



Frozen shoulder and the Big Five personality traits

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Background: In the past, several studies have suggested the existence of a “periarticular personality” in patients with frozen shoulder. We conducted a study to determine differences in personality traits in patients with primary and secondary frozen shoulders.

Materials and methods: We prospectively evaluated 118 patients (84 women and 34 men; mean age, 53.8 years; SD 7.56) with a frozen shoulder. Of these patients, 48 had an idiopathic frozen shoulder and 70 had a secondary frozen shoulder. Personality traits were determined by the NEO Five-Factor Inventory (NEO-FFI) scale. This questionnaire measures the 5 major personality traits and is based on the norms determined in a neutral test situation for 2415 controls.

Results: Compared with healthy controls, no differences in personality traits were found in patients with primary and secondary frozen shoulder, except for Conscientiousness and Extraversion, for which patients with secondary frozen shoulder scored significantly higher than healthy controls. Patients with primary frozen shoulder scored significantly higher on Openness to Experience than did patients with secondary frozen shoulder; on the other 4 Big Five personality traits, no significant differences were found between patients with primary and secondary frozen shoulder. More specifically, patients with idiopathic frozen shoulder did not score higher on the trait Neuroticism as would be expected from previous publications.

Conclusions: Our study results do not indicate that patients with an idiopathic frozen shoulder have a specific personality compared with healthy controls. Only a few differences were found in personality traits when the entire frozen shoulder group was compared with healthy controls and between patients with primary and secondary frozen shoulders. The results of this study suggest that these differences are not sufficient to speak about a specific “frozen shoulder personality.”

Level of evidence: Level III, Cross-Sectional Design, Epidemiology Study.

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Keywords: Personality; Big Five personality traits; NEO-FFI; primary frozen shoulder; secondary frozen shoulder

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Frozen shoulder is a common, disabling condition associated with synovitis and capsular contracture of the glenohumeral joint. The classic definition of a frozen shoulder is a shoulder with limitation of both active and passive range of motion. The condition can be primary (or idiopathic), meaning that the etiology is unknown. It can also be secondary, indicating that a specific cause can be identified.¹⁶

Apart from these classic causes of frozen shoulder, clinicians often have the impression that a frozen shoulder is frequently seen in patients with a specific personality.^{4,6,8,11,12} In contrast, other researchers found no psychological differences. Wright and Haq¹⁵ showed that psychological factors were of little importance in the causation of frozen shoulder. They assumed that the development of a stiff shoulder was due to an interrelationship of many factors, mainly age. On the basis of these studies, there is still uncertainty about the association between personality characteristics and frozen shoulder.

The current study was conducted to further investigate a possible relationship between frozen shoulder and personality with use of the Dutch version of the Neuroticism–Extraversion–Openness to New Experience Five-Factor Inventory (NEO-FFI).⁵ The NEO-FFI assesses the Big Five personality traits: Neuroticism, Extraversion, Openness, Altruism, and Conscientiousness. In psychology, the Big Five personality traits are 5 broad domains or dimensions of personality that are used to describe human personality.

We wanted to investigate whether there is a difference in personality profile between patients with an idiopathic frozen shoulder and healthy controls and evaluate differences in personality traits between patients with secondary frozen shoulders and healthy controls and between patients with an idiopathic frozen shoulder and those with a secondary frozen shoulder. We hypothesized that persons with an idiopathic frozen shoulder would score higher on the trait Neuroticism (emotional instability) compared with healthy controls and that patients with a secondary frozen shoulder would show no differences in personality compared with a healthy control population because a clear etiology is present in these cases. Finally, we hypothesized that patients with an idiopathic frozen shoulder would score higher on the trait Neuroticism compared with those with secondary frozen shoulders (systemic and nonsystemic).

Methods

We recruited 118 consecutive patients, 84 women and 34 men with a mean age of 53.88 years (SD = 7.56; range, 28 to 74 years), who presented to our Orthopaedic Upper Limb Clinic with a frozen shoulder for more than 6 months between December 2009 and May 2012. Participants provided written informed consent before inclusion in our study.

Assessments and instruments

The diagnosis of frozen shoulder was made on clinical grounds: marked loss of active and passive glenohumeral motion with

severe restriction of external rotation, abduction, and forward flexion. Active and passive range of motion was measured with a handheld goniometer with the patient in the standing position. Forward flexion and abduction were evaluated by measurement of the angle formed by the arm and thorax. External rotation was measured with the arm adducted and the elbow at the side and flexed to 90°. Internal rotation of the arm behind the back was determined by the vertebral level that could be reached by the dorsum of the hand. After enrollment in the study, patients were divided into the primary frozen shoulder group and the secondary frozen shoulder group by the criteria of Zuckerman.¹⁶ In patients with a primary frozen shoulder, no underlying cause or associated condition could be identified. In secondary types of frozen shoulders, a clear cause or associated condition could be identified, and this group was further subdivided into 3 categories: systemic, nonsystemic intrinsic, and nonsystemic extrinsic. Systemic causes of frozen shoulder included diabetes mellitus, thyroid disease (hypothyroidism and hyperthyroidism) and hypoadrenalism, and any other condition that has been documented to have an association with the development of frozen shoulder (e.g., hyperlipidemia and Dupuytren's disease^{3,14}). Nonsystemic secondary frozen shoulders can be divided into intrinsic and extrinsic frozen shoulders. Intrinsic secondary frozen shoulders include all frozen shoulders associated with rotator cuff disease (e.g., tears, calcifications, tendinitis) and biceps disease (secondary intrinsic frozen shoulder). Extrinsic secondary frozen shoulders are those associated with an abnormality remote from the shoulder (e.g., cerebrovascular accident, pulmonary disease, cardiac disease, cervical radiculopathy, chest wall tumors, ipsilateral breast interventions) or more local problems in the shoulder joint (e.g., humeral shaft fractures, acromioclavicular problems, clavicle fracture).

On the basis of a questionnaire and available medical records, patients were classified as having a primary frozen shoulder when no underlying cause or associated condition could be identified. All patients with a clear cause were subdivided into the secondary frozen shoulder group. This group was further subdivided into the systemic group and the nonsystemic group (Fig. 1). Because we did not perform biochemical analyses in all patients, the existence of diabetes, thyroid disease, or hyperlipidemia was based on the current drug treatment of the patients. All patients had standard radiography of the shoulder to detect the presence of calcifications, malunions, fractures, and signs of glenohumeral arthritis. Ultrasound and magnetic resonance imaging were used to evaluate the integrity of the rotator cuff and the biceps tendon and to detect any calcifications.

Exclusion criteria for this study were stiffness caused by glenohumeral arthritis, stiff shoulders after shoulder arthroplasty, reflex sympathetic dystrophy of the ipsilateral hand, malignant neoplasms of the shoulder girdle, and mental incapacity to fill in the questionnaire.

Personality traits were assessed by means of the Dutch version of the NEO-FFI.^{5,9} This scale assesses 5 major personality traits: Neuroticism, Extraversion, Openness, Altruism, and Conscientiousness. The different personality traits and their characteristics are described in Table I. The NEO-FFI consists of 60 items and measures the 5 major personality traits (12 items for each trait). Items are answered on a 5-point scale ranging from *strongly disagree* to *strongly agree*. It takes 10 to 20 minutes to finish the NEO-FFI, and norms for the population are available. The patients filled in the pen and paper version of the NEO-FFI

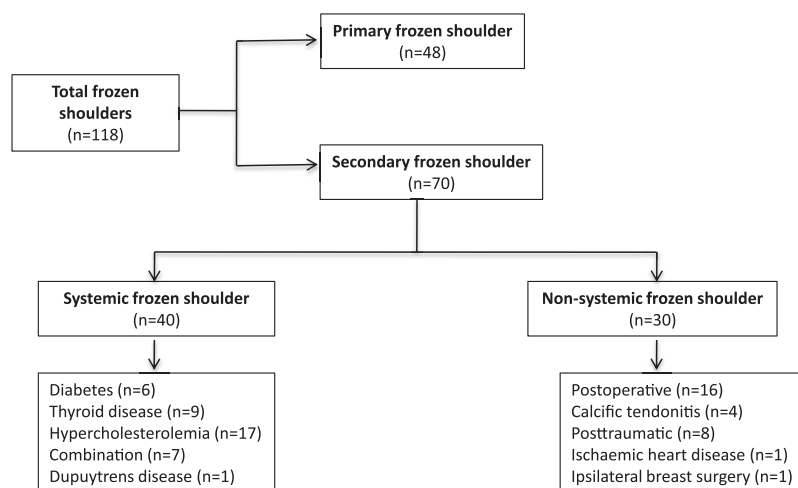


Figure 1 Flow chart with distribution of subjects per different type of frozen shoulder in this study (n = number of patients).

questionnaire. In this study, we used the available means and standard deviations of 2415 healthy controls to compare the Big Five personality traits of the frozen shoulder patients and healthy controls. The reliability of the 5 NEO-FFI scales in the present sample was determined by means of Cronbach's α coefficient. For the trait Neuroticism, Cronbach's α coefficient was .845; Extraversion, .812; Openness, .606; Altruism, .700; and Conscientiousness, .766. All 5 NEO-FFI scales had an acceptable to good internal consistency.

Statistics

To compare the mean scores of the Big Five personality traits of the different types of frozen shoulder patients and healthy controls, we made use of analyses of variance (SPSS Inc., version 19, Chicago, IL, USA). To control for multiple comparisons, the significance level was adapted by means of Bonferroni correction for multiple comparisons ($P < .05/25 = .002$).

In addition, a multivariate analysis of covariance (SPSS Inc., version 19, Chicago, IL, USA) was performed with the raw scores of the 5 personality traits as dependent variables and the type of frozen shoulder (primary or secondary, systemic or nonsystemic), gender, and their interaction as independent variables and age as covariate. Statistical analyses were conducted at a 95% confidence interval. $P < .05$ was considered statistically significant.

Results

A total of 48 patients were identified with an idiopathic frozen shoulder. The remaining 70 had a secondary frozen shoulder, and of these 40 were systemic and 30 were nonsystemic frozen shoulders (Fig. 1). Nine patients had thyroid disease, 17 had hypercholesterolemia, 6 had isolated diabetes and 7 had a combination of the above. Five patients had type 1 diabetes and 5 patients had type 2 diabetes. One patient had Dupuytren's disease. Postoperative frozen

shoulders were diagnosed after rotator cuff repair (n = 5), arthroscopic decompression (n = 7), arthroscopic needling of calcifications (n = 2), open biceps tenodesis (n = 1), and resection of an axillary abscess (n = 1). In the group of posttraumatic frozen shoulders, 4 patients developed progressive stiffness after a minor trauma (contusion, fall on the shoulder without fracture); 1 patient had stiffness after a shoulder dislocation; and 3 patients had a frozen shoulder after a conservatively treated, well-united, and completely undisplaced subcapital humeral fracture. Four patients had a frozen shoulder associated with calcific deposits in the rotator cuff; 1 patient had ischemic heart disease, and 1 patient had ipsilateral breast surgery.

Assessment of the Big Five personality traits

Differences between primary and secondary frozen shoulder versus normal controls

Table II shows the mean values (in raw scores) of the different frozen shoulder groups on the Big Five personality traits compared with the healthy controls. Compared with normal controls, the total group of patients with frozen shoulder, patients with secondary frozen shoulder, and patients with nonsystemic frozen shoulder scored significantly higher on Conscientiousness. Furthermore, patients with secondary frozen shoulder scored significantly higher on Extraversion compared with the control population.

Differences between primary and secondary frozen shoulder on the Big Five personality traits controlled for gender and age

Patients with primary and secondary frozen shoulder were compared with respect to the Big Five personality traits controlled for gender and age. Overall, a significant main effect of type of frozen shoulder (primary versus

Table I Personality traits of the Neuroticism–Extraversion–Openness to New Experience Five-Factor Inventory (NEO-FFI) and their characteristics^{1,25}

Neuroticism	Extraversion	Openness	Altruism	Conscientiousness
Worrying	Sociable	Curious	Helpful	Reliable
Feelings of unhappiness	Enjoy the company of others	Rich and varied world of experience	Oriented on the experiences, interests, and goals of others	Disciplined, restrained, and thoughtful
Feeling unsafe	Assertive	Playful and flexible	Modest	Planning, organizing, and performing task
Feelings of shame and guilt	Active	Love new unconventional ideas and images	Friendly and willing to cooperate	Practical and ambitious
Less able to deal with frustration and stress	Talkative	Tolerate ambiguity	Beliefs of other people being helpful to them when necessary	Organized and systematic
Negative emotions		Against intolerance and inconsistency		Do what the environment demands

secondary) on the Big Five personality traits (Wilks' Λ , .883; $F(5,108) = 2.862$; $P < .05$; partial $\eta^2 = .12$) was demonstrated, but no significant effect of gender or their interaction ("type of frozen shoulder" * "gender") and age. Patients with primary frozen shoulder scored significantly higher on Openness to Experience than did patients with secondary frozen shoulder (Table III). On the other 4 Big Five personality traits, no significant differences were found between patients with primary and secondary frozen shoulder.

Discussion

This study is the first to analyze personality traits of a selected group of patients with a frozen shoulder by widely accepted diagnostic criteria.¹⁶ Within a contemporary biopsychosocial view, it is commonly accepted that musculoskeletal disorders are multifactorial and multidimensional in origin.¹ Possible risk factors are of a physical, psychosocial, or personal origin. In treating patients with a frozen shoulder, the clinical impression often arises that this condition is more often seen in patients with a specific personality. The detection of a disorder-specific personality could have important implications for the treatment and the outcome of this recalcitrant disorder.

In the past, several authors have commented on a possible relation between certain personality profiles and shoulder pain. In 1934, Codman⁴ described 4 patients with a frozen shoulder who were "a little run-down without anything particular the matter." This "run-down" condition might predispose individuals to the development of frozen shoulder.^{12,13} The so-called periarthritic personality was further described by Coventry⁶ in 1953; characteristics include a passive apathetic attitude, muscle tenseness, and a low pain threshold. Similarly, Lorentz and Musser¹¹

described these patients as "tense, vulnerable, insecure, dependent and restless people, who permit themselves few diversions as long as a task remains to be finished." Bruckner and Nye² used the Middlesex Hospital Questionnaire,⁷ a self-rating scale of psychoneurotic symptoms and traits that focuses primarily on Neuroticism, in 99 neurosurgical patients in whom there was a high incidence of capsulitis. They showed an association between the development of adhesive capsulitis and different factors, such as impairment of consciousness, hemiparesis, duration of postoperative intravenous infusion, age, and depressive personality disorder. Fleming et al⁸ also used the Middlesex Hospital Questionnaire to assess 56 frozen shoulder patients. They found that patients who developed a frozen shoulder scored significantly higher on Neuroticism compared with controls. Not all studies point toward Neuroticism as a causative factor in the development of frozen shoulders. Wright and Haq¹⁵ used the Maudsley Personality Inventory,¹⁰ a questionnaire to address primarily Neuroticism and Extraversion, and showed that psychological factors were of little importance in the causation of frozen shoulder. They assumed that the development of a stiff shoulder was due to an interrelationship of many factors, mainly age. On the basis of these studies, there is still uncertainty about the association between personality characteristics and frozen shoulder.

In some of these earlier studies, the term *periarthritis* also represented other (non-frozen shoulder) disorders, like brachialgia¹² and shoulder-hand syndrome.⁶ Clearly, these disorders should be differentiated from frozen shoulder. We made sure that non-frozen shoulder conditions were excluded to obtain a representative group of primary and secondary frozen shoulders according to the criteria of Zuckerman.¹⁶

We used the Dutch version of the NEO-FFI to determine the Big Five personality traits in patients with a frozen shoulder. The Big Five has been preferably used because it

Table II Raw scores of the different frozen shoulder groups on the Big Five personality traits compared with healthy controls

	Total frozen shoulder group			Healthy controls (N = 2415)		F	P
	N	M	(SD)	M	(SD)		
Neuroticism	118	32.54	(8.26)	31.1	(8.2)	3.4671	.0627
Extraversion	118	41.74	(7.08)	40.1	(6.6)	6.8984	.0087
Openness	117	37.35	(5.14)	35.9	(6.4)	5.8229	.0159
Altruism	118	44.59	(5.38)	44.1	(5.2)	0.9957	.3184
Conscientiousness	118	48.12	(5.49)	45.3	(5.6)	28.5804	<.0001
Primary frozen shoulder group							
	N	M	(SD)	M	(SD)		
Neuroticism	48	32.75	(9.15)	31.1	(8.2)	1.8967	.1686
Extraversion	48	40.27	(7.98)	40.1	(6.6)	0.031	.8604
Openness	48	38.52	(5.52)	35.9	(6.4)	7.9262	.0049
Altruism	48	45.19	(5.90)	44.1	(5.2)	2.0567	.1517
Conscientiousness	48	47.04	(5.79)	45.3	(5.6)	4.5378	.0333
Secondary frozen shoulder group							
	N	M	(SD)	M	(SD)		
Neuroticism	70	32.40	(7.66)	31.1	(8.2)	1.7159	.1903
Extraversion	70	42.75	(6.27)	40.1	(6.6)	10.9969	.0009
Openness	69	36.55	(4.74)	35.9	(6.4)	0.7006	.4027
Altruism	70	44.19	(4.99)	44.1	(5.2)	0.0204	.8864
Conscientiousness	70	48.87	(5.19)	45.3	(5.6)	27.7559	<.0001
Systemic secondary frozen shoulder group							
	N	M	(SD)	M	(SD)		
Neuroticism	40	34.23	(8.49)	31.1	(8.2)	5.7265	.0168
Extraversion	40	42.40	(6.80)	40.1	(6.6)	4.7739	.029
Openness	40	36.93	(4.91)	35.9	(6.4)	1.0259	.3112
Altruism	40	43.83	(5.50)	44.1	(5.2)	0.1059	.7449
Conscientiousness	40	47.68	(5.76)	45.3	(5.6)	7.1007	.0078
Nonsystemic secondary frozen shoulder group							
	N	M	(SD)	M	(SD)		
Neuroticism	30	29.97	(5.65)	31.1	(8.2)	0.5662	.4518
Extraversion	30	43.23	(5.56)	40.1	(6.6)	6.6874	.0098
Openness	29	36.03	(4.53)	35.9	(6.4)	0.0119	.9132
Altruism	30	44.67	(4.29)	44.1	(5.2)	0.3574	.55
Conscientiousness	30	50.47	(3.87)	45.3	(5.6)	25.4136	<.0001

$P < .05/25 = .002$.

M, mean value; SD, standard deviation.

Table III Comparison of the raw scores of the primary and secondary frozen shoulder groups on the Big Five personality traits

	Primary frozen shoulder group		Secondary frozen shoulder group		F	Partial η^2 *
	M	(SD)	M	(SD)		
Neuroticism	32.75	(9.15)	32.55	(7.60)	0.004	.000
Extraversion	40.27	(7.98)	42.76	(6.31)	2.087	.018
Openness	38.52	(5.52)	36.55	(4.73)	6.805	.057
Altruism	45.18	(5.90)	44.15	(5.03)	2.418	.021
Conscientiousness	47.04	(5.79)	48.82	(5.21)	0.816	.007

$P < .05$.

* Interpretation of partial η^2 : .0099 = small effect; .0588 = medium effect; .1379 = large effect.

is able to measure different traits in personality without overlapping. It is based on one of the most fundamental modern personality theories, and its Dutch version has shown consistency and reliability.^{5,9}

In this study, no significant differences in personality traits could be demonstrated between the patients with a frozen shoulder and healthy controls, except for Conscientiousness. More specifically, we could not corroborate our initial

hypothesis that patients with an idiopathic frozen shoulder would score higher on the trait Neuroticism compared with normal controls. Interestingly, patients with nonsystemic secondary frozen shoulder scored significantly higher on Conscientiousness compared with normal controls. This means that patients with secondary frozen shoulder show more self-discipline, act more dutifully, and aim for more achievement than normal controls do. We noted that patients with a primary frozen shoulder scored significantly higher on Openness compared with patients with secondary frozen shoulder. People who are open to experience are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be more creative and more aware of their feelings. This finding is in contrast with our initial hypothesis that patients with primary frozen shoulder would score higher on the trait Neuroticism.

This study has some limitations. No laboratory tests were used to screen for the presence of systemic diseases, and therefore some frozen shoulder patients may have been misclassified. Another limitation of this study design is the fact that it remains unclear whether the obtained personality traits are the result or the cause of the frozen shoulder. Codman⁴ already speculated that the observed personality changes in patients with shoulder pain are not the cause but rather reflect the result of this unpleasant condition. Because frozen shoulder is a painful disabling condition with a possible duration of several years, it is not inconceivable that the patients would have shown a different outcome on the NEO-FFI if they had to fill in the questionnaire before the onset of the frozen shoulder. Further prospective longitudinal studies are warranted to evaluate the exact relation between a certain personality and the risk for development of a frozen shoulder. In this study, we used only one specific psychological test to detect possible differences in the personality profile of patients with a frozen shoulder. The results of this study are thus specific for the NEO-FFI. Other personality tests might detect other subtle differences in personality. Furthermore, the NEO-FFI is a self-report questionnaire to assess the Big Five personality traits, which can influence the results, given that personality traits are idiosyncratic. Future studies could therefore also use reports by others to control for possible confounding factors.

Conclusion

This study does not confirm that persons with an idiopathic frozen shoulder have a specific personality compared with healthy controls. Only a few differences in personality traits were observed when the entire frozen shoulder group was compared with healthy controls and between patients with primary and

secondary frozen shoulders with use of the NEO-FFI. In our opinion, these differences are not sufficient to state that a specific "frozen shoulder personality" exists.

Disclaimer

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References

1. Bongers PM, Ijmker S, van den Heuvel S, Blatter BM. Epidemiology of work related neck and upper limb problems: psychosocial and personal risk factors (part I) and effective interventions from a bio behavioural perspective (part II). *J Occup Rehabil* 2006;16:279-302. <http://dx.doi.org/10.1007/s10926-006-9044-1>
2. Bruckner FE, Nye JS. A prospective study of adhesive capsulitis of the shoulder ("frozen shoulder") in a high risk population. *Q J Med* 1981; 50:191-204.
3. Bunker TD, Esler CN. Frozen shoulder and lipids. *J Bone Joint Surg Br* 1995;77:684-6.
4. Codman EA. The shoulder: rupture of the supraspinatus tendon and other lesions in or about the subacromial bursa. Boston: Thomas Todd Co; 1934.
5. Costa PT Jr, McCrae RR. Revised NEO Personality Inventory (NEO-PI-R) and the Five Factor Inventory (NEO-FFI): professional manual. Odessa, Fla: Psychological Assessment Resources; 1992.
6. Coventry MB. Problem of painful shoulder. *JAMA* 1953;151:177-85.
7. Crown S, Crisp AH. A short clinical diagnostic self-rating scale for psychoneurotic patients. The Middlesex Hospital Questionnaire (M.H. Q.). *Br J Psychiatry* 1966;112:917-23.
8. Fleming A, Dodman S, Beer TC, Crown S. Personality in frozen shoulder. *Ann Rheum Dis* 1976;35:456-7.
9. Hoekstra HA, Ormel J, de Fruyt F. NEO-PI-R en NEO-FFI Big Five persoonlijkheidsvragenlijsten. Handleiding. Amsterdam: Swets & Zeitlinger; 1996.
10. Jensen AR. The Maudsley Personality Inventory. *Acta Psychologica* 1958;14:314-25.
11. Lorentz TH, Musser MJ. Life stress, emotions and painful stiff shoulder. *Ann Intern Med* 1952;37:1232-44.
12. Oesterreicher W, Van Dam G. Social psychological researches into brachialgia and periarthritis. *Arthritis Rheum* 1964;7:670-83.
13. Quigley TB. Checkrein shoulder: a type of "frozen shoulder". *N Engl J Med* 1954;250:188-92.
14. Smith SP, Devaraj VS, Bunker TD. The association between frozen shoulder and Dupuytren's disease. *J Shoulder Elbow Surg* 2001;10: 149-51.
15. Wright V, Haq AM. Periarthritis of the shoulder. I. Aetiological considerations with particular reference to personality factors. *Ann Rheum Dis* 1976;35:213-9.
16. Zuckerman JD, Rokito A. Frozen shoulder: a consensus definition. *J Shoulder Elbow Surg* 2011;20:322-5. <http://dx.doi.org/10.1016/j.jse.2010.07.008>