

Personality and Its Relationship with Prevalence of Musculoskeletal Disorders

Omran Ahmadi,¹ Yahya Rasoulzadeh,^{2,*} Asghar Abbaspour,³ Pouya Sheikh Damanab,² Mitra

Rahimzadeh,⁴ Fatemeh Keshizadeh,¹ and Sepideh Dalili²

¹Department of Occupational Engineering, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

²Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

³Department of Occupational Engineering, Faculty HSE, Shahid Beheshti University, Tehran, Iran

⁴Social Determinations of Health Research Center, Alborz University of Medical Sciences, Karaj, Iran

*Corresponding author: Yahya Rasoulzadeh, Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. Tel: +98-4133376228, E-mail: rasoulzadehy@tbzmed.ac.ir

Received 2016 March 17; Revised 2016 September 06; Accepted 2016 December 27.

Abstract

Background: Individual factors are usually important as non-occupational parameters that participate in the prevalence of musculoskeletal disorders. Personality traits are one of the individual factors that affect physical illness, which are constant over time, thereby reflecting stable individual differences. Identifying the personality trait can be used to predict musculoskeletal disorders in workers and select individual with appropriate personality traits for different works.

Objectives: The purpose of the present study was to identify the personality traits used to determine the relationship between different personality traits and the prevalence of musculoskeletal disorders.

Methods: 136 people of 2 different companies in Tabriz (in 2015) were selected as the study population. The first group was selected from the petrochemical repair workers and the second from a dairy factory. The 50-item version of Goldberg's big five personality scale was used to assess the personality traits. Nordic questionnaire was employed to evaluate the prevalence of musculoskeletal disorders. Chi-square test was incorporated for analyzing the data. Finally, logistic regression test was used to study the factors affecting upper and lower body pain.

Results: Results indicated that individual personality traits were associated with musculoskeletal disorder prevalence in some members of body: Extraversion with wrist (P-value = 0.013) and hip (P-value = 0.044), emotional stability with shoulder (P-value = 0.012), wrist (P-value = 0.043), back (P-value = 0.034), low back (P-value = 0.029) and ankle (P-value = 0.014), Conscientiousness with Hip (P-value = 0.009), Agreeableness with shoulder (P-value = 0.004), back (P-value = 0.001), Hip (P-value = 0.006) and ankle (P-value = 0.019).

Conclusions: According to the results of this study, the personality traits can contribute to musculoskeletal disorders. Therefore, notice of personality traits can be used to predict individuals who are prone to musculoskeletal disorders. Necessary actions may be tailored for the people that are proportional to individual personality traits to prevent musculoskeletal disorders. As a further study, it is recommended that a better relationship may be revealed between personality traits and musculoskeletal disorders.

Keywords: Personality, Musculoskeletal Disorders, Extraversion, Agreeableness, Conscientiousness, Emotional Stability, Openness

1. Background

Musculoskeletal disorders allocate a dominant part of work-related diseases. According to the definition, musculoskeletal disorders are disorders of muscles, tendons, nerves, joints, bones, ligaments, and blood vessels that are created as the result of repetitive stress or immediate to acute trauma (e.g. slip and fall) (1). Despite the spread of mechanized and automated processes, work-related musculoskeletal disorders account for the most common cause of work time loss, increase of costs, and human diseases (2). Currently, the factors that increase the probability of experiencing musculoskeletal disorder should be studied in detail. As most health consequences, musculoskele-

tal disorders have multifactorial source (3). Individual factors are often interpreted as non-occupational factors that will participate in the prevalence of musculoskeletal disorders. Individual traits influence the individual's response to environmental exposures (4). Individual factors include demographic data (gender and different reactions to stress), age, anthropometric (height and weight), psychological traits (character), lifestyle people (i.e. physical activity, exercise, smoking, drugs), disease (i.e. Diabetes, confusion, depression), past history (musculoskeletal disorders), as well as social features (i.e. divorce, segregation and poverty) (5). Studies have pointed out that there is significant relationship between psychosocial factors

and musculoskeletal disorders. Bongers et al. concluded that many psychological factors have been interrelated in emerging of such disorders including: stable work, time pressure, high load work, low control over work, poor social support from colleagues, worry, tension, anxiety, and anger with pain in the back, neck and shoulders (6). The relationship between the physical and psychosocial factors and its contribution to the development of musculoskeletal disorders has not yet been completely understood. It has been proved that these factors have interaction by the risk of musculoskeletal disorders, effectively. To help better understand this interaction, it may be important to determine whether individuals show different reactions when exposed to psychosocial factors or whether they prefer workplace as stressful or better. The personality theory helps understand this matter. It dictates adaptability for many life situations, such as work. Theorist Gordon Allport (1937) has defined personality as the dynamic organization within the individual that determines his/her unique adaptation to the environment. This subject reflects the idea within which a person's character is a system that integrates both physical and mental aspects and people are active to get adjusted with their surroundings. Personality traits are psychological factors that have been hidden to affect the physical illness over time and thereby reflect individual differences. Amongst these variables, some of the important personality traits may be named as neuroticism and extraversion (7, 8).

Many psychologists believe that the main basis of the human character can be observed through 5 main traits including: extraversion, agreeableness, conscientiousness, neuroticism, and openness. Extraversion represents a dynamic approach inside a person towards the material and social world whose traits can be stated as sociability, activeness, decisiveness, courage and more. Agreeableness represents the social and prosocial orientation against hostile feedback to others. Some of these features may be depicted as altruism, kindness, trust, humility, etc. Conscientiousness describes the power impulses so that the society knows it as an ideal behavior and facilitates it as task-oriented and goal-oriented behavior. The adjective traits may be described as traits such as thinking before acting, delay of desire gratification, compliance with rules and norms as well as organize and prioritize tasks. Neuroticism can be defined as the tendency to represent negative emotions and experiences against emotional stability and calm. This dimension also includes sensitivity to the unreal beliefs, poor control of individual desires and ineffective strategies against the stress. Openness also describes the breadth, depth, complexity and creativity of the mind and experience of the person towards the finite subjective (9). Each of these personality traits have certain advan-

tages that may be answered by a person in a work situation and a task with certain conditions that can affect a person's energy and stress (10). Neuroticism, extraversion and conscientiousness have reliable relationships with the physical activity (11-14). Previous studies have shown a lot of evidence that people with high neuroticism scores are more likely to suffer with a disability (9). High levels of neuroticism personality traits related with high levels of diseases, including heart disease, asthma, arthritis, autoimmune, and infection (15-18). Individuals with high extraversion levels are usually active and bolder and with more energy in comparison to those who are introvert (that are usually quiet, shy and dissociable) (19). More diseases have been reported for the individuals with high extraversion traits compared with introverts (20-22). Individual differences are very important in determining how people behave in the workplace. Personality traits have an important role in the prevalence of musculoskeletal disorders.

2. Objectives

The purpose of the present study is to identify the personality traits used to determine the relationship between different personality traits and the prevalence of musculoskeletal disorders in 2 different companies including petrochemical repair and dairy factory workers in Tabriz, Iran (in 2015).

3. Methods

The present study has been implemented in 2 different companies. In the study there were 136 people of the petrochemical repair workers (n = 84) and dairy factory workers (n = 52) that were involved in census method. For this purpose, all repair workers in petrochemical company and all workers in dairy factory were studied. The permanent workers with at least 1 year experience were included in study. In order to measure personality traits of people, Goldberg's big five personality scale was used. The Goldberg (1999) designed scale is based on a five-factor pattern of personality, which measures five factors including emotional stability, extraversion, openness, agreeableness, and conscientiousness (Goldberg, 1999). In the present study, the 50-item question version of the Goldberg questionnaire was used. The questionnaire, which any 10 questions were related to a feature of neuroticism, extraversion, openness of experience, agreeableness, and conscientiousness, meet the appropriate validity and reliability index and they are based on the five-point scale (from 1 to 5).

The Scoring of Goldberg's Five Personality Factors Questionnaire:

As stated, the utilized questionnaire consists of 50 sections within which, 10 sections are devoted into the personality traits. The scoring method is based on the Likert five-degree scale. Score one belongs to the first option (mostly not-correct) and the score of five to the fifth option (mostly correct). The sub-scales are as follows:

Questions No. 1, 6, 11, 16, 21, 26, 31, 36, 41 and 46: extraversion

Questions No. 2, 7, 12, 17, 22, 27, 32, 37, 42 and 47: agreeableness

Questions No. 3, 8, 13, 18, 23, 28, 33, 38, 43 and 48: conscientiousness

Questions No. 4, 9, 14, 19, 24, 29, 34, 39, 44 and 49: Emotional stability

Questions No. 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50: Openness

Questions No. 2, 4, 6, 8, 10, 12, 14, 16... 48: converse questions

Goldberg has reported Cronbach's alpha as 0.65 to 0.85 for traits of the big five personality factors in this questionnaire (23). The value of 0.82 for agreeableness, 0.79 for conscientiousness, 0.86 for emotional stability, 0.8 for openness, and 0.87 for extraversion were reported (24). The Persian version of this scale was a translation and prepared with standard methods by Ghorbani et al. (2005) (25). Aghababaie (2012) reported the alpha coefficient factor (of correlation) from 0.70 to 0.79. Khormaei revealed the validity and reliability of the test and Cronbach's alpha coefficient of conscientiousness and agreeableness as 0.8, openness as 0.78, extraversion as 0.77, and emotional stability as 0.88 (26).

The Nordic questionnaire was used to evaluate the prevalence of musculoskeletal disorders. In the present study, the Nordic questionnaire (that was designed by Kurinka et al. at the Scandinavian institute of occupational health) was incorporated to investigate the wide spread rate of musculoskeletal disorders. This questionnaire has been widely used as standard tool to conduct the epidemiologic researches for evaluation of the musculoskeletal disorders at different industries. It consists of personal information such as age, gender, weight, height, marriage, education, job experience, work shift, and the dominant hand besides the musculoskeletal disorders such as neck, shoulder, elbow, wrist and hand, reins, hips and thigh, knee, ankle, and feet-related diseases. The first part of the questionnaire concerns the demographic information. Other parts are regarding the prevalence of musculoskeletal disorders in different body parts during a week and 12 months. To analyze the data, chi-square test were used and the p-value lower than 0.05 is considered as a significant association. Finally, logistic regression test was used to study the factors affecting the upper and lower body pain.

4. Results

4.1. Subjects Demographic Characteristics

All of the subjects were male at the overall samples. They worked in part of repairing the petrochemical industry ($n = 84$) and dairy company ($n = 52$). The workers mean age for the petrochemical and dairy companies were 42.4 ± 6.31 and 50 ± 6.24 , respectively. BMI mean weights of the workers in the petrochemical industry were 26.56 ± 3.6 and 25.5 ± 3.4 , respectively. The workers average heights in petrochemical and dairy company were 174.4 ± 6.58 and 169.7 ± 8.49 cm, respectively. The average workers job tenure in petrochemical and dairy company was 16.4 ± 4.9 and 11.9 ± 6.7 , respectively. Other demographic traits are shown in Table 1. Furthermore, most of the people were married. The majority of the people were right handed in 2 companies (89.2% for petrochemical company and 86.8% for dairy company). Additionally, the majority of people had a bachelor degree (45.3%) in petrochemical company and high school diploma (38.6%) in the dairy company.

4.2. Personality Traits

Extraversion trait average scores were as 32.3 ± 4.6 and 33.41 ± 5 for petrochemical and dairy companies, respectively. Emotional stability trait average score were as 32.9 ± 4.5 and 33.07 ± 5.7 for the petrochemical and dairy companies, respectively. Openness trait average score were as 36.56 ± 5.2 and 36.39 ± 4.9 for the petrochemical and dairy companies, respectively. Agreeableness trait average score were 38.73 ± 5.33 and 41.8 ± 4.2 for the petrochemical and dairy companies, respectively.

4.3. Musculoskeletal Disorders

Distribution of the musculoskeletal disorders is presented in Table 2 in different parts of the body in 2 companies. Based on Table 2, prevalence of musculoskeletal disorder in low back (petrochemical; 49.4% and dairy; 58.5%) was higher than its prevalence in other parts of the body at both companies. The second part of the body that had high prevalence of disorder (52.8%) was the shoulder in dairy company and knee (with prevalence of 39.8%) in petrochemical company.

Significant difference was observed between the prevalence of disorder in shoulder (P - value = 0.001) at 2 companies. There was no significant relationship amongst the prevalence of disorder in other parts of body in 2 companies (Neck; P - value = 0.209, Elbow; P - value = 0.167, Wrist; P - value = 0.556, Back; P - value = 0.152, Low back; P - value = 0.195, Knee; P - value = 0.479, Ankle; P - value = 0.256).

Table 1. Demographic Traits of the Individual (Subjects)^a

Demographic Traits		Company	
		Petrochemica	Dairy
Age	30 and under	2 (2.4)	10 (18.9)
	31 - 35	11 (13.3)	14 (26.4)
	36 - 40	17 (20.5)	14 (26.4)
	41 - 45	30 (36.5)	10 (18.9)
	46 - 50	15 (18.1)	5 (9.4)
	51 and above	8 (9.6)	0
Education	Under diploma	20 (24.1)	1 (1.9)
	Diploma	32 (38.6)	8 (15.1)
	Upper diploma	10 (12)	7 (13.2)
	Bachelor	21 (25.3)	24 (45.3)
	Post graduate	12 (22.6)	-
Dominant hand	Right	74 (89.2)	46 (86.8)
	Left	9 (10.8)	7 (13.2)
Work experience	1 - 5	2 (2.4)	12 (22.6)
	6 - 10	9 (10.8)	12 (22.6)
	11 - 15	22 (26.5)	14 (26.4)
	Above 16	50 (60.2)	15 (28.3)
BMI	Under 25	28 (33.7)	26 (49.1)
	26 - 30	42 (50.6)	22 (41.5)
	Above 31	13 (15.7)	5 (9.4)
Marital status	Single	4 (4.8)	9 (17)
	Married	79 (95.2)	43 (81.1)
Personality traits	Extraversion	32.3 ± 4.6	33.41 ± 5
	Agreeableness	38.73 ± 5.33	41.8 ± 4.2
	Conscientiousness	40.87 ± 5.3	40.67 ± 4.6
	Emotional stability	32.9 ± 4.5	33.07 ± 5.7
	Openness	36.56 ± 5.2	36.39 ± 4.9

^aValue are expressed as number percent.

4.4. Personality Trait and Musculoskeletal Disorder

The effects of the results were obtained from the multiple regression logistic model has been represented in [Table 3](#) for determining the personality trait that affects the musculoskeletal disorder in different parts of the body in the studied individuals. The results indicated that the individuals with a lower extraversion score had a higher chance to musculoskeletal disorder prevalence in wrist (OR = 0.920, CI95% = 0.840 - 937, P - value = 0.013) and hip (OR = 0.932, CI95% = 0.866 - 992, P - value = 0.044) comparing to those with high extraversion score. Individual with low emo-

tional stability had a high chance to musculoskeletal disorder prevalence in shoulder (OR = 0.907, CI95% = 0.841 - 983, P - value = 0.012), wrist (OR = 0.919, CI95% = 0.847 - 997, P - value = 0.043), back (OR = 0.922, CI95% = 0.856 - 994, P - value = 0.034), low back (OR = 0.923, CI95% = 0.859 - 992, P - value = 0.029), and ankle (OR = 0.895, CI95% = 0.819 - 978, P - value = 0.014) than an individual with high emotional stability score. Individuals with low conscientiousness score also had a high chance to musculoskeletal disorder prevalence in hip (OR = 0.879, CI95% = 0.798 - 968, P - value = 0.009) than individual with high conscientiousness score. Individuals with a low agreeableness score had a high chance to musculoskeletal disorder prevalence in the shoulder (OR = 0.880, CI95% = 0.808 - 960, P - value = 0.004), back (OR = 0.855, CI95% = 0.783 - 934, P - value = 0.001), Hip (OR = 0.866, CI95% = 0.804 - 917, P - value = 0.006) and ankle (OR = 0.821, CI95% = 0.803 - 927, P - value = 0.019).

5. Discussion

The results of the present study revealed that the distribution of musculoskeletal disorders in the lower back were high in both companies. The second part of body that had a high prevalence of disorder in the dairy company was the shoulder, which had a significant difference with prevalence of a shoulder disorder in the petrochemical company.

5.1. Extraversion

There was a negative significant relationship between extraversion traits of individual and musculoskeletal disorders prevalence in the wrist, which is in agreement with the Malchaire et al. study that was conducted on 133 women from 7 different companies working at constraining workplace with very repetitive work (27). In the Vasseljen et al. case - control study, which investigated the psychological and psychosocial risk factors for shoulder and neck pain at the workplace, no associations was observed between pain in neck and shoulders and extraversion traits (28). Furthermore, Edvin Bru et al. observed no associations between the extraversion traits and musculoskeletal disorders in a study that was conducted on the female hospital staff (29). Extravert people were active, energetic, and assertive whereas individuals with lower extraversion were quiet, reserved, and shy (14). Some other studies have also indicated the positive association between extraversion and muscle strength (13, 22). In agreement with the present study, however, muscles of the extrovert people were strong; they were low prone to the musculoskeletal disorders than introvert individuals. Oron et al. conducted

Table 2. Distribution of Musculoskeletal Disorder in Different Part of Body in Two Company^a

Limb	Musculoskeletal Prevalence	Company		P Value
		Petrochemical	Dairy	
Neck	No	54 (65.1)	30 (56.6)	0.209
	Yes	29 (34.9)	23 (43.4)	
Shoulder	No	63 (75.9)	25 (47.2)	0.001
	Yes	20 (24.1)	28 (52.8)	
Elbow	No	60 (72.3)	43 (81.1)	0.167
	Yes	23 (27.7)	10 (18.9)	
Wrist	No	63 (75.9)	40 (75.5)	0.556
	Yes	20 (24.1)	13 (24.5)	
Hip	No	70 (84.43)	45 (84.43)	0.565
	Yes	13 (15.7)	8 (15.1)	
Back	No	54 (65.1)	29 (54.7)	0.152
	Yes	29 (34.9)	24 (45.3)	
Low back	No	42 (50.6)	22 (41.5)	0.195
	Yes	42 (49.4)	22 (58.5)	
Knee	No	50 (60.2)	33 (62.3)	0.479
	Yes	33 (39.8)	20 (37.7)	
Ankle	No	62 (74.7)	43 (81.1)	0.256
	Yes	21 (25.3)	10 (18.9)	

^aValue are expressed as number percent.

the similar study on soldiers and observed that extrovert individuals suffered from musculoskeletal disorders (30).

5.2. Emotional Stability

In the present study, negative significant association was observed between emotional stability and prevalence of musculoskeletal disorder in the shoulder, wrist, back, low back, and ankle. Emotional stability was in opposite of neuroticism. In agreement of the present study results, evidence of a positive association was mentioned between neuroticism and physical function in some previous studies. In these studies, individuals with higher scores on neuroticism had mobility limitations and disability than those with lower scores (9, 31, 32). Rogaland et al. studied 86 female hospital staff for observation of any association between the personality traits and musculoskeletal pain of the neck, shoulders and lower back. The results showed a positive significant association between the neuroticism, shoulder, and low back pain (29). Astrand studied 391 male employees in a Swedish pulp and paper industry. The results showed an association between back pain and neuroticism trait of individual (33). In other studies, higher

risks of unhealthy behaviors were observed amongst the individuals with high neuroticism scores (34, 35).

5.3. Conscientiousness

In the present study, negative significant association was observed between conscientiousness and prevalence of musculoskeletal disorder in the Hip. In agreement with the present study, Conscientiousness has been reported as a determinant factor in healthy behavior (12). Conscientiousness as the personality trait may be described such that the society accepts it as a favorite mode and facilitate it as task and goal-oriented behavior. So, individuals with this trait are rule based capable of doing their work based on the correct way. So, they are not prone to musculoskeletal disorders than individuals with low score of conscientiousness.

5.4. Agreeableness

The negative significant association was observed between agreeableness and prevalence of musculoskeletal disorder in shoulder, back, hip, and ankle. Individuals with

Table 3. Multiple Regression Logistic Model for Determining the Personality Trait That Affect the Musculoskeletal Disorder in Different Part of Body in the Studied People

Limb	Musculoskeletal Prevalence	Personality Trait	P Value	OR	CI 95%	
					Lower	Upper
		Extraversion				
Wrist	No	33.36	0.013	0.920	0.840	0.937
	Yes	30				
Hip	No	33	0.044	0.932	0.866	0.992
	Yes	31				
		Emotional stability				
Shoulder	No	33.7	0.012	0.907	0.841	0.983
	Yes	31				
Wrist	No	33.54	0.043	0.919	0.847	0.997
	Yes	31				
Back	No	33.7	0.034	0.922	0.856	0.994
	Yes	31.7				
Low back	No	34	0.029	0.923	0.859	0.992
	Yes	32				
Ankle	No	33.4	0.014	0.895	0.819	0.978
	Yes	30				
		Conscientiousness				
Hip	No	40.36	0.009	0.879	0.798	0.968
	Yes	39				
		Agreeableness				
Shoulder	No	43.4	0.004	0.880	0.808	0.960
	Yes	40.3				
Back	No	41	0.000	0.855	0.783	0.934
	Yes	38				
Hip	No	40	0.006	0.866	.804	0.917
	Yes	35				
Ankle	No	40	0.019	0.821	.803	0.927
	Yes	37				

high scores of agreeableness had a lower chance for musculoskeletal disorder than individuals with high scores. In agreement of the present study, in a recent meta-analysis, agreeableness correlates with physical activity (11). A positive association of agreeableness with other healthy behaviors has been reported in other studies (34, 36). Individuals with agreeableness trait, social and prosocial orientation in front of others, showed characteristics such as altruism, kindness, trust, and humility. Therefore, observance laws and labor standards were more likely to be agreed by these people. Therefore, this trait can prevent them from getting

musculoskeletal disorders.

Mental factors are one of the most important parameters in prevalence of musculoskeletal disorders. Individual differences are very important in determining how people behave in the workplace. The human factors directly affect the human behavior. Usually, people respond to stress depending on their personality. People that have personality trait of conscientiousness perform their tasks on time and with calm and less prone to the musculoskeletal complications. Also, someone who has a high level neuroticism trait may perform poorly in response to environmental stresses.

These people are more prone to get musculoskeletal complications.

Personality traits, including emotional stability, conscientiousness, and neuroticism can be involved in prevalence of musculoskeletal complications. Therefore, notice of personality traits can be used to predict the probability of musculoskeletal disorder in people. Then, the necessary tailored training proportional to the individual's personality traits seems to be helpful for the prevention of musculoskeletal disorders.

As a further study, more uniform population should be chosen to reveal the personality traits of people in developing musculoskeletal disorders, efficiently.

Acknowledgments

Authors appreciate all petrochemical and dairy factory personnel who helped in conducting this study.

References

- Bernard BP. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back. NIOSH; 1997. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back.
- Vanwonderghem K. Work-related musculoskeletal problems: Some ergonomic considerations. *J Hum Ergol (Tokyo)*. 1996;**25**(1):5-13. [PubMed: 9551125].
- Krieger N. Epidemiology and the web of causation: Has anyone seen the spider?. *Soc Sci Med*. 1994;**39**(7):887-903. doi: 10.1016/0277-9536(94)90202-x.
- Barondess J, Cullen M, de Lateur B, Deyo R, Donaldson K, Drury C. Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities. ; 2001. pp. 1-512.
- Cole DC, Rivilis I. Individual factors and musculoskeletal disorders: a framework for their consideration. *J Electromyogr Kinesiol*. 2004;**14**(1):121-7. doi: 10.1016/j.jelekin.2003.09.021. [PubMed: 14759757].
- Bongers PM, de Winter CR, Kompier MA, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. *Scand J Work Environ Health*. 1993;**19**(5):297-312. [PubMed: 8296178].
- Cohen S, Williamson GM. Stress and infectious disease in humans. *Psychol Bull*. 1991;**109**(1):5-24. [PubMed: 2006229].
- Jemmott JB, Locke SE. Psychosocial factors, immunologic mediation, and human susceptibility to infectious diseases: How much do we know?. *Psychol Bull*. 1984;**95**(1):78-108. doi: 10.1037/0033-2909.95.1.78.
- Chapman B, Duberstein P, Lyness JM. Personality Traits, Education, and Health-Related Quality of Life Among Older Adult Primary Care Patients. *J Gerontol B Psychol Sci Soc Sci*. 2007;**62**(6):343-52. doi: 10.1093/geronb/62.6.P343.
- Myers I, Myers P. Gifts differing: Understanding personality type. Nicholas Brealey Publishing; 2010.
- Rhodes RE, Smith NE. Personality correlates of physical activity: a review and meta-analysis. *Br J Sports Med*. 2006;**40**(12):958-65. doi: 10.1136/bjism.2006.028860. [PubMed: 17124108].
- Bogg T, Roberts BW. Conscientiousness and health-related behaviors: a meta-analysis of the leading behavioral contributors to mortality. *Psychol Bull*. 2004;**130**(6):887-919. doi: 10.1037/0033-2909.130.6.887. [PubMed: 15535742].
- Saklofske DH, Austin EJ, Rohr BA, Andrews JJ. Personality, emotional intelligence and exercise. *J Health Psychol*. 2007;**12**(6):937-48. doi: 10.1177/1359105307082458. [PubMed: 17956972].
- De Moor MH, Beem AL, Stubbe JH, Boomsma DI, De Geus EJ. Regular exercise, anxiety, depression and personality: a population-based study. *Prev Med*. 2006;**42**(4):273-9. doi: 10.1016/j.ypmed.2005.12.002. [PubMed: 16439008].
- National Research Council. Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities. ; 2001.
- Cohen S, Doyle WJ, Skoner DP, Fireman P, Gwaltney JJ, Newsom JT. State and trait negative affect as predictors of objective and subjective symptoms of respiratory viral infections. *J Pers Soc Psychol*. 1995;**68**(1):159-69. [PubMed: 7861312].
- Miller TQ, Smith TW, Turner CW, Guijarro ML, Hallett AJ. A meta-analytic review of research on hostility and physical health. *Psychol Bull*. 1996;**119**(2):322-48. [PubMed: 8851276].
- Moos RH, Solomon GF. Minnesota multiphasic personality inventory response patterns in patients with rheumatoid arthritis. *J Psychosom Res*. 1964;**8**(1):17-28. doi: 10.1016/0022-3999(64)90018-2.
- Costa PJ, McCrae RR. Hypochondriasis, neuroticism, and aging. When are somatic complaints unfounded?. *Am Psychol*. 1985;**40**(1):19-28. [PubMed: 3977166].
- Harkins SW, Price DD, Braith J. Effects of extraversion and neuroticism on experimental pain, clinical pain, and illness behavior. *Pain*. 1989;**36**(2):209-18. doi: 10.1016/0304-3959(89)90025-0. [PubMed: 2919101].
- Turner Cobb JM, Steptoe A. Psychosocial influences on upper respiratory infectious illness in children. *J Psychosom Res*. 1998;**45**(4):319-30. doi: 10.1016/S0022-3999(97)00311-5. [PubMed: 9794278].
- Tolea MI, Terracciano A, Simonsick EM, Metter EJ, Costa PJ, Ferrucci L. Associations between personality traits, physical activity level, and muscle strength. *J Res Pers*. 2012;**46**(3):264-70. doi: 10.1016/j.jrp.2012.02.002. [PubMed: 23966753].
- Goldberg LR. The development of markers for the Big-Five factor structure. *Psychol Assessment*. 1992;**4**(1):26-42. doi: 10.1037/1040-3590.4.1.26.
- Lim BC. Assessing the Convergent and Discriminant Validity of Goldberg's International Personality Item Pool: A Multitrait-Multimethod Examination. *Organ Res Meth*. 2006;**9**(1):29-54. doi: 10.1177/1094428105283193.
- Ghorbani N, Ghramaleki AF, Watson PJ. Philosophy, self-knowledge, and personality in Iranian teachers and students of philosophy. *J Psychol*. 2005;**139**(1):81-95. doi: 10.3200/JRLP.139.1.81-95. [PubMed: 15751832].
- Khormaie F. The casual model of personality traits, motivational orientation and cognitive learning styles [PhD thesis]. Shiraz Univ. 2006.
- Malchaire JB, Roquelaure Y, Cock N, Piette A, Vergracht S, Chiron H. Musculoskeletal complaints, functional capacity, personality and psychosocial factors. *Int Arch Occup Environ Health*. 2001;**74**(8):549-57. doi: 10.1007/s004200100264. [PubMed: 11768043].
- Vasseljen OJ, Westgaard RH, Larsen S. A case-control study of psychological and psychosocial risk factors for shoulder and neck pain at the workplace. *Int Arch Occup Environ Health*. 1995;**66**(6):375-82. doi: 10.1007/BF00383143. [PubMed: 7782120].
- Bru E, Mykletun RJ, Svebak S. Neuroticism, extraversion, anxiety and type A behaviour as mediators of neck, shoulder and lower back pain in female hospital staff. *Pers Individ Dif*. 1993;**15**(5):485-92. doi: 10.1016/0191-8869(93)90331-v.
- Oron Y, Reichenberg A. Personality traits predict self-referral of young male adults with musculoskeletal complaints to a general practitioner. *J Psychosom Res*. 2003;**54**(5):453-6. doi: 10.1016/S0022-3999(02)00451-8. [PubMed: 12726902].

31. Jang Y, Haley WE, Mortimer JA, Small BJ. Moderating effects of psychosocial attributes on the association between risk factors and disability in later life. *Aging Ment Health.* 2003;7(3):163-70. doi: [10.1080/1360786031000101111](https://doi.org/10.1080/1360786031000101111). [PubMed: [12775395](https://pubmed.ncbi.nlm.nih.gov/12775395/)].
32. Jang Y, Mortimer JA, Haley WE, Graves AB. The role of neuroticism in the association between performance-based and self-reported measures of mobility. *J Aging Health.* 2002;14(4):495-508. doi: [10.1177/089826402237180](https://doi.org/10.1177/089826402237180). [PubMed: [12392023](https://pubmed.ncbi.nlm.nih.gov/12392023/)].
33. Astrand NE. Medical, psychological, and social factors associated with back abnormalities and self reported back pain: a cross sectional study of male employees in a Swedish pulp and paper industry. *Br J Ind Med.* 1987;44(5):327-36. [PubMed: [2954580](https://pubmed.ncbi.nlm.nih.gov/2954580/)].
34. Terracciano A, Costa PJ. Smoking and the Five-Factor Model of personality. *Addiction.* 2004;99(4):472-81. doi: [10.1111/j.1360-0443.2004.00687.x](https://doi.org/10.1111/j.1360-0443.2004.00687.x). [PubMed: [15049747](https://pubmed.ncbi.nlm.nih.gov/15049747/)].
35. Vollrath ME, Torgersen S. Personality types and risky health behaviors in Norwegian students. *Scand J Psychol.* 2008;49(3):287-92. doi: [10.1111/j.1467-9450.2008.00631.x](https://doi.org/10.1111/j.1467-9450.2008.00631.x). [PubMed: [18419592](https://pubmed.ncbi.nlm.nih.gov/18419592/)].
36. Terracciano A, Lockenhoff CE, Crum RM, Bienvenu OJ, Costa PJ. Five-Factor Model personality profiles of drug users. *BMC Psychiatry.* 2008;8:22. doi: [10.1186/1471-244X-8-22](https://doi.org/10.1186/1471-244X-8-22). [PubMed: [18405382](https://pubmed.ncbi.nlm.nih.gov/18405382/)].