

# Research progress of pain catastrophizing in patients with lumbar disc herniation



Review

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Received: 17 January 2024; Accepted: 25 March 2024; Published: 20 September 2024

**Abstract:** Pain catastrophization is one of the negative emotional factors and an important psychological factor associated with patients with lumbar disc herniation (LDH). Currently, the concept of pain catastrophization of LDH is relatively mature abroad; however, there are only few research studies on this in China. To understand the *status quo* of pain catastrophization (PC) in patients with LDH and its influencing factors, the intervention measures of PC and their efficacy were further analyzed. In the present paper, the research status of PC at home and abroad is briefly expounded, and the influencing factors and clinical intervention measures for PC are analyzed. This paper reviews the concept of PC, the assessment tools, influencing factors, and the relevant intervention measures. In order to evaluate the pain degree of patients, understand the incidence of pain in patients, and improve the cure rate and quality of life of patients, the basic situation of patients with pain disaster is summarized to provide reference for medical personnel.

**Keywords:** lumbar disc herniation • measure • nursing • pain • pain catastrophizing • pain factor

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## 1. Introduction

Lumbar disc herniation (LDH) is a condition wherein after the lumbar disc degenerates, the annulus ruptures partially or completely, and the nucleus pulposus protrudes outward alone or with the annulus and cartilaginous endplate, which in turn stimulates or compresses the sinus vertebral nerves and nerve roots.<sup>1</sup> It is a clinical syndrome with back and leg pain as the main symptoms. Intervertebral disc degeneration is the root cause of LDH, and other related factors include trauma, excessive load, pregnancy, and prolonged standing. The latest research studies from around the world have shown that the incidence of LDH is about 2%–3% in the population, 4.8% in males, and 2.5% in females

>35-years-old, 2% in the general population, and 1.42% in adolescents.<sup>2–4</sup> According to epidemiological studies from China, LDH mainly occurs in adults as an L4-L5 and L5-S1 condition; 95% of the patients are aged from 20 to 50 years and the incidence of LDH among men and women is (4–6):1.<sup>5</sup> The prevalence of LDH tends to be mainly among the young and the male population, which may be related to the nature of work of the patients. LDH pathology occurs partly due to the disc bearing the weight of the body above the trunk and the upper limbs, with only a small amount of blood supply, relative lack of nutrition, and large spinal motion, leading to a high incidence of LDH. The main characteristics

How to cite this article: Xiong T, Piao LF. Research progress of pain catastrophizing in patients with lumbar disc herniation. *Front Nurs*. 2024;3:253–258.

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include chronic pain in the lumbosacral region, and in severe cases, pain can radiate to the hip, which may be the case where the nerve distribution area will feel abnormal or numb. Studies have shown that pain catastrophization (PC) not only indicates both the compromised physical and mental states of LDH patients.<sup>6</sup> The aggravation of LDH pain may cause psychological symptoms, further resulting in PC. In recent years, PC has become a hot topic in Europe and America. However, the research field is relatively small in China. The research is at a preliminary stage with respect to pain catastrophization in patients with LDH. The purpose of this study is to review the influencing factors and intervention measures for pain catastrophization of LDH, so as to provide theoretical basis for clinical practice.

## 2. The concept of PC

In 1962, Ellis put forward the concept of catastrophization for the first time under the framework of a biopsychosocial perspective.<sup>7</sup> Catastrophization had not entered the clinic at that time. In 1995, Sullivan<sup>8</sup> conducted several studies to explore the relationship between PC, emotion, and pain intensity and pointed out the key elements of PC: reflection, exaggeration, and helplessness. PC was yet to enter clinical trials held abroad at that time. In 2007, Eccleston and Crombez<sup>9</sup> found that PC was a negative emotional problem, and they considered an unsuccessful strategy to solve it. In 2013, Flink et al.<sup>10</sup> believed that PC was a catastrophic worry and a kind of repetitive negative thinking. The concept of PC is being widely used in many clinical and experimental settings and is considered to be one of the most important psychological associations of pain chronic and disability. At present, complete consensus has not been reached with respect to the definition of PC. There is no clear common bases in clinical practice, and a lack of unified background and general theoretical consensus characterizes PC research. However, most researchers mainly agree with Sullivan's research and believe that PC is a negative emotional and psychological state in the face of pain. In LDH patients, PC means that the patient suffers from low back pain and is diagnosed as LDH by clinical testing. The patient suffers from intense pain and negative cognitive emotions, and the patient shows psychological states such as reflection, exaggeration, and helplessness in the face of pain.

## 3. Evaluation tools

The pain catastrophizing scale (PCS), one of the catastrophization evaluation tools, was compiled by Sullivan<sup>8</sup> in 1995. It is currently widely used in European countries and has good reliability and validity. To date,

PCS has been translated into many languages around the world. In 2020, Majumder et al.<sup>11</sup> revised the PCS and used a predictive test in 30 adult patients with chronic nonmalignant musculoskeletal pain to develop a culturally adaptive Bangladeshi pain catastrophizing scale (BePCS). It is shown that the BePCS Cronbach's  $\alpha$  coefficient is 0.92. In 2021, Ibrahim et al.<sup>12</sup> translated the PCS, conducted an experimental study on 200 patients with chronic low back pain, and transculturally modified the PCS into Hausa Language Pain Discatrophe Scale (Hausa-PCS), showing that the Hausa-PCS Cronbach's  $\alpha$  coefficient was 0.84. In 2008, Yap et al.<sup>13</sup> a scholar from Hong Kong, China, conducted a cross-sectional study on 130 patients with chronic nonmalignant pain in China. The study showed that the Cronbach's  $\alpha$  coefficient of the Chinese PCS scale was 0.927 with good reliability and validity. The scale includes three dimensions, such as reflection, exaggeration, and helplessness and has 13 items in total, including 4 items of reflection, 3 items of exaggeration, and 6 items of helplessness.<sup>14</sup> The Likert 5-level scoring method was adopted, with 0–4 points scoring from “never” to “always,” where the total score of the scale was 0–52 points. PC level minimum line score  $\geq 38$  points, the lower the score indicates the lower the PC level. The research shows that the Cronbach's  $\alpha$  coefficient of the total table is 0.945, and the Cronbach's  $\alpha$  coefficient of each dimension is 0.920, 0.716, and 0.901.<sup>15</sup> The results show good reliability and validity, so PCS can be considered as a pain-specific assessment scale to provide reference direction for the treatment of LDH pain patients in the future. However, at present, there is a lack of a specific assessment scale for PC in patients with LDH, which needs to be further explored and developed by readers or researchers.

## 4. Influencing factor

### 4.1. Physiology

Impaired body function is prevalent in LDH patients with PC. LDH is the impairment of the lumbar and dorsal body functions, which can seriously cause sciatica and leg function impairment, thus causing PC feelings in patients. According to the cluster analysis of 163 patients with LDH conducted by Raymaekers et al.<sup>16</sup> the research report showed that patients with intense low back pain had higher pain awareness, catastrophic thoughts and disability, and lower relative quality of life. The most typical clinical manifestation of LDH is chronic pain. There is evidence that PC is strongly correlated with pain severity and general disability of patients.<sup>17</sup> High pain levels were present in PC patients. PC was strongly correlated with impaired body function in

patients with severe LDH. The results thus indicate that PC is positively correlated with physical function, pain intensity, and disability in LDH patients. The stronger the physical function impairment, pain degree, and disability degree were, the higher the level of catastrophization was. However, there are few domestic clinical studies on the physiological function of PC in LDH patients. Follow-up researchers will need to carry out more studies on PC in LDH patients, so as to provide a theoretical basis for clinical intervention measures to be implemented.

## 4.2. Psychology

Studies have shown that pain acceptance is the mediating effect between anxiety, depression, and PC experienced in LDH patients; the higher the pain acceptance of patients, the lower the PC.<sup>18</sup> Darnall et al.<sup>19</sup> conducted 3 rounds of cognitive interviews with 30 adult chronic pain patients, evaluated 14 items, and refined and tested the final daily PCS in 3 validation studies, which studied a total of 519 adults with chronic pain and confirmed that PC was associated with anxiety, depression, and anger. This is consistent with Pei et al.'s<sup>20</sup> research highlighting that anxiety is the most relevant factor for patients' PC. PC is seriously affected by negative emotions; anger, anxiety, and depression may increase the level of PC. On the contrary, catastrophic thoughts will also spur negative emotions. Mental state plays a significant role in the rehabilitation of LDH patients. Prevention and intervention of catastrophizing thoughts in LDH patients can help with the rehabilitation effects of patients. Studies have shown that treatment for fear, anxiety, and depression is important for LDH patients. Also, physical therapy plus psychotherapy can accelerate the rehabilitation process of patients, and positive psychological interventions play a positive role in the rehabilitation of patients.<sup>21</sup> At present, most clinical researchers tend to study the level of PC in chronic pain, while there are few studies on the catastrophized state of LDH patients. Some only study the mediating effect between LDH patients and PC, and few directly clarify the PC field in LDH patients.

## 4.3. Society

Social factors such as living environment, education level, family income, gender, and race affect the level of PC in LDH patients to some extent. Simon et al.<sup>22</sup> compared two studies and found that in different models, individuals who experienced adverse early life conditions were more inclined to high levels of PC. A good living environment is conducive to reducing the pain degree of LDH patients. Adverse living conditions pose patients to have higher sensitivity to pain perception and a higher level of pain-related fear. Living environment has a significant effect on PC in LDH patients. Studies have

shown that the pain belief of LDH patients is affected by education level and family income.<sup>23</sup> Xu et al.<sup>24</sup> found in a longitudinal observation study that pain is not only an important factor affecting PC, but is also associated with factors such as education, marital status, gender, income, and other social conditions. In a cross-sectional study of 187 adults, Fullwood et al.<sup>25</sup> showed that non-Hispanic black (NHB) adults reported worse pain, disability, and loss of functional performance than non-Hispanic whites (NHW) and that PC is more severe. On the basis, Terry et al.<sup>26</sup> further studied 136 community residents with knee osteoarthritis, including 66 NHBs and 70 NHWs. Compared with the NHWs, NHB participants were younger, had lower income, were less likely to be married, and had higher self-reported clinical pain and PC levels. This shows that race also has some effect on PC. However, at present, it is not clear whether race has a significant influence on PC in LDH patients, and this needs to be further studied and discussed by scholars.

## 5. Intervening measure

### 5.1. Cognitive behavior therapy

Cognitive behavioral therapy (CBT) is a widely accepted intervention in clinics. Cognitive behavioral intervention can improve patients' sense of self-efficacy to a certain extent, strengthen patients' compliance behavior in rehabilitation training, and ultimately improve patients' recovery quality. CBT promotes healthy mood and behavior through cognitive restructuring to change the maladjustment experienced to pain experience. Zuo et al.<sup>27</sup> conducted 6-week CBT on 68 patients with LDH. Firstly, communication was strengthened to understand patients' cognitive level and explain the significance of postoperative rehabilitation. From 2 days after surgery to 1 day before discharge, rehabilitation methods were explained, objectives and matters needing attention were recognized, and patients' wrong cognition corrected. A plan was established for muscle relaxation and deep breathing training at 6 weeks after surgery, spanning 20–30 min each time. A WeChat group was established, regular rehabilitation exercise videos and precautions were sent, and timely notifications were performed for patients for review, and so on. Studies have shown that CBT has a certain impact on self-efficacy, rehabilitation training, and recovery quality of LDH patients.<sup>28</sup> CBT can change the catastrophization thoughts of LDH patients and help evaluate and intervene PC patients with LDH. CBT has been accepted by most medical workers in clinical practice and is currently a widely used intervention. CBT also carries out physical and psychological interventions for LDH patients. During rehabilitation, patients understand the function of the instrument and this improves patients' pain acceptance,

so as to reduce the PC level of LDH patients and increase the rehabilitation effects in patients.

## 5.2. Interdisciplinary rehabilitation therapy

Schumann et al.<sup>29</sup> completed a 3-week interdisciplinary pain rehabilitation program for 315 patients with chronic pain. The interdisciplinary rehabilitation program was composed of a team, including doctors, nurses, psychologists, pharmacists, counselors, physical therapists and occupational therapists, who jointly developed an intervention plan for patients for 15 consecutive working days. Eight hours of programming a day, in addition to CBT and other procedures during the program, showed that more than 80% of patients had a notable change in at least one pain-related measure. Interdisciplinary pain rehabilitation therapy combines psychology, physics, occupational therapy, clinical medicine, and nursing therapy on the basis of CBT to provide individualized services for LDH patients. The interdisciplinary rehabilitation treatment team is organized to evaluate the specific conditions of patients, so that the team can develop the corresponding implementation plan, reduce the PC level of patients, and improve the quality of life of patients.

## 5.3. Pain management skills course

It is widely believed that CBT can reduce pain in patients with LDH. Darnall et al.<sup>30</sup> used a randomized clinical trial to collect self-reported data of 263 patients with chronic low back pain before treatment and 1, 2, and 3 months after treatment to compare the pain relief effects of CBT, pain management skills courses and health education, and the difference between pain management skills courses and CBT was 1.39%. The results of the study showed that the pain management skills course was not inferior to CBT in PCS score, and the pain management skills course could effectively reduce the pain of LDH patients and reduce the occurrence of PC. The pain management skills course is taught primarily by

psychology professors and uses slides to train patients in a 2-h session that includes pain neuroscience education, mindfulness principles, identifying painful thoughts and emotions, cognitive remodeling, relaxation response exercises, and a self-soothing action plan. This course enables patients to understand their own pain degree and pain concept, correctly identify pain, and make corresponding plans according to their own conditions, so as to reduce the level of pain and reduce the emergence of catastrophic thoughts in LDH patients.

## 6. Conclusions

At present, PC is a hot research topic in foreign countries and involves professionals from diverse fields who have developed a PCS specifically for children. The idea of PC is in its preliminary stage in China. Currently, there are few studies on PC related to LDH patients, and there is a lack of PCS specifically for LDH in China. The PC is a multifaceted and complex construct, and current research does not extend beyond the practical separation of reflection, magnification, and helplessness. Owing to the complex and diverse factors affecting PC, there are few clinical studies on the level of pain disaster in LDH. The prevalence rate of LDH in China is increasing and tends to occur in younger people, and pain is an obvious and direct manifestation of LDH patients. It is suggested that more number of scholars actively study the disaster level of LDH pain in the future, so as to provide more scientific and applicable treatment programs and preventive measures for patients.

## Ethical approval

Ethical issues have been dealt with in this research work.

## Conflicts of interest

All contributing authors declare no conflicts of interest.

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