

# Development of An Information System Model for Improving Muscle Strength in Patients with Lumbar Disc Herniation

By

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## Abstract

This study is to develop a model of information system for improving muscle strength in patients with lumbar disc herniation. The subjects were surveyed and interviewed 86 people who visited orthopedics in the metropolitan area from July 15 to September 24, 2021. The analysis of the information characteristics of the study subjects was used as Chi-square test. Before and after the application of the information system to alleviate herniated disk herniation. it was analyzed by a t-test. The results of this study are as follow. Firstly. in the case of sitting properly, 27.9% of the patient group showed a significantly lower distribution than 62.8% of the control group( $X^2=1.47$ ,  $p=.000$ ). Secondly, daily stretching was significantly higher at the average of 47.26 points after application of the information system than 16.27 points before application( $t=-1.64$ ,  $p<.01$ ). Thirdly, back pain tended to decrease gradually from the 11th day of application compared to before the information system. Based on the derived research results, it was confirmed that the application of the information system is effective in preventing and treating lumbar disc. The application of health information is expected to contribute not only to lumbar disc but also to other joint treatments.

**Keywords** : Lumbar disc, Herniation, Muscle strength, Information system, Patients

## 1.Introduction

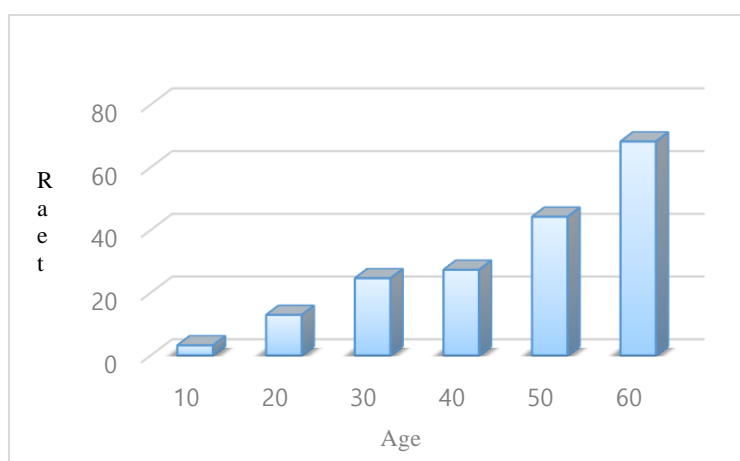
The subjects were surveyed and interviewed 86 people who visited orthopedics in the metropolitan area from July 15 to September 24, 2021. The survey informed the subjects that it was not used for anything other than the purpose of this study. The investigation was carried out after being agreed to participate in the study (Benlidayi et al., 2016; Van Der Windt et al., 2010).

Many people are suffering from various kinds of pain because of lifestyle and aging society. In particular, they often suffer from spinal diseases. The intervertebral disc is highly elastic and relieves physical shocks from the outside. If this disc bounces out due to external shock or wrong posture, it causes inflammation. This is a lumbar disc that presses the nerves and causes pain such as back pain and radiation pain. In other words, damage to the intervertebral disc herniation route add mechanical pressure to the inflamed neuromuscular muscle. It is a disease that causes cervical, thoracic or lumbar pain and neuromuscular irritation symptoms. There is a high possibility of recurrence if you simply treat the pain. It is recommended to treat the cause of herniated disc as well as the pain (Pick et al., 2021; Rosewell et al., 2021).

Patients with lumbar disc herniation have pain in their legs along with back pain and numb radiotherapy. The herniated intervertebral disc stimulates the nerve root, causing sensory abnormalities in the legs where the nerve root is distributed. When the fifth lumbar nerve root is stimulated, it complains of sensory abnormalities in the inner foot. It usually

complains of decreased sensation or numbness, but it also appears to be pain-sensitive. Muscle strength is also weakened, and the ankle extensor muscle is weakened, and it becomes difficult to walk on the heel at this time. In rare cases, bowel or sexual dysfunction and paralysis of the lower extremities may occur. According to previous studies, there are about 2.06 million patients with lumbar disc in Korea. Figure 1 shows age-specific artificial disk surgery (Bydon et al., 2019; Mo et al., 2018).

In previous studies on intervertebral disc herniation were conducted. For the treatment of patients with lumbar disc herniation, training to strengthen their muscles is required. In order to treat herniated disc, the habit of strengthening her muscles in everyday life is important. For this purpose, mediation of medical information management is necessary to treat intervertebral disc herniation. Therefore, the study is to develop a model of information system for improving muscle strength in patients with lumbar disc herniation.



**Fig. 1** Age-specific artificial disk surgery

## 2. Material and Methods

### 2.1. Effective Strategies for the Treatment of Lumbar Disc Herniation

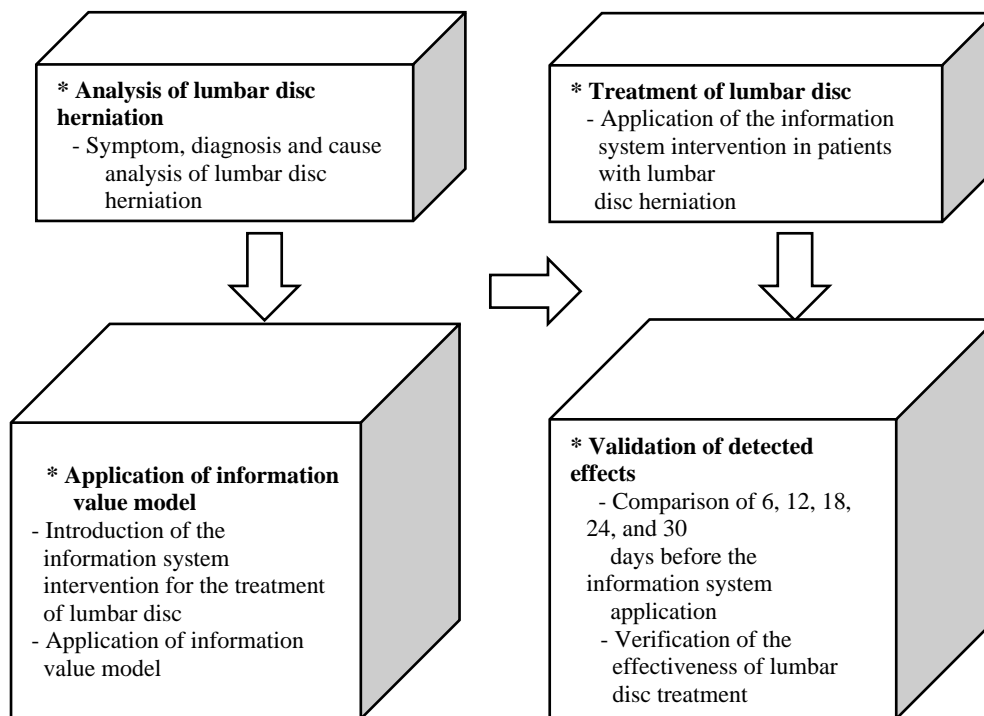
Figure 2 shows an efficient strategy for the treatment of lumbar disc herniation. 1) Symptom, diagnosis and cause analysis of lumbar disc herniation 2) Analysis for the prevention and treatment of lumbar disc herniation 3) Introduction of information intervention for the treatment of lumbar disc herniation 4) Application of information intervention in patients with lumbar disc 5) Comparative analysis of lumbar disc herniation before and after experiment 6) Comparison before the application of information system and after 6, 12, 18, 24, and 30 days 7) Verification of the effectiveness of lumbar disc treatment

### 2.2. Materials and research ethics

The subjects were surveyed and interviewed 86 people who visited orthopedics in the metropolitan area from July 15 to September 24, 2021. The survey informed the subjects that it was not used for anything other than the purpose of this study. The investigation was carried out after being agreed to participate in the study.

### 2.3. Methods

The analysis of the information characteristics of the study subjects was used as Chi-square test. Before and after the application of the information system to alleviate herniated disk herniation. it was analyzed by a t-test. Changes in the lumbar disc before and after the application of medical information over time were analyzed by a t-test.



**Fig. 2** Effective strategies for the treatment of lumbar disc herniation

### 3. Results

#### 3.1. The information characteristics of study subjects

Table 1 presents the information characteristics of the study subjects. In the case of frequent stretching, 32.6% of the patient group was significantly lower than 58.1 of the control group ( $X^2=3.75$ ,  $p=.004$ ). In the case of sitting properly, 27.9% of the patient group showed a significantly lower distribution than 62.8% of the control group ( $X^2=1.47$ ,  $p=.000$ ).

**Table 1** The information characteristics of the subjects

Variables	Experimentalgroup	Control.group	X <sup>2</sup>	p
	N(%)	N(%)		
Stretching				
Often	14(32.6)	25(58.1)	3.75	.004
Hardly	29(67.4)	18(41.9)		
Age				
≤50	5(11.6)	7(16.3)	10.18	.215
51-59	9(20.9)	11(25.6)		
60-69	13(30.2)	15(34.9)		
≥70	16(37.2)	10(23.3)		
Sitting position				
Proper posture	12(27.9)	27(62.8)	1.47	.000
Improper posture	31(72.1)	16(37.2)		
BMI				
Underweight	8(18.6)	13(30.2)	5.63	.327
Normal	11(25.6)	9(20.9)		
Overweight	24(55.8)	21(48.8)		
Total	43(100.0)	43(100.0)		

**3.2 Application of information system to mitigate lumbar discs**

Table 2 shows the changes before and after applying the information system for muscle relaxation in lumbar disc patients. Daily stretching was significantly higher at the average of 47.26 points after application of the information system than 16.27 points before application ( $t=-1.64, p<.01$ ). The Square exercise showed a significantly higher distribution after application than before the information system was applied ( $t=-1.92, p<.05$ ).

**Table 2.** Application of information system to mitigate lumbar disc

Variables	Before	After	t
	Mean±S.D.	Mean±S.D.	
Jogging	12.81±1.47	43.19±1.68	-3.82**
Stretching	16.27±3.53	47.26±3.83	-1.64**
Sitting position	23.84±0.62	49.75±0.77	-5.09*
Weight management	35.16±5.27	24.39±4.28	2.16*
Leg pain	37.51±2.14	30.72±1.63	2.6 4.83
Acupressure	24.72±0.91	48.15±0.91	-3.11*
Balanced magic cushion	10.59±4.73	32.69±3.27	-5.94**
Low back pain	43.24±1.69	36.82±0.52	2.75
Abdominal fat	41.07±3.84	34.65±2.96	4.25
Square exercise	23.69±0.51	47.27±1.38	-1.92*

\* $p<.05$  \*\*  $p<.01$

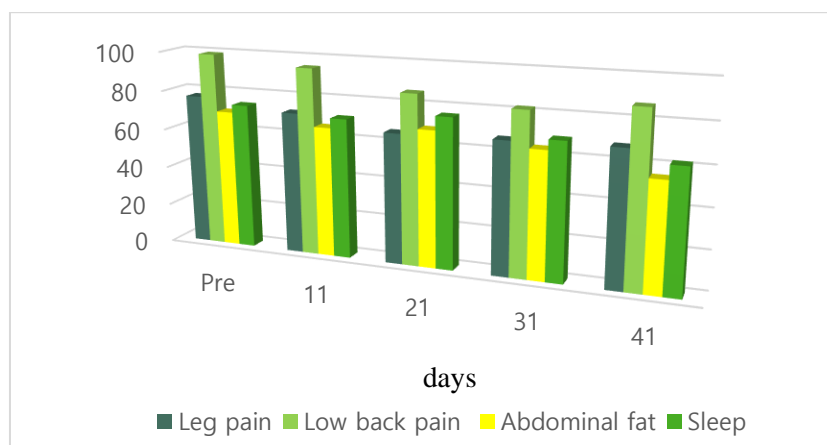
$$t - value = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s^2_1}{n_1} + \frac{s^2_2}{n_2}}}$$

\*t-test is a parametric statistical technique that verifies that the average value of the two groups is derived from the same population

$$t = \frac{\text{the difference between the two groups}}{\text{the amount of group change}} = \frac{\bar{X}_1 - \bar{X}_2}{s(\bar{X}_1 - \bar{X}_2)}$$

**3.3 Changes in lumbar disc symptoms before and after the information system over time**

Figure 3 shows the change of lumbar disc symptoms before and after the information system over time. Back pain tended to decrease gradually from the 11th day of application compared to before the information system. Abdominal fat tended to gradually decrease from the 21 day of application compared to before the information system.



**Fig. 3** Changes in lumbar disc symptoms before and after information system over time

## 4. Discussion and Conclusion

This study is to develop a model of information system for improving muscle strength in patients with lumbar disc herniation. As a result of this study, leg pain decreased significantly after application compared to before the information was applied. This showed similar results in previous studies (De Carvalho et al., 2010; Jeddi et al., 2020). Lumbar disc causes pain in the legs due to poor blood circulation, resulting in the legs. It is important to loosen up with stretching that can improve blood circulation for leg pain. Daily stretching increased significantly after application than before the information system was applied.

As a result of this study, back pain also decreased significantly after the information system than before the information system was applied. Previous studies have shown similar results to stretching in joints (Korovessis et al., 2002; Lopes et al., 2020). Jogging strengthens the muscles around the waist, so it is effective in relieving the lumbar disc. It is good to walk steadily for more than 30 minutes at a high speed. Based on the derived research results, it was confirmed that the application of the information system is effective in preventing and treating lumbar disc. The application of the information system is expected to contribute not only to lumbar disc but also to other joint treatments.

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