

THE IMPORTANCE OF PERSONALITY TRAITS, OPTIMISM AND QUALITY OF LIFE FOR PAIN THRESHOLD AND PAIN TOLERANCE IN THE ELDERLY

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Abstract With increasing age, the frequency of chronic pain increases compared to acute pain. This is due to structural and functional changes caused by ageing of the nervous system. The aim of this study was to investigate relationships between personality traits, optimism, quality of life, and subjective assessment of pain measured experimentally with an algometer and clinically with the Visual Analogue Scale (VAS). In the group of 133 seniors (61–86 years; 78% women), we used an algometer to measure pain threshold and tolerance, the VAS scale to assess subjective intensity, and standardized questionnaires (EPQ-R(s), LOTR, SWLS) to measure psychological variables. Extraversion was found to promote both higher pain threshold and higher pain tolerance, whereas pain tolerance was negatively correlated with neuroticism. Higher severity of the psychotic trait was associated with more intense subjective pain experience. Optimism and overall quality of life were not associated with any pain measures. A better understanding of the personality correlates of pain perception could support a more accurate tailoring of pain management in elderly patients.

Key words: pain perception, algometer, Visual Analogue Scale, elderly, personality traits, optimism, quality of life

Introduction

Scientific studies have shown that people's response to pain and their sensitivity to positive and negative stimuli are very different (Price, 2000). According to the International Association for the Study of Pain (IASP), pain is described as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (Raja et al., 2020). Physiologically, pain has an informational and warning function in that it indicates impending or threatened tissue damage. Its protective function, in turn, greatly increases a person's chances of survival by allowing them to recognize their environment and avoid situations that could threaten their health or life (Pawlak et al., 2019). Pain or its absence is also a subjective criterion for illness or health. A complex combination between personality and its effect on pain perception is observed (Pawlak, 2013). It is known that pain perception is highly modulated by the circumstances in which it occurs. Environmental, social, and also emotional or religious factors play a special role in the perception of pain stimuli (Gatchel et al., 2007). Psychological factors, including personality, have also been shown to determine individual differences in pain threshold and pain tolerance, as well as how we cope with pain (Seminowicz & Davis, 2006; Lim et al., 1983). Thus, pain perception can be enhanced or attenuated depending on a person's motivation, activity, life satisfaction, or stress coping strategy.

Personality traits have a significant impact on the patient's perception of pain and attitude (Levine et al, 1966; Lynn & Eysenck, 1961). According to Eysenck, extroverts and psychopaths have a higher pain tolerance than introverts, due to a more rapid increase in cortical inhibition and the resulting tendency to suppress sensory stimuli (Eysenck, 1967). Extroverts are open-minded and curious about the outside world; their lives are empirically richer. They are willing to embrace innovative ideas and unconventional values. Compared to closed-minded people, they are more willing to experience both positive and negative emotions. They willingly enter into new social relationships and face the situations they encounter in life with optimism. Psychopaths, on the other hand, are antisocial, aggressive, often insensitive and extravagant people (Eysenck, 1970). High levels of psychoticism often lead to various mental disorders, such as psychosis. According to Lynn and Eysenck, the final dimension of personality is neuroticism, which is defined as the highest level of emotional instability (Lynn & Eysenck, 1961). Neurotic people are more prone to exaggeration and have difficulty returning to a normal level of emotional activity. Some cognitive and behavioral traits have also been shown to be significantly related to pain (Goubert et al. 2004; Kadimpati et al., 2015). Research shows that catastrophism influences the relationship between negative affect (neuroticism), pain, and functional disability (Vervoort et al., 2006; Swinkels-Meewisse et al., 2006). People who tend to have catastrophic thoughts about their pain very often get into a so-called vicious cycle of fear of pain, increased vigilance, and avoidance, which in turn increases pain. It seems that optimism can protect against the development of this vicious circle and prevent the occurrence of chronic pain. Optimism as a personality trait generally means optimistic expectations and a tendency toward positive feelings and satisfaction with life (Scheier & Carver, 1987). Many studies have shown that optimists respond more positively to health-threatening situations (Carr, 2009), do not catastrophize, and do not show excessive vigilance to negative information. In experimental studies of pain, optimists are aware that the harmful effects of the stimulus are temporary and will soon pass.

In turn, the studies by Geers et al. (2008) showed that optimists are not more resistant to pain stimuli (Geers et al., 2008). The authors explain that compared to pessimists, optimists are more flexible in dealing with pain because they focus their attention on the positive aspects of the situation and use active pain management strategies (Ramirez-Maestre et al., 2012; Saariaho et al., 2010).

Over the past 30 years, there has been a significant increase in interest in describing and measuring the quality of life of older people (Fayers & Machin, 2007).

The concept of life satisfaction is semantically related to such terms as: well-being, satisfaction and quality of life. Mostly, health-related quality of life is measured by the aspects of overall quality of life that can be clearly shown to affect physical and mental health (Diener et al., 1985).

Many studies suggest that the quality of life of older people depends more on personality traits and social situation than on the biological state of the body (Felce & Perry, 1995).

From published research it appears that people strive for life satisfaction and are generally satisfied with it (Diener & Diener, 1996). The occurrence of the disease is associated with lower life satisfaction compared to healthy people (Hyphantis et al., 2013; Czapiński, 2008).

In healthy people, life satisfaction is related to extraversion and negative emotionality, whereas in patients, social inhibition and conscientiousness are predictors of satisfaction. This proves that the satisfaction level of healthy people results from their own activity and contacts with other people, while in sick people the fulfilment of social and professional roles plays an important role in the satisfaction level (Kozaka & Kobus, 2015).

In aging, cognitive, emotional, and social pain competencies have both direct and indirect effects on pain perception. Many authors point out that the mental and physical health of older people has a significant impact on their quality of life and their perception of pain (Schoenborn et al., 2013; McAuley et al., 2003).

The aim of this study was therefore to investigate the relationship between personality traits, optimism and quality of life, and subjective assessment of pain measured experimentally with an algometer and clinically with the Visual Analogue Scale (VAS).

Materials and methods

Participants

Study sample consisted of 133 seniors (77.4% woman), aged 61–86 years, mostly with secondary or higher level of education, differentiated by places of residence.

Pain Measurement

PPT, PTOL. Tissue pressure sensitivity measurements were performed using an FPN 100 Algometer (Wagner Instruments, Greenwich, USA) with a measurement range of 0 to 20 kg and an attached disk-shaped rubber tip of 1 cm². Measurements were taken on the dominant upper limb, on the dorsum of the hand between the thumb and index finger.

Two tests were performed with this device to determine pain threshold (PPT) and pressure pain tolerance (PTOL). PPT is defined as the minimum pressure required for the sensation of pressure to first change to pain, whereas PTOL describes the maximum stimulus intensity or duration of continuous painful stimulation that a subject is willing to endure.

All participants were instructed on how to use the algometer and then allowed to use the device. They were tested in a sitting position, and measurements were taken on the dominant upper extremity on the dorsum of the hand between the thumb and index finger. All measurements were taken by the same researcher. When pain occurred, the participant said 'stop,' and this measurement was used as an indicator of pain threshold (PPT result). The measurement was then continued until the participant could no longer tolerate the stimulus and signaled the

end of the measurement. The point at which a painful pressure stimulus could no longer be tolerated was used as the pain tolerance measurement (PTOL result).

Visual Analog Scale (VAS)

After completing PPT and PTOL tests, the patients were asked to indicate their subjective pain level using the Visual Analog Scale (VAS) to assess the degree of subjective pain experienced during the procedure compared to an individual subjective amount of pain experienced in life. The pain intensity was assessed using a scale from 0 = "No pain and discomfort" to 10 = "The worst possible pain and discomfort".

Psychological traits

Personality

Eysenck EPQ-R Personality Questionnaire.

The questionnaire aims to examine the basic dimensions of personality contained in Eysenck's theory (Eysenck & Eysenck, 1994). It allows an initial determination of personality in the following dimensions: Extraversion, Neuroticism, Psychoticism and Tendency to present oneself in a good light. Higher scores on the Neuroticism scale (EPQ-N) indicate an anxious, fearful, overly emotional, and somewhat rigid personality. A higher score on the Extraversion Scale (EPQ-E) indicates an outgoing, optimistic, exciting, and relaxed personality. Higher scores on the Psychoticism Scale (EPQ-P) indicate an uninhibited, hostile, and maladjusted personality, and Lying (EPQ-L) represents uncomplicated hypocrisy (Jaworowska, 2011).

Optimism

Optimism was measured with the Life-Orientation Test- Revised (LOT-R), a 10-item measure of optimism versus pessimism created by Scheier and Carver (1985) in Polish adaptation by Poprawa and Juczynski (Scheier & Carver, 1987). Of the 10 items, six of them measure optimism (e.g., *In uncertain times, I usually expect the best*, and *If something can go wrong for me, it will*, reverse-scored), and four items serve as fillers. Respondents rated each item on a 5-point scale from 0 = strongly disagree to 4 = strongly agree.

Quality of life

The Satisfaction with Life Scale (SWLS) is one of the most widely used tools to measure the cognitive dimension of subjective well-being (Kjell & Diener, 2021; Juczynski, 2001). The SWLS contains 5 statements. The range of its results is in the range from 5 to 35 points, and a higher score means a sense of greater satisfaction with life.

Study design

The study involved seniors attending courses in senior citizens' clubs and at the University of the Third Age in Szczecin and Gdansk. Subjects were informed of the purpose of the experiment and the possibility of dropping out at any time. The Bioethics Committee of the Regional Medical Chamber in Gdansk approved the study (KB -10/19).

After written informed consent to participate in the study, pain threshold and pain tolerance tests were performed, as well as assessment of subjective pain perception using the VAS scale. Participants were then asked to complete a demographic survey and research questionnaires. Seniors completed the questionnaires without assistance but in the presence of the researcher. If the participant had difficulty completing the questionnaire, they could ask the researcher for help, but in any case, all answers were exclusively their own.

Results

In subjective pain assessment using an algometer, analyzed seniors achieved threshold scores from 0.1 to 4.1, while pain tolerance was scored from 0.8 to 20.3. In the assessment of subjective pain intensity participants scored the maximum possible range from 1 to 10. Table 1 contains basic sociodemographic and pain measurements results, described by mean (*M*) and standard deviation (*SD*) for quantitative variables and frequency (*n*) and percentage (%) for qualitative ones.

Table 1. Sociodemographic characteristics and pain measurements results in study sample

Variables	<i>N/M</i>	<i>%/SD</i>
Age in years	72.68	5.57
Gender		
woman	103	78.0
man	30	22.0
Education		
primary	3	2.3
vocational	20	15.0
secondary	58	43.6
higher	44	33.1
higher and more	8	6.0
Place of residence		
village	24	18.0
small town	36	27.1
medium town	44	33.1
cities	27	20.3
big cities	2	1.5
Pain threshold (algometer)	1.15	1.26
Pain tolerance (algometer)	5.53	3.05
Pain intensity (VAS)	6.57	1.80

Table 2 presents the results of the Spearman's correlation analysis between pain measurements (threshold, tolerance and subjective intensity) and psychological factors as personality features, optimism and general quality of life. Three personality dispositions turned out to be significantly correlated with objective and subjective pain measurements. Extraversion was positively associated with pain tolerance ($\rho = 0.217$; $p = 0.012$) and threshold ($\rho = 0.198$; $p = 0.023$), which suggests that among analyzed seniors increased social openness coexisted with higher pain resistance. More introverted seniors were found to be slightly more sensitive to physical pain. Only pain tolerance negatively correlated with the neurotic domain of personality ($\rho = -0.180$; $p = 0.038$). This result indicates that higher emotional stability can promote better pain tolerance – more negative affect coexisted with increased pain intolerance. Differently to extraversion, neuroticism was not related to pain threshold ($p > 0,05$). Psychoticism was the last personality disposition significantly associated with pain experiences – but only with its subjective intensity, measured by the VAS scale ($\rho = 0.228$; $p = 0.044$). Stronger discomfort caused by physical pain experienced coexisted with higher scores on indicators of emotional coldness, lack of empathy, hostility or associability.

Neither objective nor subjective pain indicators were related to the results of control lie scale and general level of quality of life ($p > 0,05$). Furthermore, extroversion corresponds to better life quality ($\rho = 0.295$; $p = 0.001$), while neuroticism was linked to being prone to dishonest self-presentation, indicates by the scale of Lie ($\rho = -0.310$; $p < 0.001$).

Table 2. Spearman's correlation between physical pain and psychological factors

	ALGOMETER	VAS	LOTR	EPQ-R(S)			SWLS	
	Pain tolerance	Pain intensity	Optimism	Extraversion	Neuroticism	Psychoticism	Lie Scale	
Pain threshold	0.412***	-0.025	-0.043	0.198*	0.007	-0.021	0.122	-0.019
Pain tolerance	-	0.073	0.068	0.217*	-0.180*	-0.149	-0.041	0.050
VAS (n = 79)		-	-0.071	-0.139	0.084	0.228*	-0.211	0.091
Optimism			-	0.234**	-0.166	-0.022	0.011	0.111
Extraversion				-	-0.166	-0.031	0.115	0.295**
Neuroticism					-	0.111	-0.310***	-0.146
Psychoticism						-	0.024	0.147
Lie Scale							-	0.100

* p < 0.05; ** p < 0.01; *** p < 0.001.

In addition, we examined the associations between pain threshold and tolerance and selected sociodemographic variables. Pain resistance was stronger among men, who achieved higher scores in tolerance ($Z = -2.884$; $p = 0.004$) as well as in tolerance ($Z = -5.119$; $p < 0.001$). Higher pain threshold was favored also by higher height ($\rho = 0.188$; $p = 0.031$) and lower education level ($\rho = -0.254$; $p = 0.003$), while greater pain tolerance – with higher height ($\rho = 0.471$; $p < 0.001$) and body weight ($\rho = 0.353$; $p < 0.001$), even besides BMI was not correlated with pain experiences. Neither senior's age nor place of residence were not correlated with objective pain sensitivity. Also subjective experiences, assessed by the VAS scale, did not associated to any of sociodemographic factors.

Discussion

The phenomenon of multimorbidity is associated with the aging process of the organism. With increasing age, the frequency of acute pain decreases, while the number of people reporting chronic pain increases. The severity of pain in this age group is influenced by a number of factors, including limited mobility, abandonment or restriction of social life, discouragement, loneliness, and depression (Singh, 2002). In this study, we aimed to examine the associations between pain experiences and three psychological variables–personality, optimism, and quality of life–in a very specific group of seniors over 61 years of age. Optimism and quality of life were not related to any of the pain measures, but three personality dispositions were found to be significantly related to goal setting. Among the seniors studied, extraversion promoted slightly higher pain threshold and tolerance, whereas neuroticism was associated with lower pain tolerance. Our results are consistent with other findings and thus support the hypothesis of a relationship between physical pain sensitivity and relatively stable personality domains. Individuals with high neuroticism scores have been found to have low pain tolerance, high pain intensity (Vassend et al., 2013), and high scores on self-reports of pain sensitivity (Bar-Shalita & Cermak, 2020; Quan et al., 2017). The same results were obtained for extroverts characterized by high pain tolerance (Ferracuti & De Carolis, 2005) and high pain threshold (Phillips & Gatchel, 2000). In turn, Lin et al. examined the relationship between general psychological distress and the presence of anxiety in chronic neck pain in the group of people with chronic diseases, which was confirmed by a positive correlation between neuroticism and chronic neck pain (Lin et al. 2010). In classical research, neuroticism has been associated with higher pain threshold and tolerance (Tajet-Foxell & Rose, 1995; Schailing, 1971). Neuroticism was also not differentiated in postoperative pain perception, while extraversion also emerged as significantly important (Lewandowska et al., 2016). This discrepancy in results suggests that the relationship between personality dimensions and physiological responses are more complex than simple correlation data.

Other research reports suggest that neurotic and introverted individuals are less likely to report their pain because of significant personality limitations (Bond, 1971; Walding, 1991; Feldman et al., 1999), e.g., masking/hiding the pain response. Published evidence suggests that high levels of neuroticism and low levels of extroversion influence cognition and processes related to pain meaning, which in turn affect pain threshold and pain tolerance (Harkins et al., 1989; Newth & DeLongis, 2004).

In addition to these two main personality dispositions, a third - psychoticism - proved to be significantly important for subjective pain intensity. Seniors who scored higher on this domain were more likely to rate the pain they experienced as more painful than less psychotic individuals. Many studies have not found a relationship between this personality component and pain intensity (Cooper et al., 2000) but the most recent study by Davydov et al. (2021) showed that psychoticism is involved in conscious pain management by mediating pain coping strategies such as catastrophizing and cognitive distraction (Davydov et al., 2021). The presence of this relationship suggests that nociception processes may mask the effects of personality on pain threshold and tolerance. Thus, to better understand the independent influence of personality on pain, a thorough exploration of the origin of the personality-pain relationship is needed.

In our study, no relationship was found between optimism and pain sensitivity, but other studies with younger participants show that individuals with high levels of optimism expect positive outcomes for their future and are better able to cope with stress and everyday challenges (Carr, 2009). High levels of optimism are associated with better coping with stressful situations and better physical and mental well-being (Scheier & Carver, 1987; Scheier et al., 1994), so it can be assumed that it is associated with greater resilience to pain. Similarly, no correlation was found between pain sensitivity and quality of life, while such a correlation was found in studies by other authors (Laursen et al. 2005; Morgan et al. 2003; Raiisi, 2020). One of the possible reasons for the observed differences could be the specification of the study sample. It is possible that the overall quality of life in the elderly is determined by a number of factors, so that in our group there was no correlation between objective and subjective pain measures as in younger participants.

Conclusion

Thus, our results support the notion that higher extroversion and neuroticism, in particular, may act as key personality traits that predispose older people to greater pain resistance and thus differentiate the experience of pain that cannot be avoided anyway. Personality may be one of the most important filters of individual pain interpretation, along with more biological temperament, which has also been shown to be an important modulator of pain experience.

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