

Implementation of the Health Belief Model to Predict Acupuncture Therapy Adherence in Patients with Hernia Nucleus Pulposus

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ABSTRACT

Background: Hernia Nucleus Pulposus is one of the causes of low back pain that can interfere with activity and quality of life. Acupuncture therapy is one of the effective non-pharmacological treatment alternatives in reducing pain due to Hernia Nucleus Pulposus. However, patient adherence to undergoing acupuncture therapy is still a challenge. This study aims to analyze the factors within the framework of the Health Belief Model that affect adherence to acupuncture therapy in patients with Hernia Nucleus Pulposus.

Subjects and Method: This study was a cross-sectional study conducted in Surakarta, from January to March 2025. A total of 200 patients were selected randomly. The dependent variable was adherence to acupuncture therapy in Hernia Nucleus Pulposus. Independent variables were perceived susceptibility, perceived severity, perceived benefits, perception of barriers, self-efficacy, and cues to action. The data were analyzed using Linear Regression.

Results: Adherence to acupuncture therapy patients with hernia nucleus pulposus increased with high perceived susceptibility ($b=0.14$; 95% CI= 0.01 to 0.27; $p= 0.040$), high perceived severity ($b= 0.30$; 95% CI= 0.02 to 0.59; $p=0.038$), high perceived benefits ($b= 0.16$; 95% CI= 0.01 to 0.31; $p=0.042$), high cues to action ($b=0.19$; 95% CI= 0.02 to 0.36; $p= 0.032$), high self-efficacy ($b=0.19$; 95% CI= 0.02 to 0.38; $p= 0.022$). Adherence to acupuncture therapy decreased with high perceived barrier ($b= -0.10$; 95% CI= -0.21 to -0.01; $p= 0.046$).

Conclusion: There was a positive relationship between perceived susceptibility, perceived severity, perceived benefits, cues to action, and self-efficacy on adherence to acupuncture therapy. Perceived barriers decrease adherence to acupuncture therapy in hernia nucleus pulposus.

Keywords: health belief model, adherence, acupuncture therapy, hernia nucleus pulposus

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BACKGROUND

Pain is a universal problem, and every individual is certain to have experienced

pain, even with mild pain intensity (Daneau et al., 2022). One of the pain problems that often occurs in humans is Hernia Nucleus

Pulposus, or commonly referred to as pinched nerves. Hernia Nucleus Pulposus is a condition in which protrusion occurs in the intervertebral disc caused by injury and incorrect mechanical loads over a long period of time (Howay et al., 2022). The main cause of hernia nucleus pulposus is disc degeneration due to the aging process, repetitive mechanical stress, trauma, and congenital or connective tissue abnormalities. The disc undergoes degeneration in three phases: dysfunction, instability, and stabilization. Annulus tear causes the nucleus pulposus to protrude, compress the spinal nerve and cause pain, sensory and motor impairment (Abid et al., 2021).

The prevalence of hernia nucleus pulposus shows a fairly significant number in the adult population. The prevalence of symptomatic hernia nucleus pulposus or lumbar disc herniation (LDH) is estimated to reach about 5% in the population aged 30 years and above (Shiga 2022). In addition, other studies show that as many as 20–40% of adult individuals have disc herniation that is asymptomatic, i.e. does not cause any obvious clinical symptoms (Jin et al., 2025). The annual incidence of hernia nucleus pulposus also varies depending on the case definition, ranging from 0.3 to 2.7 per 1,000 people per year for cases requiring surgery, to 0.1–298 per 1,000 on general clinical reports (Hincapie et al., 2025). This study shows that hernia nucleus pulposus is a fairly common musculoskeletal problem, especially in the productive age group, and requires attention in terms of prevention, early diagnosis, and appropriate management, including conservative therapies such as acupuncture.

Nucleus Pulposus Hernia management can be done with acupuncture therapy. Acupuncture therapy is a way of treatment by inserting needles into specific points in the skin to relieve pain and treat certain

health conditions. In its development, acupuncture therapy is very effective in reducing pain, even able to overcome pain in various diseases with milder side effects than chemical treatment. Acupuncture therapy provides a calming effect through the release of endorphin hormones, resulting in reduced pain levels (Liu et al., 2023).

Therapy adherence is a form of behavior that occurs because of the interaction between health workers and patients, where the patient knows the plan designed by the health worker and the patient knows all the consequences and implements them. Patient adherence to acupuncture therapy in cases of hernia nucleus pulposus is an important factor that determines the effectiveness of long-term treatment. Recent research by Huang et al. (2019) showed that patients with sciatica due to hernia nucleus pulposus who underwent 10 acupuncture sessions over 4 weeks experienced a significant reduction in pain.

The positive effects felt by patients can last up to one year after the therapy ends, which is one of the main factors driving high adherence rates in completing the entire therapy suite. Thus, the level of patient adherence to acupuncture therapy in the case of hernia nucleus pulposus is greatly influenced by the perceived benefits felt directly, the systematic structure of the therapy, and effective communication between the therapist and the patient.

The Health Belief Model is a theory used to understand individual health behaviors, especially in the context of disease prevention and treatment. Health Belief Models are also used to predict why people will take action to prevent, to screen, or to control disease conditions (Putri et al., 2024). Patient adherence in undergoing acupuncture therapy in cases of hernia nucleus pulposus can be explained through the Health Belief Model approach. The

constructs of the health belief model describe that a person's health behavior is greatly influenced by his perception of the disease and the actions to be taken. Patients with hernia nucleus pulposus who feel themselves prone to complications and view their condition as a serious problem tend to have stronger motivation to undergo therapy consistently. In addition, patients' belief that acupuncture is able to provide benefits in reducing pain and improving movement function is an important impetus in improving adherence (Macpherson et al, 2018). A high perceived benefit, accompanied by minimal barriers such as therapy accessibility, discomfort, or doubts about effectiveness, will strengthen the patient's decision to continue to undergo regular therapy sessions (Rachmawati, 2019).

Another factor that plays a role is the presence of cues to action, both from health workers, families, and public information that provides encouragement or reminders to follow therapy. In addition, the patient's self-efficacy or confidence in his ability to complete the series of therapies is also an important key in maintaining compliance. A recent study shows that the health belief model approach effectively explains patients' decisions in choosing and maintaining acupuncture therapy, especially when the perceived benefits outweighs perceived barriers (Ningrum et al., 2025). Therefore, educational interventions and therapeutic communication that reinforce positive perceptions of therapy, as well as minimize barriers, are essential to improve patient adherence to acupuncture as part of the management of hernia nucleus pulposus. This study aims to apply a health belief model to predict adherence to acupuncture therapy among patients with hernia nucleus pulposus.

SUBJECTS AND METHOD

1. Study Design

The design used in this study was observational analysis with a cross-sectional approach. This study was conducted in the city of Surakarta in January – March 2025.

2. Population and Sample

The population in this study was hernia nucleus pulposus patients who underwent acupuncture therapy in the city of Surakarta. Sampling in this study was carried out using probability sampling with simple random sampling of 200 hernia nucleus pulposus patients. The criteria for the study sample are as follows Inclusion criteria are characteristics that must be met by each member of the population that will be used as a study sample.

3. Study Variables

In this study, the dependent variables were adherence to acupuncture therapy in patients with hernia nucleus pulposus. The independent variables were perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action.

4. Operational Definition of Variables

Perceived susceptibility is an individual's belief in the seriousness or negative impact of the condition of hernia nucleus pulposus that is still felt even though undergoing acupuncture therapy

Perceived severity is an individual's subjective view or assessment of the level of seriousness or adverse impact that may be caused by the condition of hernia nucleus pulposus on their health, activity, and quality of life.

Perceived Benefits is a person's belief in seeing the benefits felt in the individual when doing acupuncture therapy.

Perceived Barriers are negative aspects in individuals that prevent them from undergoing acupuncture therapy.

Cues to Action is a factor that stimulates individuals to carry out acupuncture therapy obediently.

Self-efficacy is self-belief in the ability to perform acupuncture therapy.

Acupuncture Therapy Adherence is a patient with a hernia nucleus pulposus undergoing acupuncture therapy regularly for 1 session, namely 12 visits, according to the patient's condition.

5. Study Instruments

The instrument used in this study was a questionnaire. The questionnaire was compiled by the researcher based on existing theories to measure variables, namely perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action, as well as adherence to acupuncture therapy for hernia nucleus pulposus patients. The questionnaire had been tested for validity and reliability.

6. Data analysis

Univariate analysis aims to explain and describe the characteristics of each study variable. Bivariate analysis in this study was conducted using statistical correlation tests, and multivariate analysis was conducted using linear regression.

7. Research Ethics

This study received ethical clearance from DR. Moewardi Hospital, Surakarta, Indonesia, No.2813/XII/HREC/2024, on December 16, 2024.

RESULTS

1. Sample Characteristics

The characteristics of the sample in this study were divided into 4 categories, namely age, gender, last education, and occupation. The characteristics of the sample are presented in Table 1.

Table 1. Categorical data of sample characteristics

Variable	Frequency (n)	Percentage (%)
Age		
≤ 60 years old	120	60
> 60 years old	80	40
Gender		
Male	128	64
Female	72	36
Final Education		
Primary School	10	5
Secondary School	14	7
High School	152	76
University	24	12
Employment Status		
Unemployed	40	29
Private	59	49.5
Self employed	89	44.5
Civil Servants	12	6

Table 1 shows that out of 200 age samples in the dominance was less than or equal to 60 years old, with a total of 120 people (60.0%). Gender was dominated by male with a total of 128 people (64.0%). Most of

the respondents completed their education up to high school, as many as 152 people (76.0%). The respondents' jobs were dominated by self-employed, as many as 89 people (44.5%).

2. Univariate Analysis

Univariate analysis was performed to analyze one variable separately. The goal

was to understand the characteristics and distribution of data from a single variable.

Table 2. Univariate analysis of continuous data

Variable	N	Mean	SD	Min.	Max.
Perceived Susceptibility	200	4.22	1.52	0	6
Perceived Severity	200	5.63	0.68	3	6
Perceived Benefits	200	5.08	1.32	0	6
Perceived Barriers	200	4.24	1.86	0	6
Cues to action	200	5.27	1.15	3	6
Self-Efficacy	200	5.18	1.01	3	6

Table 2 of the continuous data analysis shows the average respondents in this study. The average of respondents' perceived susceptibility was 4.22, with a minimum value of 0 and a maximum value of 6, meaning that most of the respondents in this study had a good perceived susceptibility. The average perceived severity of respondents was 5.63, with a minimum score of 3 and a maximum score of 6, meaning that most of the respondents in this study had a good perceived severity.

The average of respondents' perceived benefits was 5.08 with a minimum value of 0 and a maximum value of 6, meaning that most of the respondents in this study had good perceived benefits. The average of respondents' cues to action was 5.27, with a

minimum score of 3 and a maximum score of 6, meaning that most of the respondents in this study had good cues to action.

The average of respondents' self-efficacy was 5.18, with a minimum score of 3 and a maximum value of 6, meaning that most of the respondents in this study had good self-efficacy. The average of score of perceived barriers was 4.24 with a minimum value of 0 and a maximum value of 6, meaning that most of the respondents in this study had poor perceived barriers.

3. Bivariate Analysis

Bivariate analysis was performed to explain the influence of one dependent and one independent variable. This analysis was conducted using the correlation coefficient test presented in Table 3

Table 3. Bivariate analysis of variables with correlation coefficients affecting therapeutic adherence

Variable	r	95% CI		P
		Lower limit	Upper limit	
Perceived susceptibility	0.22	0.09	0.36	0.001
Perceived severity	0.43	0.13	0.73	0.005
Perceived benefits	0.31	0.14	0.45	<0.001
Perceived barriers	-0.11	-0.22	-0.00	0.045
Cues to action	0.30	0.12	0.48	0.001
Self-efficacy	0.31	0.13	0.50	0.001

Table 3 shows the analysis of the correlation coefficient of the health belief model constructs that affect the adherence of acupuncture therapy of patients with hernia nucleus pulposus.

Perceived susceptibility and adherence to acupuncture therapy had a positive bivariate relationship (r= 0.22; 95% CI= 0.09 to 0.36; p= 0.001). These results suggest that the perceived susceptibility

had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The higher the perceived susceptibility value to hernia nucleus pulposus, the higher the patient's level of adherence to undergoing acupuncture therapy.

Perceived severity and adherence to acupuncture therapy had a positive bivariate relationship ($r= 0.43$; 95% CI= 0.13 to 0.73; $p = 0.005$). These results suggest that the perceived severity had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The higher the perceived severity value of a nucleus pulposus hernia, the higher the patient's level of adherence to undergoing acupuncture therapy.

Perceived benefits and adherence to acupuncture therapy had a positive bivariate relationship ($r= 0.31$; 95% CI= 0.14 to 0.45; $p < 0.001$). These results show that the perceived benefits had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The higher the value of the perceived benefits of acupuncture therapy, the higher the level of patient adherence to undergoing it

Cues to action and adherence to acupuncture therapy had a positive bivariate relationship ($r= 0.30$; 95% CI= 0.12 to 0.48; $p = 0.001$). These results suggest that cues to action had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The higher the value of the cue to act, the higher the patient's level of adherence to undergoing acupuncture therapy.

Self-efficacy and adherence to acupuncture therapy showed a positive bivariate relationship ($r= 0.31$; CI 95% = 0.13 to 0.50; $p = 0.001$). These results show that self-efficacy had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The higher the self-

efficacy value, the higher the patient's level of adherence to undergoing acupuncture therapy.

Perceived barriers and adherence to acupuncture therapy showed a negative bivariate relationship ($r=-0.11$; CI 95%= -0.22 to -0.00; $p = 0.045$). These results show that the perceived barriers had an effect on adherence to acupuncture therapy; this relationship was statistically significant. The low perceived barriers to acupuncture therapy had a positive influence on increasing patient adherence to acupuncture therapy.

4. Multivariate analysis

Multivariate analysis was performed to analyze the relationship between more than two variables. This analysis was carried out using the linear regression test presented in Table 4.

Table 4 shows a linear regression analysis of the health belief model (HBM) constructs to determine the adherence of acupuncture therapy in patients with hernia nucleus pulposus.

Acupuncture therapy adherence and perceived susceptibility showed a positive relationship, and the relationship was statistically significant. Each one unit increase in perceived susceptibility would be followed by an increase in acupuncture therapy adherence score by 0.14 units ($b=0.14$; CI 95% = 0.01 to 0.27; $p=0.040$).

Adherence to acupuncture therapy and perceived severity showed a positive relationship, and the relationship was statistically significant. Each one unit increase of perceived severity would be followed by an increase in acupuncture therapy adherence score by 0.30 units ($b=0.30$; CI 95% = 0.02 to 0.59; $p=0.038$).

Acupuncture therapy adherence and perceived benefits showed a positive relationship, and the relationship was statistically significant. Each one unit increase of

perceived benefits would be followed by an increase in acupuncture therapy adherence score by 0.16 units (b=0.16; CI 95% = 0.01 to 0.31; p=0.042).

Adherence to acupuncture therapy and cues to action indicated a positive relationship, and the relationship was statistically significant. Each one unit increase of cue to action would be followed by an increase in acupuncture therapy adherence score by 0.19 units (b=0.19; CI 95% = 0.02 to 0.36; p=0.032).

Adherence to acupuncture therapy and self-efficacy showed a positive relation-

ship, and the relationship was statistically significant. Each increase of one unit of self-efficacy would be followed by an increase in acupuncture therapy adherence score by 0.19 units (b=0.19; CI 95% = 0.02 to 0.38; p=0.022).

Adherence to acupuncture therapy and perceived barriers showed a negative relationship, and the relationship was statistically significant. Each increase of one unit of perceived barriers would be followed by a decrease in acupuncture therapy adherence score by -0.10 units (b=-0.10; CI 95% = -0.21 to -0.01; p=0.046).

Table 4. Multiple linear regression analysis of the application of the Health Belief Model to determine the determinants of adherence to acupuncture therapy in patients with Hernia Nucleus Pulposus

Variable	b	95% CI		p
		Lower limit	Upper limit	
Perceived Susceptibility	0.14	0.01	0.27	0.040
Perceived Severity	0.30	0.02	0.59	0.038
Perceived Benefits	0.16	0.01	0.31	0.042
Perceived Barriers	-0.10	-0.21	-0.01	0.046
Cues to Action	0.19	0.02	0.36	0.032
Self-Efficacy	0.19	0.02	0.38	0.022
n observations = 200				
Adjusted R2 = 56.3%				
p = 0.003				

DISCUSSION

1. Perceived susceptibility to determine adherence to acupuncture therapy

The results of the study showed that there was a positive relationship between the perceived susceptibility and adherence to acupuncture therapy, and that the relationship was statistically significant. Many people lack information or misunderstand about a disease, including in terms of prevention and treatment. If information about health behaviors is obtained correctly from the beginning, then everyone will be

better prepared to conduct prevention or treatment.

According to Bishop *et al.*, (2017) patients with lower adherence consider their illness to be more severe and experience a stronger emotional response, while those with higher adherence show a greater sense of personal control and have a better understanding of their condition. A study conducted by Timmerman *et al.* (2019) shows that patients with back pain who feel they need treatment are more adherent. This emphasizes the importance of balanced education so that the perceived susceptibility encourages compliance

without causing excessive fear (Timmerman et al., 2019).

2. Perceived severity to determine adherence to acupuncture therapy

The results of the study showed that there was a positive relationship between adherence to acupuncture therapy and perceived severity, and that the relationship was statistically significant. Perceived severity is an individual's accumulated belief in a health threat, which means that individuals are more likely to have a healthier lifestyle if their perceived risk of contracting the disease is very high and they believe that the disease they suffer can greatly affect their life (Colloca 2019).

A study conducted by Colloca (2019) explains that patients who experience acute and chronic pain, such as low back pain, neuropathic nerve pain, or joint pain due to osteoarthritis, often have their own view of how severe their condition is. A patient's view of the severity of the disease and their expectations of the outcome of therapy greatly influence whether or not they will comply. If patients feel that their pain is serious and believe that therapy can help, they are usually more enthusiastic about undergoing treatment, and the results can be better. On the other hand, if they feel that their illness is not too serious or are unsure about the benefits of treatment, then they tend to be undisciplined, and the results can be less than optimal. A low perceived severity can decrease adherence due to a lack of motivation to undergo treatment (Svingen et al., 2023).

A study conducted by Sharafkhani *et al.* (2016) argues that perceived severity has been shown to play an important role in improving adherence to lower back pain prevention behaviors. When individuals are seriously aware of the negative impact that a disease can have, in this case, chronic low back pain, such as decreased productivity,

long-term physical impairment, and disability risk, they will be more motivated to adhere to preventive measures or therapies.

3. Perceived Benefits to Determine Adherence to Acupuncture Therapy

The results of the study showed that there was a positive relationship between adherence to acupuncture therapy and perceived benefits, and the relationship was statistically significant. Perceived benefits are a person's opinion about the value or benefits of a new behavior and reducing the risk of developing a disease. Individuals will tend to engage in healthy living behaviors when they believe that the behavior they are doing can reduce their chances of developing another disease or reduce the rate of disease they are experiencing (Bishop et al., 2017).

Health workers play an important role in understanding the management and handling of treatment issues in the elderly, so as to reduce medication errors and improve medication adherence. The perceived benefits of conservative therapy have a significant influence on the adherence of hernia nucleus pulposus patients in undergoing treatment. A study conducted by Peterson et al (2021) shows that patients who choose conservative therapy consider this approach more beneficial because it is low risk and supports long-term self-management.

The perceived benefits is based on the patient's real experience, such as feeling a pain reduction after undergoing regular therapy exercises, as well as the understanding that conservative therapy allows for greater control of symptoms without the need for invasive procedures. Patients are also more motivated to comply when they see clear results and understand how therapy contributes to their quality of life.

Thus, the higher the patient's perceived benefits of conservative therapy, the more likely they are to adhere to it (Peterson et al., 2021).

4. Perceived barriers to determine adherence to acupuncture therapy

The results of the study showed that there was a negative relationship between acupuncture therapy adherence and perceived barriers, and the relationship was statistically significant. Perceived barriers have been shown to have a significant influence on patient adherence to conservative therapy in cases of low back pain or hernia nucleus pulposus.

A study conducted by Bishop et al, (2017) states that the perceived barriers to low back pain symptoms are significantly related to non-adherence to acupuncture therapy. When the patient understands that there will be many symptoms caused by lower back pain, then it is likely to undergo therapy without any obstacles. It is recommended that healthcare providers remember that a patient needs to be educated on how to manage the disease and also constantly reminded of the improvement of their quality of life (Wong et al, 2017).

A study conducted by Chikaka & Keller (2024) states that the perceived barriers is an important factor that affects the adherence of low back pain patients to therapy. Obstacles such as pain during therapy, feelings of fear, time constraints, and lack of socialization about therapy are the main causes of low compliance. The study stated that the higher the perceived barriers that patients felt, the lower the level of adherence to therapy. Therefore, identifying and reducing these barriers is essential to improve the success of therapy.

5. Cues to action to determine the adherence to acupuncture therapy

The results of the study showed that there was a positive relationship between adherence to acupuncture therapy and cues to action, and the relationship was statistically significant. A study by Sharafkhani et al. (2014) shows that cues to action have a significant relationship with adherence to low back pain prevention behaviors. Cues to action are the most powerful predictors of influencing preventive behavior compared to perceived severity or benefits. This emphasizes the importance of proper cues and social support to encourage patient adherence in undergoing therapy or prevention of low back pain.

A study conducted by Alayat et al, (2019) states that early detection of patient compliance levels and the application of motivational strategies such as personal education and monitoring from the health sector can increase the adherence of low back pain patients in undergoing therapy. When patients are aware of the benefits of the therapy being carried out, compliance will be easier to achieve. Therefore, patients need to be encouraged to actively follow all agreed therapy schedules. Repeated or regular sessions in carrying out therapy with a physiotherapist significantly improve adherence in patients with low back pain (Nicolson et al. 2017).

6. Self-efficacy to determine the adherence of acupuncture therapy

The results of the study showed that the relationship between adherence to acupuncture therapy and self-efficacy was positive, and that the relationship was statistically significant. High self-efficacy or belief in their own ability or effort in achieving health that individuals possess will make them more adherent to preventive behaviors to carry out prevention (Shinohara *et al.*, 2022).

This is in accordance with the opinion, to achieve healing, individuals must have high self-efficacy. Because by having high efficacy, individuals will have a positive incentive that the treatment and prevention of the disease they are currently experiencing will reach the point of success in recovery. An individual's confidence to recover can be achieved, one of which is from the cognitive or knowledge provided and obtained through health workers, families, and informants both from social media and print media (Ningrum) et al., 2025).

A study conducted by Shokrgoza et al. (2024) found that self-efficacy has a significant positive relationship with patient adherence to a therapy plan, particularly in patients with chronic pain. Patients who have a high level of self-efficacy tend to be more confident in managing their pain conditions and more consistently follow the recommendations of medical personnel. Strong self-efficacy is related to increased motivation, perseverance, and the ability to overcome challenges in the treatment process. Thus, improving self-efficacy can be an effective strategy to encourage long-term adherence to therapy, including in cases of hernia nucleus pulposus.

AUTHOR CONTRIBUTION

Afifah Kusumaning Tyas was the main researcher in this study who determined the topic, conducted the study, and data collection. Bhisma Murti, Ika Sumiyarsi Sukanto, Setyo Sri Rahardjo, and Revi Gama Hatta Novika assisted the principal investigators in analyzing and reviewing documents

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CONFLICT OF INTEREST

There was no conflict of interest in this study.

DISCUSSION

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