



# Does fear impede the success of spinal surgery in patients with chronic Back pain? Potential prognosticative factors in spinal surgery failure

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## Abstract

One of the challenges in pain management is that many spine surgeries do not alleviate the pain in patients with chronic back pain (CBP). For Patients suffering from CBP, constant, persistent and relapsing pain overtime as a result of undergoing several surgeries main point of concentration will be on pain-related stimuli and develop pain-related fears. To show how fundamental fears can affect the outcome of the surgery. To assess fundamental fears (death anxiety, fear of pain (FOP), and Kinesiophobia) in CBP patients before undergoing spinal surgery. Patients [ $n = 273$ ] of Erfan Hospital had experienced persistent back pain for six months. One week before the operation, we administered the Tampa Scale for Kinesiophobia [Tampa], Fear of Pain Questionnaire-Short Form, Templer Death Anxiety Scale [DAS], and The McGill Pain Questionnaire. One week after the operation, we re-administrated only the McGill questionnaire and conducted multiple regressions to determine how fundamental fears can predict surgery failure concerning pain outcome. Intense fear of death, pain, or movement raised the probability of failure and decreased the postoperative pain [fear of death:  $T = 3.77$ ,  $P < 0.001$ ; FOP:  $T = 4.63$ ,  $P < 0.001$ ; Kinesiophobia:  $T = 3.88$ ,  $P < 0.001$ ]. Furthermore, results showed that death anxiety 18%, FOP 30%, and fear of movement 45% could predict surgery failure concerning pain sedation. Moreover, correlational coefficients between variables revealed the following indices respectively: FOP:  $r = 0.067$ , Kinesiophobia:  $r = -0.53$ , and death-related anxiety:  $r = 0.39$  (all variables significant:  $\text{Sig} = 0.001$ ). Initial fears such as fear of death, pain, and movement may lower the chance of surgery success. Hypervigilance, intrusive thoughts about death, avoidance behaviors (such as inactivity induced by Kinesiophobia) and obsessing over physical symptoms may cause spinal surgery's failure in CBP patients. Ultimately, we provide future research suggestions and practical approaches to address these fears.

**Keywords** Back pain · Surgery · Fear of death · Fear of pain · Fear of movement

## Introduction

Back pain is one of the primary health issues among patients below 45, impairs daily function, and imposes high costs on individuals and society (Abbott et al., 2010; Alzahrani et al., 2019). Chronic back pain has a high prevalence among diseases in developed countries. Recent findings indicate that 67.7% of patients who had undergone surgery reported that the operation made the pain worse in terms of intensity and

disability (Buchbinder et al., 2018). Although experts have accomplished remarkable progress in understanding the mechanisms leading to the perpetuating pain. From patients' perspective, these progress has not helped eliminate their pain as much (Oliveira et al., 2019). Misinterpretation, pain-related catastrophism, and intrusive thoughts related to pain (such as fear of movement) are among the primary factors that lead to chronicity even in patients suffering from acute pain (Hopkins et al., 2019; Thompson et al., 2020).

Current traditional treatments provide a modest improvement in pain perception and minimum improvements in physical and psychological functions. Chronic pain, especially chronic back pain (CBP), is one of the primary detrimental health conditions due to its disabling nature and comorbidity with psychological and physical disorders (Purcell et al., 2019). Several factors mediate physio-pathology and subjective pain perception in CBP, encompassing an individual's unique

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genotype, learning history, economic and external factors (Juneyoung et al., 2019), cognitive, emotional, and behavioral factors (Juneyoung et al., 2019). Furthermore, socio-demographic factors such as educational deprivation in women or insufficient social participation affect pain perception [MR1] (Alsufiany et al., 2020; Oliveira et al., 2019). Individual response to pain relies on psychological mechanisms and how patients perceive pain since pain perception is subjective (Fatoye et al., 2019). Pain psychologists believe that psychic misinterpretation and emotional arousal directly intensify pain perception by provoking the sympathetic nervous system (McGirt et al., 2017). For instance, exposure to neck regions' movements in patients with chronic neck pain evokes the sympathetic-excitatory nervous system because patients misinterpret neck movement as harmful stimuli, which leads to the chronicity of their illness (Khan et al., 2020).

We have investigated the role of psychological and social-demographic factors that may affect medical treatment outcomes. McGirt [MR2] showed that cognitive attitudes, such as preoccupation with intrusive thoughts and pain catastrophism, might stimulate a particular brain region's activity, including pain centers (Willmott et al., 2018). We discovered gender differences are responsible for pain perceptiveness; anxiety causes pain perception in men more than women. Pain-related stress (such as fear of pain and sensitivity to pain induced by high anxiety) leads to increased pain in men (Koenders et al., 2019). There is a significant positive relationship between pain catastrophizing and pain perception and a negative correlation between positive psychological attributes and pain catastrophism (Abbott et al., 2010) [MR3]. Approximately 30% of chronic pain patients experience fundamental fears (Gilmore et al., 2015; Prince et al., 2008).

Clinical results emphasize that many patients who have undergone surgery because of back pain. Regardless of how expert the surgeons, many patients did not benefit from the surgical procedure for pain relief. Several potential factors determine whether the spinal operation is successful or not, among which fundamental fears may be the outcomes' psychological determinants. Surgery can be costly for the patient and the health system if denying the patient's personality. Nevertheless, there is limited research on the role of psychological factors in spinal surgery outcomes. This study mainly served two purposes: First, we assessed potential psychological predictors (primary fears such as death-related fear, fear of pain (FOP), Kinesiophobia [MR4]). Second, we explored the relationship between these fears in pain intensity and disability after spinal surgery.

## Materials and Methods

We carried out a descriptive correlational designed to examine the hypothesis. The patients at Erfan Hospital who had at least six months of back pain in Tehran voluntarily participated in

the present study. They all preferred surgical treatment for pain relief. Based on Morgan's table, we chose approximately 225 patients to obtain valid results. We recruited 300 patients to decrease the chance of missing data. Finally, 270 participants left the study or submitted incomplete questionnaires.

The inclusion criteria were as follows: Patients were undergoing spinal cord surgery, Patients who were referred to a spine specialist for medication more than three times, Patients who were operated on by a spine surgeon more than once before this study. The patient's age ranged between 25 to 50 years old. The patients had at least secondary education level. The exclusion criteria were a histrionic personality disorder (categorized in cluster B), such as borderline or histrionic personality disorder, and receiving other psychological treatments simultaneously.

The ethical code for this study was IR.SSU.MEDICINE.REC.1398.383. As far as ethical considerations are concerned, the patient's satisfaction was taken into account in the research.

Regarding patients' information confidentiality, we disguised patients' personal information and data collectors, and executors were blind to the study's purpose. We administered The McGill questionnaire to evaluate the surgical failure for pain relief. Participants completed the McGill Pain Questionnaire before and after the surgery to report the difference between severity and disability. Scores above zero revealed that surgery was not successful regarding pain reduction, and scores below zero showed that the surgery could reduce the pain intensity and helplessness. Also, we applied questionnaires, including the Tampa Scale for Kinesiophobia (Tampa), Fear of Pain Questionnaire-Short Form, Templer Death Anxiety Scale (DAS), and The McGill Pain Questionnaire, one week before the operation. Statistical analyses were performed by SPSS 24.

### Tampa Scale for Kinesiophobia (TSK)

In 1991, Miller et al. developed the scale Fear of Movement and Re-injury (Miller et al., 1991). The scale includes 17 items, which could be answered on a Four-Point Likert Scale. All respondents could obtain scores on a range from 17 to 68 points. Scores 39 and above indicate an extreme fear of movement. Some items on this scale are as follows:

"I'm afraid of injuring myself if I exercise." "Pain always means; I have injured my body." Items 4, 8, 12, and 16 show negativities. For example, in item 4: "my pain would probably be relieved if I did not exercise." In the previous studies, factor analysis indicated that the following determining one factor (Houben et al., 2005), two factors (Gómez-Pérez et al., 2011), three factors (Mintken et al., 2010), 4, and 5 factors (Lundberg et al., 2004). In this study, we carried out the exploratory factor analysis (EFA) with the maximum likelihood method, Varimax rotation, for understanding the factor structure of

TSK, in which the two-factor model (“pathological somatic focus” and “activity avoidance”) was more appropriate. Goodness of fit index was: RMSEA (90% CL) = 0.049, NNFI = 0.90, CFI = 0.93, ECVI = 1.89. The validity and reliability of the scale have been proven in Iran (Jafari et al., 2010). Cronbach’s alpha in the original version was 0.83. Similarly, in the English version, this coefficient was 0.84, while in the Iranian version, it was 0.79. The internal consistency correlation coefficient obtained by calculating the coefficient between items was 0.82. In the Swedish version, the correlation coefficient was reported to be 0.91, whereas, in the Persian version, the Pearson correlation coefficient was calculated to be 0.86. In the Iranian version, the Tampa fears scale correlation with the Roland-Morris clinical disability was 0.60.

### Fear of Pain Questionnaire-Short Form (FPQ-9)

McNeil and Rainwater (1998) and McNeil et al. (2018) introduced a self-report inventory to assess fear of pain in the form of three categories of severe, minor, and pain-alleviating methods (such as injection) within 30 items. FPQ was translated into several languages and was tried on clinical and non-clinical samples. The original questionnaire with 30 items was reduced to 20 items in short form (FPQ-III) with four factors. In the final, a 9-item shortened version (FPQ-9) was applied for fear of pain by McNeil et al. (2018). The sample of items of FPQ-9: “I fear my pain was associated with breaking bones” and “having someone slam a heavy car door on your hand.” Goodness of fit for original version (4-factor) it was (RMSEA = 0.00, CFI = 1.00, TLI = 1.00, SRMR = 0.03), whereas in shorten version (3-factor) it was (RMSEA = 0.034, CFI = 0.763, TLI = 0.996, SRMR = 0.012). The Iranian version for 3-factor was calculated (RMSEA = 0.08, CFI = 0.84, TLI = 0.82, SRMR = 0.011). Correlation between two versions, FPQ-III and FPQ-9, convergent and divergent validity ( $r = 0.77$ ,  $p < 0.001$ ) (Kachooei et al., 2015). Cronbach’s alpha was calculated to be 0.72 to 0.94, respectively. In the present study, Cronbach’s alpha was calculated to be 0.78.

### Templer Death Anxiety Scale (DAS)

For the first time, Donald Templer (1970, 2013) developed a death anxiety inventory. The Templer Death Anxiety Scale is a self-administered scale to measure death anxiety. It consists of 15 items based on the yes or no option. Examples of items can be seen as follow: “I fear of dying from a painful death” or “I am terrified of having a heart attack.” Gilmore et al. (2015) reported Cronbach’s alpha coefficient for the three factors obtained by the factor analysis 0.68, 0.49, and 0.60, respectively. To evaluate the psychometrics of Templer (1970), they measured the relationship between DOS and Boyar’s fear of

death scale (BFDS), which showed good validity. Over the years, this scale has been studied many times in psychometric scales in different countries and cultures. For example, Abdel-Khalek (1998) found five factors among Egyptian Arabs. He reported 0.57 split-half reliability and 0.92 Cronbach Alpha coefficients (Abdel-Khalek, 2004).

Saggino and Kline (1996) found three factors among Italians (Saggino & Kline, 1996). In this research, Cronbach’s alpha also was 0.75. In the Iranian version, however, the final fit was suitable (AGFI = 0.922, PCFI = 0.703, NFI = 0.912, RMSEA = 0.055).

### The McGill Pain Questionnaire

Melzack and Thorgerson of McGill University developed the McGill Pain Inventory (Melzack, 1975, 1987). This questionnaire provides patients a detailed explanation of the quality and intensity of their pain. The main version of the scale includes 20 items. The short-form McGill questionnaire, with 15 items, has two subscales that were standard in Iran. This scale runs as a self-report and paper-pen questionnaire and scores on a 4-point Likert Scale: without pain = 0 to severe = 3. In the end, three scores are obtained: Sensory, Emotional, and General., were obtained from Cronbach’s alpha for the whole questionnaire [ $r = 0.87$ ], pain intensity dimensions [ $r = 0.87$ ], and pain response of [ $r = 0.89$ ] respectively. The results of Iranian version demonstrated a good fit for the scale (GFI = 0.97, SRMR = 0.04, RMSEA = 0.06, TLI = 0.996).

## Results

As shown in Table 1, participants’ age ranged from 36 to 42 years old [37.3% of the participants]. 55.8% of the participants included women, and 37.5% were unemployed. If we consider retired patients and uncompleted questionnaires, this amount will increase. About 81.8% of participants had lower education [diploma and under diploma], 45% had a history of another surgery, and 84.2% had the same surgery in the previous year [MR7]. Table 2 illustrates the mean and standard deviation of fundamental fears are specified.

It was necessary to check if the normal distribution criterion was met before analyzing multiple regressions. The Kolmogorov-Smirnov test results presented in Table 3 showed that the normal distribution of research data was fulfilled. As shown in Table 4, there is a significant correlation between fear of death, fear of pain, and fear of movement.

As shown in Table 4, Simultaneous [or standard] multiple regressions used to study how fundamental fears can predict unsuccessful surgery consequences as pain reduction. According to the table, all three fears could explain the outcome of the surgery. As the fear of death, pain, and movement increased, the failure to reduce postoperative pain intensified

**Table 1** Demographic characteristic of participants

Demographic information	Sub criteria	percentage
Age	Less than 25 y	7
	Between 26 and 35 y	33.2
	Between 36 and 45 y	37.3
	Between 46 and 50 y	22.6
Sex	Female	55.8
	Male	44.2
Occupation	Employer	12.7
	Self-employment	19.4
	Retired	30.4
	Unemployed	37.5
Education	Low literate	39.2
	diploma	42.6
	Masters	11.9
	Masters and PhD.	6.2
Other surgical histories	With a history of surgery	45
	Without a history of surgery	55
The time elapsed from previous surgery	6 months	46.7
	6 months to one year	37.5
	More than a year	15.8

accordingly [fear of death:  $T = 3.77, P < 0.001$ ; fear of pain:  $T = 4.63, P < 0.001$ ; Fear of movement:  $T = 3.88, P < 0.001$ ]. Furthermore, the findings showed that the fear of death, 18%, fear of pain 30%, and fear of movement 45% could explain surgery failure for pain reduction.

### Discussion

The current study showed that the fear of movement could predict spine surgery failure in patients suffering from back pain. This result is consistent with previous research findings (La Touche et al., 2018; Sharpe et al., 2017; Tsuboi et al., 2019). Among the chronic pain trials, fear of movement is a significant issue. It is expected that around 30% of patients with chronic pain will experience this fear (Griffith et al., 2018; Hare et al., 2013); this means that reactions to pain are predictable by pain severity and disabilities.

The avoidance model explains that fear of movement is more related to disability than inactivity. Patients, who are unable to move, tending to experience this fear (Griffith et al., 2013; Sharpe et al., 2017); therefore, those who experience disability must have shown a greater fear of movement. Finding of this research shows fear of action is an important predictor factor for depression and physical disability. Some studies have revealed that Kinesiophobia is much more debilitating than the pain itself (Taylor et al., 2018). Finally, fear of movement and pain intensity reinforce each other in a loop: Kinesiophobia triggers pain perception more intense, and heightened pain provokes fear of movement and avoidance behaviors.

The results presented that fear of death predicted pain responses. This hypothesis is consistent with previous research (Griffith et al., 2018) and (Sharpe et al., 2017), which means that feedback to pain is predictable through fear of death. To

**Table 2** Kolmogorov-Smimov test to demonstrate the normal distribution of the scores studied

Criterion variable	failure in spine surgery in back pain patients	
	KSPA	Sig
Fear of death	0.57	0.781
Fear of pain	0.39	0.934
Fear of movement	0.51	0.856

**Table 3** Correlation coefficients between research variables, M (SD), minimum-maximum of

variables	1	2	3	4	M	Min- Max
Failed of surgery	–					
Fear of death	0.39**	–			28.55 (5.92)	12–38
Fear of pain	0.67**	0.22*	–		39.95 (3.05)	1–15
Fear of movement	0.53**	0.02	0.38**	–	37.50 (6.02)	14–51

\*\* $: P < 0.001$  \* $: P < 0.05$

**Table 4** Multiple regression as a predictive analysis Fundamental fears failure in spine surgery in patients with chronic back pain

Criterion variable		R	R <sup>2</sup>	F	Beta	T	P
Failed surgery as pain reduction	Fear of death	0.43	0.18	39.28	0.329	3.77	0.001
	Fear of pain	0.55	0.30	44.43	0.392	4.63	0.001
	Fear of movement	0.67	0.45	49.12	0.337	3.88	0.001

explain this hypothesis, it can be argued that anxiety of death and fear of death, which are fundamental fears, are provoked by the extinction idea through injury. This reaction is more severe, especially in patients who experience the loss of a loved one. The level of death anxiety can be different, depending on individual differences and many social factors—fear of death alerts pain sensitivity, which occurs due to the sympathetic nervous system arousal.

Fear of pain can be a corrective punishment. Some people are more alerted to punishment and pain. As a result of their reaction to painful situations, they show more resistance and experience more pain. They may even perceive pain as a punishment by God for their sins. If they believe that they are being punished and can never be released, they will be resistant to recovery.

## Conclusion

Based on the current research findings, the types of fundamental fears would consciously or unconsciously affect the patient's continuous pain even after the surgery. Fears are a strong predictor for the surgery's failure that is done to reduce pain in patients with chronic back pain. These fears, sometimes, can cause constant pain and prevent relief. Anxiety is a subjective issue, and it is not easy for patients to show their suffering to others. Patients with alexithymia tend to show their distress by physical signs than a vague feeling [such as fear and anxiety]. Treatment may be a major obstacle to express. Surprisingly, for some patients, pain is a dilemma. While patients want to avoid pain, they need to control intolerable anxiety. This conflict can cause the patient to continue experiencing pain. Fearful individuals are more vigilant about the dangers they might experience. Pain is also a sign of trouble that can be alarming. Paying excessive attention to pain can prevent recovery. People with high levels of anxiety and fear get higher cortisol levels, which increases their sensitivity to pain (Timmers et al., 2018). Besides, focusing on physical symptoms and being vigilant to pain increase pain perception in anxious patients. On the other hand, if patients cannot find convincing philosophical meaning to fundamental tension, they struggle with intractable pain.

## Implications

The World Health Organization (WHO) introduced the bio-psycho-social model in the most medical centers as teams of physicians, health psychologists, and social workers. They help patients manage psychological and social problems that increase pain. These teams are more effective in treating chronic pain than other illnesses because the psychological aspects of pain are as crucial as physical damage. This study indicates that fear of pain, movement, and death causes failure in surgery. Before undergoing surgery, it is recommended that the patients have a psychological interview with psychologists or pain consultants to reveal their deep fears. Patients with intensive fundamental anxiety may not be suitable candidates for surgery. If the patient faces their fears, they would be able to process them, which increases the chances of success in pain reduction surgeries. The surgeon can overcome the anxiety and fear of the patients by talking to patients before the surgery.

## Limitations

The method applied in the current study was a correlation [MR9]. Therefore, we could not determine any causal relationship between fundamental fears and surgery failure. A disability could be studied as a mediator to explain the relationship between variables. The research was conducted in a public health center, making it challenging to generalize private centers' results. Cultural factors, which were not addressed in this study, can also impact how patients interpret and perceive fears (Meeus, 2018). These limitations could be the starting point for future research.

As research has shown, fear can affect the outcome of the surgery. Therefore, it is better to design protocols to help patients manage their fears before undergoing surgery so that increasing the chances of successful surgery. The present study involved some limitations generalizing the results to similar research, a bit challenging; to illustrate cultural and age-related issues, determining the degree of fear of movement, and fear of death. It is recommended that the mediator role of these two variables will be investigated in future research.



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**Author Contributions** Both authors contributed to interpretation, analyzing the data, collecting the data. The idea of this work initiated by Dr. Manijeh Firoozi, Shima Rouhi, drafted the manuscript.

**Data Availability** The data that support the findings of this research are available from the corresponding author [Shima Rouhi] upon request with permission from the Ethics Committee ethical committee of Shahid Sadoughi University of Medical Sciences, IR.SSU.MEDICINE.REC.1398.383.

## Declarations

**Consent for Publication** Informed consent was taken from all the participants when they were enrolled.

**Human and Animal Rights** No animals were used in this research. All human research procedures were followed by the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

**Statement of Ethics** All procedures carried out in studies involving human participants were following the ethical committee of Shahid Sadoughi University of Medical Sciences, IR.SSU.MEDICINE.REC.1398.383.

**Conflict of Interest** The authors declare that there is no conflict of interest regarding the publication of this article.

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