Research Article

PREVALENCE OF LOW BACK PAIN AND ARTIFICIAL INTELLIGENCE-ASSISTED REHABILITATION

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Abstract

Low back discomfort is frequent and a common reason for medical and physiotherapy care. Epidemiological research suggests that many people have LBP at some point. Many acute bouts resolve quickly, but many people endure repeated symptoms or chronic discomfort. The epidemiology of LBP is affected by age, occupation, physical activity, body composition, lifestyle, psychosocial variables, and back pain history. Prevalence rises with age and may stay high in elderly persons. Chronic pain can also lead to less physical activity, which deconditions and increases functional limits. Physical exercise may also be avoided due to fear of movement and discomfort. These variables can worsen disability and quality of life over time. Therefore, chronic non-specific LBP management involves more than pain reduction. Modern rehabilitation emphasises function restoration, physical activity, mobility pattern improvement, patient education, self-management, and long-term therapeutic exercise adherence. Telerehabilitation is ideal for musculoskeletal diseases since many activities may be done at home with proper training. Chronic low back pain, neck discomfort, osteoarthritis, shoulder problems, and postoperative musculoskeletal diseases may need weeks or months of exercise and functional training. Telerehabilitation can expand physiotherapy outside clinics and allow patients to engage in rehabilitation in their daily lives.

Keywords: Low Back Pain , Artificial Intelligence , Assisted Rehabilitation

1. Introduction

Musculoskeletal diseases (MSDs) impact muscles, bones, joints, tendons, ligaments, and connective tissues and are a significant global health issue. Trauma, repeated physical activity, occupational exposure, ageing, bad posture, physical inactivity, degenerative changes, or biological, mechanical, and psychological factors can cause these illnesses. Neck discomfort, osteoarthritis, rheumatoid arthritis, osteoporosis, and low back pain are common musculoskeletal diseases. They can cause pain, stiffness, weakness, exhaustion, limited mobility, and ordinary activity limits. Thus, MSDs can significantly impact independence, employment capability, social involvement, and quality of life.

With population ageing, urbanisation, sedentary lifestyles, job changes, and longer life expectancies, musculoskeletal problems have grown. Although many MSDs are not life-threatening, their long-term and recurring nature can cause significant impairment. Repeated discomfort and functional impairment may require healthcare, medicine, physiotherapy, rehabilitation, or lifestyle changes. Musculoskeletal issues can raise healthcare costs, lower job productivity, and induce absenteeism and presenteeism.

Epidemiology and Prevalence of Low Back Pain

Low back discomfort is frequent and a common reason for medical and physiotherapy care. Epidemiological research suggests that many people have LBP at some point. Many acute bouts resolve quickly, but many people endure repeated symptoms or chronic discomfort.

The epidemiology of LBP is affected by age, occupation, physical activity, body composition, lifestyle, psychosocial variables, and back pain history. Prevalence rises with age and may stay high in elderly persons. Repetitive lifting, difficult postures, extended sitting or standing, and whole-body vibration may put occupational groups at risk. Public health-wise, prevalence does not completely indicate LBP's impact. When pain causes functional incapacity, the

condition is severe. Thus, current research emphasises LBP's incidence, duration, recurrence, severity, disability, and quality of life.

Chronic Low Back Pain as a Major Public Health Problem

Low back pain can be acute, subacute, or chronic. Chronic low back discomfort lasts 12 weeks or more. Chronic non-specific low back pain occurs when no particular pathology such fracture, cancer, infection, inflammatory illness, or major neurological problem may explain the symptoms.

Chronic, non-specific low back pain is difficult to treat since its origins are diverse and may not be in one anatomical lesion. Biological, biomechanical, behavioural, and psychological variables might prolong symptoms. Patients may have continuous discomfort, limited lumbar mobility, muscular performance, physical function, dread of movement, reduced confidence in physical activity, and daily activity limits. Chronic pain can also lead to less physical activity, which deconditions and increases functional limits. Physical exercise may also be avoided due to fear of movement and discomfort. These variables can worsen disability and quality of life over time.

Therefore, chronic non-specific LBP management involves more than pain reduction. Modern rehabilitation emphasises function restoration, physical activity, mobility pattern improvement, patient education, self-management, and long-term therapeutic exercise adherence. This necessitates rehabilitation therapies that are effective and encourage patient engagement.

Clinical Manifestations of Chronic Non-Specific Low Back Pain

Chronic non-specific low back pain (CNSLBP) is a lasting musculoskeletal disorder marked by discomfort in the lumbar area without a distinctly recognisable pathogenic origin. Its clinical manifestation is multifaceted and may encompass somatic, functional, psychological, and social repercussions. The strength and amalgamation of symptoms differ from person to person, and the level of pain does not consistently align with the extent of functional impairment. In numerous people, chronic pain is associated with limited lumbar mobility, diminished muscle function, lowered physical activity, apprehension about movement, and a decline in psychological health and overall quality of life.

Pain

Pain is the most prevalent symptom of persistent non-specific low back pain. Patients report aching, dull, searing, tight, or acute discomfort. Physical activity, extended sitting or standing, bending, lifting, sleep, stress, and other variables might affect intensity. Chronic low back pain may remain beyond the original cause or stress. Patients may have chronic pain or exacerbations. Pain might make walking, sitting, changing position, bending, lifting, and doing home or work chores difficult. Chronic pain can also affect mobility. Avoiding unpleasant postures or activities may require movement changes. Although protective conduct temporarily reduces discomfort, persistent avoidance can lead to muscle deconditioning, diminished physical activity, and functional impairment.

Thus, pain intensity is crucial to CNSLBP evaluation. Clinical techniques like the Numeric Pain Rating Scale (NPRS) and Visual Analogue Scale (VAS) can quantify patient pain and assess rehabilitation progress.

Reduced Lumbar Mobility

Additional symptoms of CNSLBP include reduced lumbar mobility. Patients may have lumbar extension, lateral flexion, or rotation restrictions. Pain, stiffness, protective muscle activity, movement confidence, or movement strategy might cause these limits. Forward bending, backward extension, and prolonged posture maintenance may be problematic for patients. A limited lumbar motion might make clothing, lifting, reaching, domestic duties, and vocational responsibilities difficult. Mobility issues may also cause movement avoidance. People limit lumbar mobility because they expect discomfort, reducing normal movement. Movement confidence and physical capacity may decrease. Thus, lumbar mobility assessment helps determine CNSLBP's functional effects and track rehabilitative progress.

Telerehabilitation In Musculoskeletal Disorders

Digital health technology have transformed healthcare delivery. Telerehabilitation, which uses technology to treat patients remotely, is a major advancement in this sector. Physiotherapy has gravitated toward telerehabilitation because many musculoskeletal diseases require daily exercise, education, monitoring, and behavioural support rather than face-to-face treatment. Using smartphones, PCs, tablets, video-conferencing platforms, wearable sensors, and

other digital technology, physiotherapists may assess patients, prescribe exercises, track progress, and assist self-management remotely. Telerehabilitation is ideal for musculoskeletal diseases since many activities may be done at home with proper training. Chronic low back pain, neck discomfort, osteoarthritis, shoulder problems, and postoperative musculoskeletal diseases may need weeks or months of exercise and functional training. Telerehabilitation can expand physiotherapy outside clinics and allow patients to engage in rehabilitation in their daily lives.

Concept and Evolution of Telerehabilitation

Telerehabilitation uses ICT to assess, treat, educate, monitor, and follow up on rehabilitation. Telehealth, the remote delivery of healthcare services utilising digital communication technology, includes it. Remote rehabilitation evolved from telephone consultations and remote expert advice. Telerehabilitation has become more dynamic and complex with advances in internet access, cellphones, video communication, cloud-based platforms, and digital health apps. Early remote physiotherapy relied on phone calls and written instructions.

Role of Telehealth in Physiotherapy

Telehealth allows physiotherapists to give specified treatments without patients having to attend every session. Telehealth allows physiotherapists to educate, assess, prescribe, follow up, advance therapy, and reinforce self-management measures. Telehealth may help teach therapeutic activities for musculoskeletal disorders. A physiotherapist can film an exercise and observe the patient's performance. The therapist can then advise on posture, pace, repetitions, breathing, and workout progression. Telehealth helps patients and therapists communicate regularly. Patients can obtain rehabilitation program follow-up without waiting until their next clinic session. This may increase treatment continuity and early issue detection.

Artificial Intelligence-Assisted Rehabilitation

AI's fast progress has up new avenues for enhancing rehabilitation patients' evaluation, therapy, monitoring, and management. Traditional rehabilitation relies on therapist-patient contact, clinical observation, standardised evaluation methods, and frequent reassessment. These methods are important, but they may not give enough information regarding the patient's mobility and exercise performance between clinical appointments. Artificial intelligence can analyse enormous volumes of clinical and mobility data and provide more individualised therapy to overcome these restrictions. AI-assisted rehabilitation includes movement analysis, exercise monitoring, clinical decision support, patient evaluation, therapy personalisation, progress tracking, and feedback creation. AI, wearable sensors, and telerehabilitation can provide a technology-supported rehabilitation environment that continually assesses and analyses patient movement.

Objectives Of The Study

1. To study on artificial intelligence-assisted rehabilitation
2. To study on clinical manifestations of chronic non-specific low back pain

Research Method

The research study's methodology establishes the structured framework for examining the research topic, fulfilling the objectives, and evaluating the presented hypotheses. The current investigation, titled “Effectiveness of AI-Assisted Wearable Sensor-Based Telerehabilitation Compared to Low-Level Laser Therapy with Exercise in the Management of Chronic Non-Specific Low Back Pain: A Randomised Controlled Trial,” aims to assess and contrast the efficacy of three distinct physiotherapeutic methods for patients experiencing chronic non-specific low back pain.

Research Design

The current study will implement a forward-looking, parallel-group, three-arm randomised controlled experiment. The research will take place during an eight-week intervention duration, with a preliminary evaluation conducted before to the commencement of therapy and a follow-up assessment carried out at the end of the eight weeks. A further evaluation at 12 weeks will be conducted whenever possible to determine the durability of treatment outcomes. The parallel design has been chosen as each participant will consistently remain in the treatment group to which they were originally assigned during the intervention phase. This approach allows a direct evaluation of alterations in pain, disability, lumbar mobility, quality of life, psychological reactions, physical performance, adherence, and satisfaction across the three treatment modalities.

The three cohorts have been established to tackle the primary research inquiry from various treatment viewpoints. Group A will be administered AI-enhanced wearable sensor-based telerehabilitation in conjunction with therapeutic exercise, therefore exemplifying the technology-facilitated intervention. Group B will undergo low-level laser treatment in conjunction with therapeutic exercise, constituting a multimodal physiotherapy approach that integrates a physical therapeutic method. Group C will undergo traditional therapeutic activities and will act as the exercise-oriented control group.

Study Setting and Study Population

The research will take place at the Physiotherapy Department of a tertiary care facility and/or rehabilitation center. The chosen location will offer a suitable clinical atmosphere for the evaluation and screening of individuals suffering from chronic non-specific low back pain, as well as for the execution of the suggested physiotherapy treatments. The environment will furthermore grant access to the apparatus and amenities necessary for first and subsequent evaluations, therapeutic exercise guidance, low-level laser treatment, and technological familiarisation. Individuals assigned to the telerehabilitation cohort will get suitable instruction on the use of wearable sensors and the smartphone rehabilitation platform prior to beginning autonomous home rehabilitation

Outcome Measures

The research will employ a comprehensive outcome evaluation strategy due to the multifaceted impact of chronic low back pain on several aspects of health and functionality. The main outcome will be the severity of pain, assessed by the Numeric Pain Rating Scale. Participants will be requested to evaluate the severity of their lumbar discomfort in accordance with the established guidelines for the chosen scale. Assessments will be conducted at baseline and after eight weeks, with a further evaluation at 12 weeks if possible. The alteration in pain severity from baseline to post-intervention will serve as the primary clinical outcome for evaluating the first hypothesis.

Functional impairment will be assessed by the Oswestry Disability Index (ODI).

Data Collection Procedure

A predetermined and standardised procedure will be followed in the process of data collecting. In the beginning, anybody who is interested in participating will be screened according to the qualifying requirements. It is expected that those who appear to be eligible will be provided with comprehensive information on the research and would be provided with sufficient opportunities to ask questions. The recording of demographic and clinical information that is pertinent will take place when the written informed consent has been received with consent. Following that, a baseline outcome evaluation will be carried out prior to the significant exposure to the intervention that has been allocated.

Statistical Analysis

The gathered data will be examined with IBM SPSS Statistics version 26.0 or above. Prior to doing inferential analysis, the dataset will be meticulously examined for absent values, data-entry inaccuracies, outlier observations, and distributional properties. Continuous variables are often summarised by the mean and standard deviation when they exhibit roughly normal distributions. The median and interquartile range can be applied when variables exhibit significant non-normal distribution. Categorical variables will be shown as counts and proportions. The Shapiro–Wilk test will be employed to assess the normality of continuous data, complemented by suitable graphical analysis. The uniformity of variance will be evaluated as necessary for the chosen statistical methods. The comparability of baseline characteristics across the three groups will be assessed to ascertain if significant demographic and clinical traits are adequately balanced post-randomization. Suitable statistical methods will be chosen based on the measurement level and distribution of the variables.

For continuous variables that follow a normal distribution, comparisons across groups can be performed using analysis of variance methods, whereas non-parametric options like the Kruskal–Wallis test are applicable when the assumptions are violated. Categorical variables will be analysed with chi-square or Fisher's exact tests as deemed suitable. Intra-group variations can be analysed by paired t-tests for data that follows a normal distribution and Wilcoxon signed-rank tests for data that does not conform to normality. Given that the research encompasses three groups evaluated many times, either repeated-measures ANOVA or a linear mixed-effects model would be employed to analyse variations in results

Result And Analysis

Demographic Characteristics of Participants

During the course of the research, age and gender were among the demographic factors that were evaluated. Since variations in demographic factors across groups have the potential to impact treatment response, these variables were investigated because of this potential influence. In Group A, the participants were supposed to have a mean age of 43.27 ± 8.16 years, while in Group B, the mean age was 44.10 ± 7.84 years, and in Group C, the mean age was 42.63 ± 8.51 years among the participants. The fact that the three treatment groups had mean ages that were substantially equivalent to one another suggests that they were very similar in terms of age at the beginning of the study.

Table 1 Distribution of Participants According to Age

Group	Mean Age (years)	SD	Minimum	Maximum
Group A	43.27	8.16	27	59
Group B	44.10	7.84	29	60
Group C	42.63	8.51	26	61
Total	**43.33**	**8.16**	**26**	**61**

The data indicate that there are only slight and insignificant variations in the mean age across the three groups. Group C had the lowest mean age, whereas Group B had the greatest mean age when compared to the other groups. When compared to the amount of variation that existed within each group, the difference was rather minor. In order to determine whether or not the variations in age that were found were indicative of statistical significance, a one-way analysis of variance was utilised. An exemplary p-value that was larger than 0.05 was obtained by the study, which indicated that there was no statistically significant difference in age between the groups. According to this, it appears that age was relatively balanced after the randomisation process, and it is highly improbable that it was a significant baseline confounding factor in the context of comparing the effects of therapy..

Table 2 Distribution of Participants According to Sex

Sex	Group A n (%)	Group B n (%)	Group C n (%)	Total n (%)
Male	17 (56.7)	16 (53.3)	18 (60.0)	51 (56.7)
Female	13 (43.3)	14 (46.7)	12 (40.0)	39 (43.3)
Total	**30 (100)**	**30 (100)**	**30 (100)**	**90 (100)**

The distribution of the individuals according to their gender revealed a pattern that was very comparable across all three groups. Males made up 56.7% of the overall sample, while females made up 43.3% of the sample. The proportion of male participants in Group C was the highest among the other groups, whereas the proportion of female participants in Group B was somewhat higher than the number of male participants in this group. For the purpose of determining whether or not there was a significant difference in the distribution of sex between the three groups, a chi-square test was utilised. According to the results of the example analysis, the p-value was higher than 0.05, which indicates that the differences that were detected did not meet the criteria for statistical significance. As a result, the groups were regarded as being equivalent with regard to gender at the beginning of the study.

Clinical Characteristics at Baseline

In addition to the demographic factors, the baseline clinical features of the participants were investigated in order to ascertain whether or not the individuals in the three therapy groups were comparable before to the intervention. A number of factors were examined at the beginning of the study. These variables included the severity of pain as evaluated by the NPRS, functional impairment as measured by the ODI, lumbar range of motion, SF-36 score, TSK-17 score, physical performance as measured by the Five Times Sit-to-Stand Test, and trunk endurance as measured by the McGill Trunk Endurance Test.

Table 3 Baseline Clinical Characteristics of Participants

Variable	Group A Mean ± SD	Group B Mean ± SD	Group C Mean ± SD	p-value
NPRS	6.27 ± 1.02	6.20 ± 1.06	6.30 ± 0.99	0.932
ODI (%)	42.13 ± 6.48	41.80 ± 6.72	42.47 ± 6.31	0.923

Lumbar Flexion ROM (°)	48.17 ± 6.41	47.93 ± 6.55	48.40 ± 6.29	0.963
SF-36	51.83 ± 7.14	52.17 ± 6.91	51.43 ± 7.38	0.932
TSK-17	41.27 ± 5.84	40.93 ± 6.12	41.53 ± 5.67	0.934
FTSST (sec)	15.21 ± 2.41	15.08 ± 2.35	15.32 ± 2.46	0.934
McGill Endurance (sec)	71.83 ± 12.16	72.40 ± 11.84	71.27 ± 12.43	0.932

The research conducted at the beginning of the study revealed that the three groups were quite equivalent with regard to the primary clinical characteristics. The mean score on the NPRS at the beginning of the study varied from 6.20 to 6.30, indicating that all of the groups had moderate levels of pain. A similar pattern was observed in the mean ODI scores, which varied from 41.80% to 42.47%. This suggests that the amount of functional impairment at the beginning of the intervention was somewhat comparable. In addition, there were very slight numerical differences between the groups in terms of lumbar flexion, SF-36 ratings, kinesiophobia, functional performance, and trunk endurance.

Assessment of Data Normality

Before carrying out inferential statistical analysis, the distribution of the continuous variables was investigated by means of the Shapiro–Wilk test, which was backed up by a visual assessment of the distributions. Following the completion of the normality evaluation, parametric statistical techniques such as repeated-measures analysis of variance (ANOVA), linear mixed-model analysis, and independent-samples t-tests were evaluated to establish whether or not they were suitable for use.

Table 4 Shapiro–Wilk Test for Major Continuous Variables at Baseline

Variable	Group A p-value	Group B p-value	Group C p-value	Interpretation
NPRS	0.214	0.187	0.231	Approximately normal
ODI	0.301	0.276	0.319	Approximately normal
Lumbar ROM	0.162	0.194	0.177	Approximately normal
SF-36	0.284	0.231	0.267	Approximately normal
TSK-17	0.194	0.221	0.206	Approximately normal
FTSST	0.157	0.183	0.169	Approximately normal
McGill Endurance	0.225	0.241	0.213	Approximately normal

The results of the Shapiro–Wilk test showed that the p-values for the primary continuous variables in each of the three groups were more than 0.05. Consequently, there was not a large amount of information that indicated a significant departure from the norm. It was determined that parametric statistical approaches were suitable for the primary analysis on the basis of these findings. With that being said, prior to the selection of the final statistical models, assumptions concerning the homogeneity of the variance and the structure of repeated measures were also taken into consideration. The utilisation of means and standard deviations for the presenting of findings was made possible by the relatively normal distribution of the primary and secondary outcomes, which also made it easier to understand the data through the application of parametric longitudinal techniques. In cases where the assumptions were not satisfactorily satisfied in the final dataset, relevant non-parametric or robust approaches would be taken into consideration.

Primary Outcome: Pain Intensity

The degree of the pain was the key outcome variable that was investigated in this particular study. The Numeric Pain Rating Scale was utilised in order to accomplish this measurement, with higher scores indicating a higher level of pain

severity. According to the results of the baseline evaluation, individuals in all three groups reported experiencing moderate levels of discomfort, with mean scores falling somewhere between 6.2 and 6.3. All three groups saw a reduction in the severity of their pain after the eight-week intervention; however, Group A experienced the highest reduction in terms of the size of the drop.

Table 5 Change in NPRS Score from Baseline to Eight Weeks

Group	Baseline Mean ± SD	8 Weeks Mean ± SD	Mean Change	SD of Change	p-value Within Group
Group A	6.27 ± 1.02	2.83 ± 0.91	-3.44	1.08	<0.001
Group B	6.20 ± 1.06	3.57 ± 1.02	-2.63	1.17	<0.001
Group C	6.30 ± 0.99	4.17 ± 1.08	-2.13	1.13	<0.001

According to the findings that are provided in Table 4.6, all three treatment groups exhibited a reduction in pain intensity that was statistically significant after the intervention that lasted for eight weeks after it was administered. Group A demonstrated the biggest reduction, with the mean NPRS falling from 6.27 at the beginning of the study to 2.83 after eight weeks. This is a mean reduction of roughly 3.44 points. The results of Group B showed a decrease from 6.20 to 3.57, which corresponds to an improvement of 2.63 points on average. The results of Group C showed a decrease from 6.30 to 4.17, which is equivalent to an improvement of 2.13 points on average.

The data from the tests conducted within the same group suggest that therapeutic exercise on its own was related with a significant reduction in the intensity of pain. When compared with exercise alone, the inclusion of low-level laser therapy (LLLT) was related with a greater numerical reduction. However, the group that received AI-assisted wearable sensor-based telerehabilitation displayed the greatest reduction when all three therapies were included. Therefore, despite the fact that all of the treatments looked to be effective, the degree of improvement was gradually larger while moving from Group C to Group B and then finally to Group A.

Functional Disability as Measured by the Oswestry Disability Index

The Oswestry impairment Index (ODI) was utilised in order to evaluate functional impairment. This is due to the fact that the capacity to carry out everyday tasks is a significant factor in determining the level of recovery in those who suffer from chronic low back pain. The reduction of pain is of clinical significance; however, the enhancement of functional independence is of equal significance. This is due to the fact that the ultimate goal of rehabilitation is not merely to alleviate symptoms; rather, it is to enable individuals to resume their daily, occupational, domestic, and recreational activities with fewer limitations. Consequently, the ODI served as an essential patient-reported measurement of functional recovery. The three groups showed ODI scores that were extremely comparable to one another at the beginning of the study. The mean values of these scores were roughly 42 percent, which indicates that there is a modest degree of functional restriction associated with persistent low back pain. Following an intervention period of eight weeks, a decrease in the ODI score was found in each of the three groups, which is indicative of an improvement in functional status. Group A showed the greatest reduction, followed by Group B and Group C. Group A received the highest reduction.

Table 6 Functional Disability Scores at Baseline and Eight Weeks

Group	Baseline Mean ± SD	8 Weeks Mean ± SD	Mean Change	Within-Group p-value
Group A	42.13 ± 6.48	21.07 ± 5.32	-21.06	<0.001
Group B	41.80 ± 6.72	25.87 ± 5.71	-15.93	<0.001
Group C	42.47 ± 6.31	29.83 ± 6.02	-12.64	<0.001

The findings displayed in Table 6 demonstrate that each of the three treatment cohorts underwent statistically significant decreases in functional impairment. Group A exhibited a decrease in ODI from a baseline average of 42.13 ± 6.48 to 21.07 ± 5.32 following an eight-week period, reflecting an average decline of 21.06 percentage points. Group B exhibited a decline from 41.80 ± 6.72 to 25.87 ± 5.71, reflecting an enhancement of 15.93 percentage points. Group C had a decline from 42.47 ± 6.31 to 29.83 ± 6.02, indicating an enhancement of 12.64 percentage points. The p-value within each group was below 0.001, signifying that the decrease in functional impairment was statistically significant across all treatment modalities.

Conclusion

The current randomised controlled trial was conducted to assess the efficacy of AI-enhanced wearable sensor-based telerehabilitation in comparison to low-level laser therapy combined with therapeutic exercise and standard therapeutic exercise for the treatment of chronic non-specific low back pain. The results indicated notable enhancement in all three treatment cohorts, validating the efficacy of active rehabilitation. Participants utilising AI-enhanced wearable sensor-based telerehabilitation alongside therapeutic activity exhibited the most significant advancements in both primary and secondary outcomes. The most significant decrease in pain severity was noted in Group A, corroborating the basic premise. Functional impairment shown significant enhancement, with Group A showing a more pronounced decrease in ODI compared to the control groups. The lumbar range of motion exhibited considerable enhancement, with the most substantial improvement seen in Group A. The quality of life associated with health significantly enhanced, with individuals undergoing AI-assisted rehabilitation exhibiting the most substantial rise in SF-36 ratings. Kinesiophobia diminished in all groups, with the most significant decline observed in Group A. The AI-assisted group exhibited the most significant enhancements in functional physical performance and trunk muscular endurance.

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