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The Relationship Between Rehabilitation Exercise Compliance And Mobility Recovery In Post-Orthopedic Surgery Patients

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Abstract

Background : Orthopedic surgery May cause mobility limitations due to muscle pain weakness , restricted range of motion , and tissue healing . Rehabilitation exercises are an important component of recovery , but their effectiveness is strongly influenced by patient adherence to the prescribed exercise program. Objective : To analyze the relationship between adherence to rehabilitation exercises and improvement in mobility scores among patients after orthopedic surgery. Methods : This study used a quasi-experimental one-group pretest-posttest design . The sample consisted of 60 postoperative orthopedic patients selected using consecutive sampling. Participants received a structured rehabilitation exercise program for 14 days . Exercise adherence was assessed based on the percentage of prescribed exercises completed , while mobility was assessed using mobility scores before and after the rehabilitation program. Pearson correlation and paired t- test were used for data analysis with a significance level of α=0.05. Results : The mean mobility score increased from 48.37 ± 9.14 before the rehabilitation program to 70.82 ± 8.76 after the program. The mean improvement was 22.45 points . Thirty-eight patients (63.3%) had high Adherence , 16 patients (26.7%) had moderate adherence , and 6 patients (10.0%) had low adherence . A significant positive correlation was found between rehabilitation exercise adherence and improvement in mobility scores (r=0.612; p<0.001). Conclusion : Higher adherence to rehabilitation exercises was associated with greater improvement in mobility scores among postoperative orthopedic patients . Structured rehabilitation exercises and adherence monitoring should be incorporated into postoperative orthopedic care.

Keywords : Adherence , Rehabilitation , Mobility , Orthopedic Surgery , Postoperative Patients .

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1. Introduction

Orthopedic surgery is a medical procedure performed to correct disorders of the musculoskeletal system caused by trauma, degenerative diseases, bone and joint abnormalities, or other conditions. Although surgery aims to improve body function, patients generally experience limitations in activity and mobility during recovery.

Post-surgery mobility limitations can be caused by pain, edema, muscle weakness, limited joint range of motion, the use of assistive devices, and patient anxiety about movement in the surgical area. If these conditions are not properly managed, patients can experience decreased muscle strength, joint stiffness, decreased ability to perform daily activities, and dependence on others.

Rehabilitation is a crucial component of recovery for patients after orthopedic surgery. Rehabilitation programs can include range-of-motion exercises, muscle strengthening exercises, position changes, sitting and standing exercises, walking exercises, and functional exercises, depending on the patient's condition and type of surgery.

The success of rehabilitation is influenced not only by the type of exercise provided, but also by the patient's consistency in following the program. Patients who participate in regular exercise have a greater chance of maintaining muscle function and improving mobility.

Compliance with rehabilitation exercises refers to a patient's behavior in following the frequency, duration, intensity, and type of exercise as prescribed by a healthcare professional. Poor compliance can result in a rehabilitation program not achieving optimal results.

Mobility recovery is a key indicator of successful rehabilitation for patients following orthopedic surgery. Improved mobility can be seen in the patient's ability to change positions, sit, stand, walk, and perform daily activities with decreasing levels of assistance.

Objective mobility measurements are necessary to determine the progress of a patient's condition. Measurements taken before and after a rehabilitation program can provide insight into changes in mobility abilities during recovery.

In healthcare practice, patients are still found to be inconsistent in their exercise routines due to pain, fear of movement, lack of understanding of the benefits of exercise, fatigue, or lack of family support. This situation highlights the importance of education and monitoring compliance during the rehabilitation process.

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Based on this description, research is needed to determine the relationship between rehabilitation exercise adherence and mobility recovery in patients after orthopedic surgery. This study focuses on changes in mobility scores before and after the rehabilitation program and the relationship between patient compliance and improved mobility scores.

2. Research Methods

This study used a quantitative research approach with a quasi-experimental one-group pretest-posttest design. All respondents had their mobility scores measured before receiving the rehabilitation exercise program (pretest), followed by a structured rehabilitation intervention, and then their mobility scores were measured again after the intervention (posttest). The research design was $O_1 \rightarrow X \rightarrow O_2$, where O_1 represents the measurement of mobility before rehabilitation exercises, X represents the rehabilitation exercise program, and O_2 represents the measurement of mobility after the intervention. In addition to evaluating changes in mobility scores, the study also analyzed the relationship between patients' adherence to rehabilitation exercises and the magnitude of improvement in mobility scores.

The study was conducted in the inpatient ward and Medical Rehabilitation Unit of the selected hospital from March to May 2026, including preparation, respondent selection, baseline assessment, rehabilitation implementation, post-intervention assessment, data processing, and analysis. The target population consisted of all post-orthopedic surgery patients undergoing treatment and rehabilitation at the hospital, while the accessible population included patients who met the predetermined inclusion and exclusion criteria during the data collection period. A total of 60 patients were selected using consecutive sampling, in which eligible patients were recruited sequentially until the required sample size was reached.

The inclusion criteria were patients aged ≥18 years who had undergone orthopedic surgery, were clinically stable and permitted by a physician or authorized healthcare professional to participate in rehabilitation exercises, were able to communicate and follow exercise instructions, were willing to participate throughout the rehabilitation program, and signed informed consent. Patients were excluded if they experienced postoperative complications requiring discontinuation of exercise, underwent reoperation, had an acute medical condition requiring bed rest, were unable to complete the rehabilitation program, or withdrew from the study. The independent variable was adherence to rehabilitation exercises, while the dependent variable was mobility recovery after orthopedic surgery, measured by the increase in mobility scores between pretest and posttest.

Exercise adherence was assessed using an exercise monitoring sheet and categorized as high (≥80%), moderate (60–79%), or low (<60%) based on the proportion of prescribed exercises completed. Mobility was assessed using a functional mobility scale covering

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activities such as changing position in bed, sitting, standing, transferring from bed to chair, walking with or without assistive devices, and performing functional activities according to the patient's condition. Mobility scores were converted to a range of 0–100, with higher scores indicating better mobility, and improvement was calculated as Δ Mobility = Posttest Score − Pretest Score.

The rehabilitation program was implemented for 14 days and adjusted according to the type of surgery, clinical condition, and functional ability of each patient. The program included range-of-motion exercises, muscle-strengthening exercises, position-change exercises, standing exercises, transfer training, and gradual walking exercises using assistive devices when necessary. Exercise intensity was adjusted according to the patient's condition and tolerance and was discontinued if complaints or clinical signs requiring further medical evaluation occurred.

The research procedures included administrative preparation, instrument development, rehabilitation program preparation, coordination with physicians, nurses, and physiotherapists, pretest assessment, implementation of the 14-day rehabilitation program, adherence monitoring, and posttest assessment. The increase in mobility was determined by subtracting the pretest score from the posttest score. The mobility assessment instrument and exercise adherence monitoring sheet were subjected to content validity assessment by experts in medical rehabilitation and orthopedic nursing, while reliability testing was conducted to ensure measurement consistency.

Data were analyzed using univariate and bivariate analyses. Univariate analysis was used to describe respondent characteristics, exercise adherence, and mobility scores before and after rehabilitation using frequencies, percentages, mean, standard deviation, median, minimum, and maximum values. Normality was assessed using the Shapiro–Wilk test. If the data were normally distributed ($p > 0.05$), changes in mobility scores were analyzed using a paired t-test; otherwise, the Wilcoxon Signed-Rank Test was used. The relationship between exercise adherence and improvement in mobility scores was analyzed using Pearson correlation when parametric assumptions were met and Spearman rank correlation when they were not met. Statistical significance was set at $\alpha = 0.05$, with $p < 0.05$ indicating a statistically significant relationship.

3. Research Results And Discussion

a. Research result

1) Respondent Characteristics

This study involved 60 post-orthopedic surgery patients. Respondent characteristics included age, gender, type of surgery, and use of mobility aids.

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Table 1. Respondent Characteristics Based on Age

Age group	Frequency (n)	Percentage (%)
18–35 years	14	23.3
36–50 years	20	33.3
51–65 years	18	30.0
>65 years	8	13.4
Total	60	100

Based on Table 1, the majority of respondents were aged 36–50 years, namely 20 people (33.3%), while the smallest number were in the age group >65 years, namely 8 people (13.4%).

Table 2. Respondent Characteristics Based on Gender

Gender	Frequency (n)	Percentage (%)
Man	34	56.7
Woman	26	43.3
Total	60	100

Most of the respondents were male, namely 34 people (56.7%).

Table 3. Characteristics Based on Operation Type

Type of operation	Frequency (n)	Percentage (%)
Lower extremity fracture	25	41.7
Upper extremity fracture	12	20.0
Total knee / hip replacement	15	25.0
Other orthopedic operations	8	13.3
Total	60	100

The most common type of surgery was lower extremity fracture surgery, namely 25 patients (41.7%).

Table 4. Distribution of Rehabilitation Exercise Compliance

Compliance level	Frequency (n)	Percentage (%)
High (≥80%)	38	63.3
Moderate (60–79%)	16	26.7
Low (<60%)	6	10.0
Total	**60**	**100**

The majority of respondents had a high level of compliance, namely 38 patients (63.3%). Respondents with moderate compliance numbered 16 patients (26.7%), while respondents with low compliance numbered 6 patients (10.0%).

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These results show that most patients were able to follow the rehabilitation exercise program according to the predetermined schedule.

Table 5. Pretest and Posttest Mobility Scores

Measurement	Mean	Elementary School	Minimum	Maximum
Pretest	48.37	9.14	30	66
Posttest	70.82	8.76	48	88
Improvement	22.45	7.31	8	39

Based on Table 5, the average mobility score before the rehabilitation program was 48.37 with a standard deviation of 9.14. After participating in the rehabilitation program for 14 days, the average score increased to 70.82 with a standard deviation of 8.76. The average increase in mobility scores was 22.45 points . This improvement indicates an improvement in the patient's mobility abilities after participating in the rehabilitation program.

Table 6. Normality Test of Mobility Score Increase Data

Variables	Shapiro-Wilk	p- value
Increased mobility score	0.976	0.287

the Shapiro-Wilk test showed a p-value of 0.287 (>0.05), so the data on the increase in mobility scores were normally distributed .

Analysis of differences in mobility scores before and after intervention can be done using a paired t- test .

Table 7. Differences in Mobility Scores Before and After Rehabilitation

Variables	Mean Pretest	Mean Posttest	Mean Difference	t	p- value
Mobility score	48.37	70.82	22.45	23.81	<0.001

The paired t- test results showed a p-value <0.001. Thus, there was a significant difference between mobility scores before and after the rehabilitation exercise program. The average mobility score increased by 22.45 points after the intervention.

Table 8. Relationship between Exercise Compliance and Increased Mobility Score

Compliance level	n	Mean increase in score	Elementary School
Low	6	12.17	4.31
Currently	16	19.31	5.42
Tall	38	25.13	6.48

There is a tendency that the higher the patient's level of compliance with rehabilitation exercises, the greater the increase in mobility scores.

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Patients with low adherence had an average increase in mobility scores of 12.17 points, while those with moderate adherence experienced an increase of 19.31 points. Patients with high adherence experienced an average increase of 25.13 points.

Table 9. Correlation of Exercise Compliance with Increased Mobility Score

Variables	r	p- value	Interpretation
Exercise compliance – increased mobility	0.612	<0.001	Strong positive relationship

The results of the Pearson correlation analysis showed a value of r=0.612 with p<0.001. These results indicate a positive and meaningful relationship between compliance with rehabilitation exercises and increased mobility scores.

The positive correlation value shows that the higher the patient's compliance in carrying out rehabilitation exercises, the greater the increase in mobility scores obtained.

b. Discussion

1) Rehabilitation Exercise Compliance

The study results showed that the majority of patients had high compliance with rehabilitation exercises. Thirty-eight patients (63.3%) were categorized as highly compliant. Compliance is a crucial component of a successful rehabilitation program. Consistent exercise provides patients with repeated training stimuli, allowing for gradual physical adaptation.

Patient compliance can be influenced by various factors, including understanding the benefits of exercise, pain levels, motivation, family support, communication with health workers, and comfort during exercise. Patients who understand the goals of exercise are more likely to adhere to rehabilitation programs. Clear education can help alleviate patient concerns about post-surgery activities.

2) Changes in Mobility Scores Before and After Rehabilitation

The average mobility score increased from 48.37 to 70.82 after the rehabilitation program. This average increase of 22.45 points indicates an improvement in the patients' functional abilities. In the early period after surgery, patients generally experience limitations due to pain, muscle weakness, edema, limited range of motion, and concerns about moving the surgical area.

Rehabilitation exercises carried out gradually can help patients improve their ability to change positions, sit, stand, move, and walk according to clinical conditions. Changes in mobility scores in this study indicate that the

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rehabilitation program has the potential to support functional recovery in patients after orthopedic surgery.

3) The Relationship between Compliance and Mobility Recovery

The results of the study showed a positive relationship between compliance with rehabilitation exercises and increased mobility scores, with a value of $r=0.612$ and $p<0.001$. This finding means that patients who are more compliant with their exercises tend to experience greater improvements in mobility.

Physiologically, regular exercise can help maintain muscle strength, increase flexibility, improve movement coordination, and help patients gradually return to functional activities. Low compliance can reduce the frequency of exercise stimuli so that the process of functional recovery can take place more slowly.

These results are also evident in the average increase in scores based on adherence categories. Patients with high adherence experienced an average increase of 25.13 points, while patients with low adherence experienced only a 12.17-point increase.

4) The Role of Health Workers in Improving Compliance

Healthcare workers play a crucial role in improving patient compliance. Nurses and physiotherapists can provide education on the benefits of exercise, explain proper exercise techniques, monitor patient progress, and provide motivation.

Regular monitoring can also help identify patient barriers to exercise. If a patient experiences pain or difficulty performing certain movements, the exercise program can be evaluated and adjusted accordingly. Family support can also help patients carry out rehabilitation programs, especially for patients who still need assistance in carrying out activities.

5) Implications for Nursing Services

The results of the study provide implications that post-orthopedic surgery rehabilitation programs need to pay attention to aspects of patient compliance.

Services are not only focused on providing exercises, but also on monitoring whether patients actually do the exercises according to the program.

Nurses can use a simple monitoring sheet to record exercise implementation and patient mobility progress. This evaluation can serve as a basis for determining the need for additional education or coordination with a physiotherapist.

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Volume 4 | Number 3 | September 2026 |

4. Conclusion And Suggestions

a. Conclusion

Based on the results of research on the relationship between compliance with rehabilitation exercises and the recovery of patient mobility after orthopedic surgery, it can be concluded that rehabilitation exercise programs are related to increasing patient mobility abilities.

The average patient mobility score increased from 48.37 before exercise to 70.82 after exercise , with an average increase of 22.45 points . The results of *the paired t- test* showed a significant difference between mobility scores before and after the rehabilitation program ($p<0.001$).

The majority of respondents, 38 patients (63.3%), had a high level of exercise compliance. Patients with high levels of compliance showed a greater average increase in mobility scores than patients with moderate or low compliance.

The results of the correlation test showed a positive and significant relationship between compliance with rehabilitation exercises and increased mobility scores ($r=0.612$; $p<0.001$). This indicates that the higher the patient's compliance in participating in rehabilitation exercises, the greater the tendency for increased mobility scores.

Patient compliance is an important component in supporting the mobility recovery process after orthopedic surgery.

b. Suggestion

For hospitals, rehabilitation programs for post-orthopedic surgery patients should be implemented in a structured and sustainable manner, accompanied by monitoring of patient compliance and mobility progress. Coordination among doctors, nurses, physiotherapists, and other health workers should also be strengthened to ensure that rehabilitation programs are appropriate to each patient's condition and type of surgery. Nurses are expected to provide education regarding the benefits of rehabilitation exercises, monitor patient compliance, and communicate with the rehabilitation team when patients experience difficulties such as pain or fear of movement. Physiotherapists should provide individualized exercise programs based on the type of surgery, clinical condition, functional ability, and recovery targets, with regular evaluations to adjust the program as needed. Patients are expected to follow the rehabilitation program according to health workers' instructions and immediately report any excessive pain, dizziness, weakness, or other complaints during exercise. Families are encouraged to provide motivation and safe assistance during the recovery process. Further research is recommended to use a quasi-experimental or randomized controlled design with a

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Volume 4 | Number 3 | September 2026 |

larger sample and consider other factors such as age, type of surgery, pain level, functional status, comorbidities, family support, and use of mobility aids, as well as longer-term follow-up to assess the sustainability of mobility improvements.

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