effective factors in explaining the DASH and SAS scores of the cases evaluated in the study. The significance level for all analyzes was

determined as $p<0.05$. The conformity of the data to the normal distribution was checked with the values of kurtosis and skewness (±1.5). IBM SPSS 22.0 program was used in the analysis.

Results

The mean age of the cases evaluated in the study was elucidated to be 45.01±9.74 (Min.=19.00-Max.=75.00). Of the cases evaluated in the study, 62 (62%) were female, 24 (24%) were primary school graduates, 2 (2%) were secondary school graduates, 45 (45%) were high school graduates, 29 (29%) were university graduates, 18 (18%) were single, 69 (69%) were married, 13 (13%) were divorced, 64 (64%) were employed, 35 (35%) were medium-income (perceived income), 65 (65%) were high-income (perceived income), 74 (74%) lived in the city center, 25 (25%) lived in the district, 1 (1%) lived in the village, and 73 (73%) did not use analgesics(Table 1).

Table 1. Demographic Characteristics of the Cases Evaluated in the Study

		f	**%**
Gender	Female	62	62.0
	Male	38	38.0
Education	Primary school graduate	24	24.0
	Secondary school graduate	2	2.0
	High school graduate	45	45.0
	University graduate	29	29.0
Marital Status	Single	18	18.0
	Married	69	69.0
	Widowed	13	13.0
Employment Status	Employed	64	64.0
	Unemployed/student	36	36.0
Perceived income	Low	0	0.0
	Middle	35	35.0
	High	65	65.0
	Very high	0	0.0
Region of Residence	City center	74	74.0
	District	25	25.0
	Village	1	1.0
Analgesic Use	No	73	73.0
	Yes	27	27.0
		$\bar{x}$ ±SD	**Min.-Max.**
Age		45.01±9.74	19.00-75.00

According to Pearson Correlation Analysis, of the cases evaluated in the study, DASH, SAS ($r=0.52$, $p<0.01$), BAI ($r=0.30$, $p<0.01$), BDI ($r=0.32$, $p<0.01$), and TAS ($r=0.33$, $p<0.01$) scores were detected to have a significant positive correlation. Besides, DASH scores of the cases and Physical Functioning ($r=-0.47$, $p<0.01$), Role Physical ($r=-0.62$, $p<0.01$), Role Emotional ($r=-0.30$, $p<0.01$), Vitality ($r=-0.20$, $p<0.05$), Bodily Pain ($r=-0.79$, $p<0.01$), General Health ($r=-0.52$, $p<0.01$), Neuroticism ($r=-0.28$, $p<0.01$) scores were determined to have a significant negative correlation.

Considering the Pearson Correlation Analysis, a significant positive correlation was found between SAS scores and BAI ($r=0.453$, $p<0.001$), BDI ($r=0.44$, $p<0.01$), and TAS ($r=0.56$, $p<0.01$) scores of the cases evaluated in the study. Moreover, A significant negative correlation was revealed between the SAS scores and Physical Functioning ($r=-0.24$, $p<0.05$), Role Physical ($r=-0.32$, $p<0.01$), Vitality ($r=-0.27$, $p<0.01$), Social Functioning ($r=-0.25$, $p<0.05$), Bodily Pain ($r=-0.55$, $p<0.01$), General Health ($r=-0.46$, $p<0.01$), Neuroticism ($r=-0.41$, $p<0.01$), and psychoticism ($r=-0.26$, $p<0.05$) scores (Table 2).

Table 2. Relationship between DASH, SAS, SF-36, BAI, BDI, TAS, and EPQR-A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1-DASH	-															
2-SAS	0.57**															
3-Physical Functioning	-0.47**	-0.24*														
4-Role Physical	-0.62**	-0.32**	0.39**													
5-Role Emotional	-0.30**	-0.19	0.09	0.45**												
6-Vitality	-0.20*	-0.273**	0.01	0.18	0.23*											
7-Mental Health	-0.04	-0.19	0.01	0.14	0.30**	0.76**										
8-Social Functioning	-0.14	-0.25*	-0.07	0.06	0.10	0.39**	0.31**									
9-Bodily Pain	-0.79**	-0.55**	0.32**	0.66**	0.34**	0.30**	0.23*	0.15								
10-General Health	-0.52**	-0.46**	0.38**	0.42**	0.29**	0.51**	0.42**	0.23*	0.60**							
11-BAI	0.30**	0.45**	-0.13	-0.24*	-0.31**	-0.32**	-0.42**	-0.25*	-0.41**	-0.51**						
12-BDI	0.32**	0.44**	-0.15	-0.15	-0.32**	-0.65**	-0.67**	-0.39**	-0.41**	-0.53**	0.60**					
13-TAS	0.33**	0.56**	0.01	-0.15	-0.26*	-0.46**	-0.41**	-0.27**	-0.35**	-0.38**	0.45**	0.51**				
14-Extraversion	0.08	-0.02	-0.11	-0.16	-0.01	-0.04	0.04	0.10	-0.04	0.08	-0.19	-0.09	-0.11			
15-Lying	0.09	-0.02	-0.09	-0.16	-0.11	-0.06	0.07	0.09	-0.03	0.04	-0.08	0.09	-0.02	0.28**		
16-Neurıtisim	-0.28**	-0.41**	0.05	0.21*	0.18	0.42**	0.55**	0.25**	0.31**	0.37**	-0.37**	-0.52**	-0.42**	0.13	0.18	
17-Psychotism	-0.159	-0.26**	-0.08	0.01	0.11	0.13	0.14	-0.08	0.21*	0.19	-0.15	-0.14	-0.28**	0.10	0.32**	0.37**

*<0.05, **<0.01, Test used: Pearson Correlation Analysis, DASH= Disability of Arm, Shoulder, and Hand Questionnaire, SAS= Somatosensory Amplification Scale, SF-36= Short Form Health Survey, BAI=Beck Anxiety Inventory, BDI=Beck Depression Inventory, TAS=Toronto Alexithymia Scale, EPQR-A=Eysenck Personality Questionnaire - Revised Abbreviated

In this study, 12% of the DASH scores of the cases evaluated in the study were found to be explained by the BDI and BAI scores at a statistically significant level (F=5.51, p=0.006). Considering the Model 1 examination, BDI scores were statistically significant in explaining DASH scores (p=0.048, CI:0.00-0.86). By adding TAS scores to Model 1, 16% of DASH scores were revealed to be explained at a statistically significant level (F=5.28, p=0.002). In the examination of Model 2, TAS scores were detected to be statistically significant (p=0.040, CI: 0.02-0.66) in explaining DASH scores. It was found that 23% of DASH scores were explained at a statistically significant level (F=3.24, p=0.005) with the addition of EPQR-A scores to Model 2. After the addition of SF-36 scores to Model 3, 77% of DASH scores were explained at a statistically significant level (F=15.36, p<0.001). Regarding the examination of Model 4, TAS (p=0.041, CI:0.01-0.42), Physical Functioning (p=0.001, CI: -0.34--0.09), Mental Health (p=0.006, CI:0.09-0.51), Bodily Pain (p<0.001, CI: -0.47- -0.22) scores were determined to be statistically significant. Considering the addition of SAS scores to Model 4, 78% of DASH scores were explained at a statistically significant level (F=14.95, p<0.001). Considering the Model 5 examination, Physical Functioning (p=0.005, CI: -0.32--0.06), Mental Health (p=0.021, CI:0.04-0.47), Bodily Pain (p<0.001, CI:-0.46--0.21) scores were statistically significant in explaining DASH scores (Table 3).

Table 3. Factors Affecting the Explanation of DASH Scores

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval	
		B	SE	β	t	p	Lower Limit	Uper Limit
1	(Constant)	15.82	3.63		4.36	<0.001	8.60	23.04
	BAI	0.25	0.24	0.13	1.06	0.292	-0.22	0.73
	BDI	0.43	0.21	0.25	2.01	0.048	0.00	0.86
2	(Constant)	1.62	7.68		0.21	0.834	-13.67	16.89
	BAI	0.13	0.24	0.07	0.54	0.591	-0.35	0.61
	BDI	0.30	0.22	0.18	1.37	0.174	-0.14	0.74
	TAS	0.34	0.16	0.25	2.09	0.040	0.02	0.66
3	(Constant)	3.42	12.06		0.28	0.778	-20.60	27.43
	BAI	0.21	0.24	0.11	0.85	0.398	-0.28	0.69
	BDI	0.16	0.24	0.09	0.66	0.514	-0.32	0.64
	TAS	0.27	0.17	0.19	1.59	0.116	-0.07	0.60
	Extraversion	2.19	1.51	0.15	1.45	0.150	-0.81	5.20
	Lying	1.50	1.48	0.16	1.02	0.312	-1.44	4.44
	Neuroticism	-1.08	1.03	-0.14	-1.05	0.296	-3.13	0.98
	Psychoticism	-2.12	1.78	-0.14	-1.19	0.238	-5.67	1.43
4	(Constant)	43.55	12.15		3.58	0.001	19.31	67.79
	BAI	-0.08	0.16	-0.04	-0.52	0.604	-0.39	0.23
	BDI	0.19	0.17	0.11	1.08	0.284	-0.16	0.54
	TAS	0.22	0.10	0.16	2.08	0.041	0.01	0.42
	Extraversion	0.65	0.90	0.05	0.73	0.470	-1.14	2.44
	Lying	0.08	0.89	0.01	0.09	0.928	-1.70	1.87
	Neuroticism	-0.65	0.67	-0.08	-0.97	0.337	-2.00	0.69
	Psychoticism	-0.93	1.15	-0.06	-0.81	0.421	-3.23	1.36
	Physical Functioning	-0.21	0.06	-0.25	-3.33	0.001	-0.34	-0.09
	Role Physical	-0.07	0.04	-0.16	-1.77	0.082	-0.15	0.01
	Role Emotional	0.00	0.04	0.00	0.02	0.983	-0.08	0.08
	Vitality	-0.11	0.10	-0.12	-1.10	0.276	-0.30	0.09
	Mental Health	0.30	0.10	0.32	2.86	0.006	0.09	0.51
	Social Functioning	-0.06	0.06	-0.06	-0.94	0.349	-0.17	0.06
	Bodily Pain	-0.34	0.06	-0.52	-5.41	<0.001	-0.47	-0.22
	General Health	0.05	0.08	0.05	0.56	0.576	-0.12	0.21
5	(Constant)	40.52	12.14		3.34	0.001	16.29	64.75
	BAI	-0.13	0.16	-0.07	-0.80	0.428	-0.44	0.19

BDI	0.15	0.17	0.09	0.84	0.404	-0.20	0.49
TAS	0.14	0.11	0.10	1.23	0.223	-0.09	0.36
Extraversion	0.49	0.89	0.04	0.55	0.581	-1.29	2.27
Lying	0.09	0.88	0.01	0.10	0.922	-1.68	1.85
Neuroticism	-0.37	0.69	-0.05	-0.54	0.590	-1.74	1.00
Psychoticism	-0.72	1.15	-0.05	-0.63	0.530	-3.01	1.56
Physical Functioning	-0.19	0.07	-0.22	-2.94	0.005	-0.32	-0.06
Role Physical	-0.07	0.04	-0.16	-1.76	0.083	-0.15	0.01
Role Emotional	-0.01	0.04	-0.01	-0.15	0.879	-0.08	0.07
Vitality	-0.10	0.10	-0.11	-1.02	0.310	-0.29	0.09
Mental Health	0.25	0.11	0.27	2.35	0.021	0.04	0.47
Social Functioning	-0.05	0.06	-0.05	-0.81	0.422	-0.16	0.07
Bodily Pain	-0.33	0.06	-0.51	-5.34	<0.001	-0.46	-0.21
General Health	0.05	0.08	0.05	0.56	0.578	-0.12	0.21
SAS	0.29	0.18	0.14	1.64	0.105	-0.06	0.64

Hierarchical Linear Regression Analysis, DASH= Disability of Arm, Shoulder, and Hand Questionnaire, SAS= Somatosensory Amplification Scale, SF-36= Short Form Health Survey, BAI=Beck Anxiety Inventory, BDI=Beck Depression Inventory, TAS=Toronto Alexithymia Scale, EPQR-A=Eysenck Personality Questionnaire - Revised Abbreviated Model 1: R2=0.12, F=5.51, p=0.006. Model 2: R2=0.16, F=5.28, p=0.002. Model 3: R2=0.23, F=3.24, p=0.005. Pattern 4: R2=0.77, F=15.39, p<0.001. Model 5: R2=0.78, F=14.95, p<0.001.

In this study, 24% of the SAS scores of the cases evaluated in the study were explained by the BAI and BDI scores at a statistically significant level (F=13.26, p<0.001). After the addition of TAS scores to Model 1, 39% of SAS scores were determined to be explained at a statistically significant level (F=17.31, p<0.001). In the examination of Model 2, TAS scores were statistically significant (p<0.001, CI:0.17-0.44) in explaining SAS scores. Considering the addition of EPQR-A scores to Model 2, it was found that 43% of SAS scores were explained at a statistically significant level (F=8.43, p<0.001). Considering Model 3, it was detected that the TAS scores were statistically significant (p<0.001, CI:0.13-0.41) in explaining the SAS scores. By adding SF-36 scores to Model 3, it was explained that 56% of SAS scores were explained at a statistically significant level (F=5.94, p<0.001). Regarding the examination of Model 4, TAS (p<0.001, CI:0.13-0.41), Neuroticism (p=0.037, CI: -1.89-0.06), Mental Health (p=0.025, CI:0.02-0.31) in explaining the SAS scores were statistically significant. With the addition of DASH scores to Model 4, 58% of SAS scores were explained at a statistically significant level (F=5.88, p<0.001). In Model 5, TAS scores (p=0.001, CI:0.10-0.38) were determined to be statistically significantly effective in explaining SAS scores (Table 4).

Tablo 4. Factors Affecting the Explanation of SAS Scores

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval	
Model		B	SE	β	t	p	Lower Limit	Uper Limit
1	(Constant)	19.01	1.66		11.44	<0.001	15.70	22.31
	BAI	0.25	0.11	0.26	2.24	0.028	0.03	0.46
	BDI	0.25	0.10	0.30	2.58	0.012	0.06	0.45
2	(Constant)	6.34	3.24		1.96	0.054	-0.11	120.79
	BAI	0.14	0.10	0.14	1.33	0.186	-0.07	0.34
	BDI	0.14	0.09	0.16	1.48	0.143	-0.05	0.32
	TAS	0.30	0.07	0.44	4.41	<0.001	0.17	0.44
3	(Constant)	10.25	5.11		2.01	0.048	0.09	200.42
	BAI	0.15	0.10	0.16	1.48	0.143	-0.05	0.36
	BDI	0.06	0.10	0.08	0.63	0.528	-0.14	0.27
	TAS	0.27	0.07	0.39	3.78	<0.001	0.13	0.41
	Extraversion	0.69	0.64	0.10	1.09	0.281	-0.58	1.97
	Lying	0.20	0.63	0.03	0.32	0.747	-1.04	1.45
	Neuroticism	-0.72	0.44	-0.18	-1.66	0.101	-1.59	.15
	Psychoticism	-0.65	0.76	-0.08	-0.86	0.393	-2.15	.86
4	(Constant)	10.56	8.27		1.28	0.206	-5.95	27.06
	BAI	0.15	0.11	0.16	1.42	0.161	-0.06	0.36
	BDI	0.15	0.12	0.17	1.24	0.221	-0.09	0.38
	TAS	0.27	0.07	0.39	3.82	<0.001	0.13	0.41
	Extraversion	0.55	0.61	0.08	0.90	0.372	-0.67	1.77
	Lying	-0.02	0.61	-0.00	-0.03	0.974	-1.24	1.20
	Neuroticism	-0.98	0.46	-0.25	-2.13	0.037	-1.89	-.06
	Psychoticism	-0.73	0.78	-0.10	-0.93	0.356	-2.29	.84
	Physical Functioning	-0.08	0.04	-0.19	-1.84	0.070	-0.17	0.01
	Role Physical	-0.00	0.03	-0.02	-0.14	0.889	-0.06	0.05
	Role Emotional	0.02	0.03	0.09	0.88	0.380	-0.03	0.08
	Vitality	-0.03	0.07	-0.07	-0.44	0.660	-0.16	0.10
	Mental Health	0.16	0.07	0.35	2.29	0.025	0.02	0.31
	Social Functioning	-0.03	0.04	-0.07	-0.73	0.467	-0.11	0.05
	Bodily Pain	-0.03	0.04	-0.08	-0.63	0.531	-0.11	0.06
	General Health	0.00	0.06	0.01	0.05	0.960	-0.11	0.12
5	(Constant)	4.76	8.90		0.54	0.594	-13.00	22.52
	BAI	0.16	0.11	0.17	1.54	0.129	-0.05	0.37
	BDI	0.12	0.12	0.14	1.03	0.308	-0.11	0.36
	TAS	0.24	0.07	0.35	3.35	0.001	0.10	0.38
	Extraversion	0.46	0.61	0.07	0.76	0.448	-0.75	1.67
	Lying	-0.03	0.60	-0.01	-0.05	0.959	-1.23	1.17

Neuroticism	-0.89	0.46	-0.23	-1.95	0.055	-1.80	0.02
Psychoticism	-0.60	0.78	-0.08	-0.78	0.440	-2.16	0.95
Physical Functioning	-0.05	0.05	-0.12	-1.12	0.269	-0.15	0.04
Role Physical	0.01	0.03	0.03	0.20	0.839	-0.05	0.06
Role Emotional	0.02	0.03	0.09	0.89	0.377	-0.03	0.07
Vitality	-0.02	0.07	-0.03	-0.23	0.820	-0.15	0.12
Mental Health	0.12	0.07	0.27	1.66	0.102	-0.03	0.27
Social Functioning	-0.02	0.04	-0.05	-0.55	0.584	-0.10	0.06
Bodily Pain	0.01	0.05	0.06	0.36	0.718	-0.08	0.12
General Health	-0.00	0.06	-0.01	-0.06	0.952	-0.11	0.11
DASH	0.13	0.08	0.27	1.64	0.105	-0.03	0.30

Hierarchical Linear Regression Analysis, DASH= Disability of Arm, Shoulder, and Hand Questionnaire, SAS= Somatosensory Amplification Scale, SF-36= Short Form Health Survey, BAI=Beck Anxiety Inventory, BDI=Beck Depression Inventory, TAS=Toronto Alexithymia Scale, EPQR-A=Eysenck Personality Questionnaire - Revised Abbreviated Model 1: R2=0.24, F=13.26, p<0.001. Model 2: R2=0.39, F=17.31, p<0.001. Model 3: R2=0.43, F=8.43, p<0.001. Model 4: R2=0.56. F=5.94, p<0.001. Model 5: R2=0.58, F=5.88, p<0.001.

Discussion

In the study, pain, and disability related to the upper extremity were detected to be associated with depression, anxiety, quality of life, alexithymia, and some personality traits (neuroticism and psychoticism) in cases with SIS. In the regression models, pain and disability linked to the upper extremity were explained only by physical functioning, general mental state, and pain scores. Besides, the symptoms of somatosensory amplificationwere only significantly explained by alexithymic symptoms and were not tied to other psychological characteristics evaluated in the study.

In the study, the fact that pain and disability scores in SIS cases were positively associated with symptoms of somatosensory amplificationmay indicate that physical and psychological problems may be intertwined in these cases. Treatment success rates vary in SIS cases, and treatment success rates have been evaluated not to exceed 60%, even when appropriate physical therapy methods are used (De Baetset et al., 2019). Distinguishing the sources of physical and psychological pain and functional problems in these cases will, therefore, contribute to treatment success rates. Additionally, Vogel et al. (2022) in their review of the literature related to SIS cases, stated that psychosomatic and psychotraumatological factors play a role in chronic pain, but the number of studies in this field is limited.

Depression and anxiety-related disorders are known to be among the most common health problems in the population (Mahmud, Hossain, Muyeed, Islam and Mohsin, 2021). These disorders were specified to worsen physical-based health problems and negatively affect the immune system in people as depressive and anxiety symptoms increase (Hur and Park, 2022; Bekhbat and Neigh, 2018). The correlation of pain and disability scores with depression and anxiety symptoms in the study supports these results. Thus, it would be beneficial to refer cases with high symptoms of depression and anxiety to mental health professionals for a faster recovery process.

Detailed assessment of quality of life in cases with SIS will be stated to facilitate the selection of appropriate treatment (Pasin and Pasin, 2021). Symptoms of pain and disability and somatosensory amplification in SIS cases are associated to the quality of life of individuals. This result shows the importance of eliminating both physical and psychological problems together in patients with SIS. The fact that personality traits such as neuroticism and psychoticism are appertaining to pain symptoms of physical and psychological origin may indicate that mental intervention methods will not be immediately successful. Because neuroticism and psychoticism define permanent problematic personality traits not easily bechanged (Beck et al.,1988). This shows that it is difficult to control the effect of negative personality traits on a health problem such as SIS, which is expected to improve after six months. Hence, it may be more beneficial to bring psychopharmacological treatments to the fore in SIS cases with intense negative personality traits.

Depression, anxiety, and sleep disorders have been explained to be more common in patients with long-term shoulder pain than in healthy people (Cho, C. Jung, Park, Song and Yu, 2013). Physical complaints in people with chronic shoulder pain resulting from unilateral shoulder injury have been stated to be related to depression among the main psychological factors (Wolfensberger et al., 2016). This study showed that depression is not an effective factor in disease symptoms in SIS cases, and instead clinicians should focus on physical functioning, general mental health and bodily pain. It should be kept in mind that the focus of physicians on the quality of life of people with SIS may increase the success of treatment, and focusing on other temporary or permanent mental problems may provide less benefit to the patient in the first step.

Somatosensory amplification includes psychosomatic mental problems (Barskyetal., 1990). The regression models used in the study showed that the most effective method of reducing exaggerated bodily sensations in patients diagnosed with SIS is to reduce alexithymic symptoms. Alexithymia is characterized by the inability to identify or express emotions in a healthy way (Güleç et al., 2009). Considering the literature, it can be said that the number of studies examining the effect of alexithymia on bodily sensations in SIS cases is limited. It was elicited that the rate of alexithymia was 1.6 times higher in people with unidentified shoulder pain than in people with chronic rotator cuff tendinitis (Miranda et al., 2005). Thoracic outlet syndrome patients with alexithymia were identified to show worse pain, symptoms, functioning, and depression than patients without alexithymia (Tunç et al., 2019). Investigating the effect of alexithymic features on somatic complaints in SIS cases may, therefore, contribute to the literature.

Research results show that SIS cases with high difficulty in expressing emotions exaggerate their physical problems, in other words, difficulties in expressing emotions cause exaggerated physical problems in cases with SIS. Hence, especially orthopedic physicians helping these patient groups to express their physical problems in a healthy way, physicians listening more carefully to the problems experienced by the patients after the operation and conveying feedback about their understanding of these problems will help to reduce exaggerated somatic sensations. Similarly, focusing more on alexithymic symptoms than mental illnesses such as depression and

anxiety by mental health professionals in cases with SIS may help to improve psychosomatic problems at an earlier stage.

Limitations

One of the limitations of the study is that the number of male patients is less than the number of the females. Besides, another limitation of the study is that the patient population consists only of patients receiving treatment in a private hospital. In the study, the physical and somatic complaints of the participants were evaluated. However, in this study, the effects of diseases with unknown causes, such as fibromyalgia, which may have effects on physical and somatic complaints, were not controlled.

Conclusion

Pain and disability symptoms in SIS cases are associated with quality of life when depression, anxiety, alexithymia, and problematic personality traits are controlled. It would be, thus, more beneficial in the first step for physicians to turn to practices that can increase the quality of life of patients with SIS instead of mental problems. Somatosensory amplificationis closely linked with alexithymic symptoms in cases with a diagnosis of SIS. In this regard, orthopedic physicians and mental health professionals helping patients express their emotions before dealing with depression, anxiety, and problematic personality traits may help reduce the amplification.

Declarations

Ethics Approval and Consent to Participate

The ethics committee permission required to start this study was obtained from the ethics committee of University of Health Sciences Bursa Yuksek Ihtisas Training and Research Hospital Ethics Committee with the decision number (2011-KAEK-25 2021/08-11 dated 23.11.2011. Ethical rules reported during the study were taken into consideration and consent forms were obtained from the participants.

Consent for Publication

Not applicable

Availability of Data and Materials

Not applicable.

Competing Interests

The author declares that no competing interests in this manuscript.

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Authors' Contributions

AK and ÇT carried out the proposal of the main idea of the research and contributed to the collection of data, analysis. AK provided technical and material support. All authors have read and approved the final article.

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