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Original Research

The Effectiveness of Back Exercises for Chronic Low Back Pain Management Among Employees of PPMI Assalaam

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ABSTRACT

Background: *Low Back Pain (LBP) is a highly prevalent musculoskeletal disorder, especially Chronic Low Back Pain (CLBP) that lasts for more than three months. The prevalence of low back pain among workers at PPMI Assalaam is very high and affects their functional abilities and work productivity. Risk factors for CLBP include age, body mass index, duration of sitting, and static and repetitive workloads.*

Purpose: *This study aims to evaluate the effect of modified back exercises based on a combination of the McKenzie method and core stability exercises in the form of rhythmic gymnastics with music on reducing pain intensity and improving functional ability in employees with CLBP.*

Method: *This study used a pretest-posttest quasi-experimental design with a sample of 50 employees. The experimental group performed back exercises three times a week for one month, while the control group only received education through posters. Pain intensity was measured using the Visual Analog Scale (VAS) and functional ability using the Oswestry Disability Index (ODI) before and after the intervention.*

Result: *Modified back exercises reduced ODI scores by 15.8 (p 0.000, effect 0.85), significantly reduced low back pain, with improved function only in the experimental group (Wilcoxon test).*

Conclusion: *Modified back exercises effectively reduce CLBP pain, improve function, and enhance employees' quality of life. These exercises are easy to implement and encourage consistency in preventing work-related back pain.*

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INTRODUCTION

With the development of technology and the demands of modern work, work-related musculoskeletal disorders (WMSDs) have become a widespread health problem, including in Indonesia. Low Back Pain (LBP) is one of the most common conditions, with a prevalence of up to 24% of the population. In Indonesia, the prevalence of LBP among older adults is estimated at 32.2% (1). The numbr of people suffering from lower back pain in Central Java reached 314,492, with around 40% in the 26-65 age range, and a prevalence of 18.2% in men and 13.6% in women (2). At the modern Islamic boarding school Assalaam, around 50 employees, the majority of whom are over 30 years old, complain of lower back pain that has lasted for more than three months, indicating cases of Chronic Low Back Pain (CLBP).

Chronic Low Back Pain (CLBP) is back pain that lasts for more than 3 months and can radiate to the buttocks and legs (3). Anatomically, the spine consists of several main components, the vertebrae, intervertebral discs, and ligaments, which provide strength and flexibility. Pathology in CLBP often involves spasms in the muscle spindles, causing pressure pain, excessive muscle use (overuse), and ischemia and inflammation due to decreased blood supply to muscle tissue(4).

Patients with CLBP variety of symptoms caused by structural bone abnormalities, muscle weakness, and nerve disorders resulting from stretching or compression of the nerves or physical trauma causing muscle and ligament damage. Identified risk factors for CLBP include increasing age, degeneration of bone and muscle tissue causing decreased elasticity and stability. Gender also plays a role, with women tending to have a higher prevalence due to pain sensitivity and hormonal fluctuations. A high Body Mass Index (BMI) increases the mechanical load on the spine (5). In addition, occupational factors such as long working hours, static work positions, repetitive movements, and heavy workloads also trigger the development of CLBP. Repetitive activities and minimal rest periods result in accumulated stress on muscles and supporting tissues, which can lead to chronic pain (6).

The physiotherapy treatment of CLBP has been widely applied using specific exercises such as McKenzie exercises and core stability exercises that focus on strengthening core muscles and improving posture to reduce pain and improve physical function. Research conducted by (Frizziero in 2021) showed that McKenzie exercises and core stability exercises are effective in reducing chronic low back pain, improving body function, quality of life, and core muscle strength and activation. These exercises also improve back stability and hip muscle flexibility (8). Education on good posture effectively increases public knowledge in preventing LBP (9). Research conducted by Pratama (2020) explains that back exercises are effective in reducing pain in CLBP patients and play an important role in preventing and reducing the risk of LBP. Although both exercises have been proven effective in reducing pain from moderate to mild levels, individual implementation often leads to boredom and indiscipline, resulting in optimal results. Therefore, combining McKenzie exercises and core stability in the form of exercises accompanied by rhythmic music is expected to increase participants' motivation and consistency in practicing. This research is important because there have not been many studies examining this innovative approach, which can address the shortcomings of conventional methods and provide practical and enjoyable solutions for CLBP patients to maximize therapy outcomes. McKenzie method is effective in reducing pain and improving function in patients with chronic low back pain, and core stability exercises have also been shown to significantly improve muscle strength and lower back function (11). These exercises are also effective in reducing the intensity of low back pain from

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moderate to mild (12). Meanwhile, core stability exercises serve to strengthen the hip muscles and can control neuromuscular function and maintain spinal stability. This exercise therapy works with muscles such as the diaphragm, pelvic floor, abdominal muscles, gluteus, and erector spine (13). Stabilization exercises for CLBP pain, when performed regularly and under supervision, can help strengthen core muscles and improve spinal stability, thereby reducing pain and increasing mobility (14). When combined, these two exercises can improve problematic spinal structure, thereby reduce pain intensity and increase workforce productivity. However, when performed individually, there are several drawbacks, such as boredom and inconsistency in performing the exercises regularly (15).

This study specifically targets a group of workers with specific characteristics in their daily activities, in the environment of the Assalaam Modern Islamic Boarding School, which has not been widely covered in previous studies. PPMI Assalaam was chosen as the research site because there are quite a number of employees in this environment who complain of lower back pain. Based on observation data from 2023, around 40 Assalaam employees experienced lower back pain (Low Back Pain) that had been felt for more than three months, thus classified as Chronic Low Back Pain (CLBP). Most of these employees work in seated positions for extended periods, such as administrative staff and teachers, putting them at high risk for musculoskeletal disorders in the back. Therefore, this location was deemed suitable for investigating the effectiveness of modified back exercises in reducing lower back pain complaints among employees. This approach can contribute new insights into the development of physiotherapy exercise programs that are more applicable and adaptive to the needs of workers with CLBP.

METHOD

This study used a quantitative quasi-experimental method with a pretest-posttest control design, involving two groups: an experimental group that received modified McKenzie exercise and core stability training, and a control group that only received education without intervention. The sample size calculation in this study was based on inclusion and exclusion criteria established to ensure respondent homogeneity. 25 people in the control group and 25 people in the experimental group.

This study used purposive random sampling with the following inclusion criteria: employees aged over 30 years; working more than 8 hours per day; able to communicate well; willing to participate in the study. The exclusion criteria were employees who were unwilling to participate in the study; had health conditions that made it impossible for them to participate in the study. The dropout criteria were a minimum of 12 back exercises out of the 15 sessions that had been determined. Both groups were tested before (pretest) and after (posttest) treatment to measure changes in pain intensity and functional ability resulting from the exercises. The purpose of this study was to examine the effect of these exercises in reducing and overcoming Chronic Low Back Pain (CLBP) in employees of the Assalaam Islamic Boarding School, as well as to compare the effectiveness of the intervention with the condition without treatment.

This study took place from August 2 to 30, 2025, at the western field of Assalaam Islamic Boarding School. Back exercises were held three times a week—Tuesdays, Thursdays, and Saturdays at 6:30 a.m.—for five weeks. Participants, employees of the school, were monitored through a WhatsApp group and completed questionnaires before and after the exercise series. Each 45-minute session included a 5-minute warm-up, 25 minutes of McKenzie and core stability exercises, followed by a 10-minute cool-down

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and a 4-minute rest. Effectiveness in reducing Chronic Low Back Pain (CLBP) was measured weekly using the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional ability. These instruments provided baseline and weekly follow-up data to track pain and functional improvements.

This study used a questionnaire in the form of the Oswestry Disability Index (ODI). This questionnaire was used to determine the level of disability or inability to perform activities due to pain. It also used the Visual Analogue Scale (VAS) instrument to determine the intensity of lower back pain experienced by patients. The author used the Wilcoxon nonparametric test because the data were not homogeneous, using SPSS software. This instrument has been validated by Oo et al., (2024) with a test-retest reliability score of 0.97 and a validity score of 0.878 (16).

This study has been approved by the Health Research Ethics Committee (KEPK) of the Faculty of Health Sciences (FIK) at Muhammadiyah University Surakarta and has received an ethics clearance letter with No. 1237/KEPK-FIK/V/2025.

RESULTS

a. Characteristics sample based on age, BMI and duration of sitting in a day

Table 1. Sample Based on Age, BMI and duration of sitting in a day

Age	Group Experiment	Percentage (%)	Group Control	Percentage (%)
61 - 65 years	2	8	0	0
56 - 60 years	5	20	1	4
51 - 55 years	6	24	4	16
46 - 50 Years	5	20	1	4
41 - 45 Years	2	8	5	20
36 - 40 Years	2	8	1	4
31 - 35 Years	0	0	1	4
26 - 30 Years	2	8	4	16
21 - 25 Years	1	4	8	32
BMI				
< 18.5 (Underweight)	1	4	1	4
18.5 – 22.9 (Normal)	9	36	10	40
23.0 – 24.9 (Overweight)	6	24	5	20
> 25.0 (Obesity)	9	36	9	36
Duration of Sitting in a Day				
Duration				
< 10 Hours	3	12	3	12
≥ 10 Hours	22	88	22	88
Total	**25**	**100**	**25**	**100**

The study involved 50 respondents aged 21–65 years, with 32% aged 21–25 (control group), 24% aged 51–55 (experimental group), and the remaining distribution spread evenly across the experimental and control groups. BMI, the

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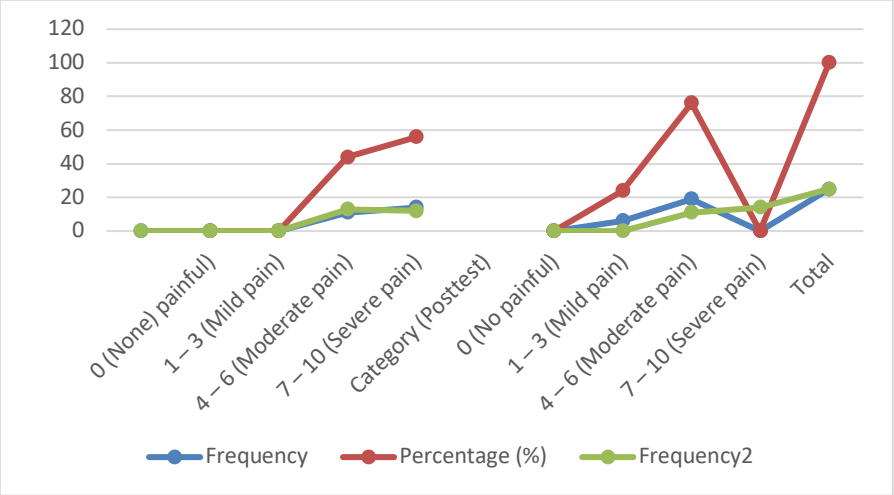
highest category was normal with 10 respondents (40%) in the control group, followed by normal and obese with 9 respondents (36%) each in the experimental and control groups, overweight with 6 in the experimental group and 5 in the control group, and underweight with 1 in each group. Based on the duration of sitting per day, 22 respondents (88%), sat for less than 10 hours per day in both the experimental and control groups, while 3 respondents (12%) sat for more than 10 hours in both groups. Both groups had baseline characteristics such as age, BMI, and duration of sitting, with a homogeneous distribution of respondents who met the inclusion criteria to ensure initial equality before the intervention.

b. Distribution pretest and posttest pain in the group experiment and control

Table 2. Distribution pretest and posttest pain in the group experiment and control



The Wilcoxon test results show that the control group had Z = -0.238, p = 0.812 (not significant) and size effect = 0,0476, while the experimental group had Z = -4.475, p = 0.000 (significant) and size effect = 0,89, proving that back exercises are effective in reducing CLBP pain.

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c. Distribution ability functional pretest and posttest in groups experiment

Table 3. Distribution ability functional pretest and posttest in groups experiment

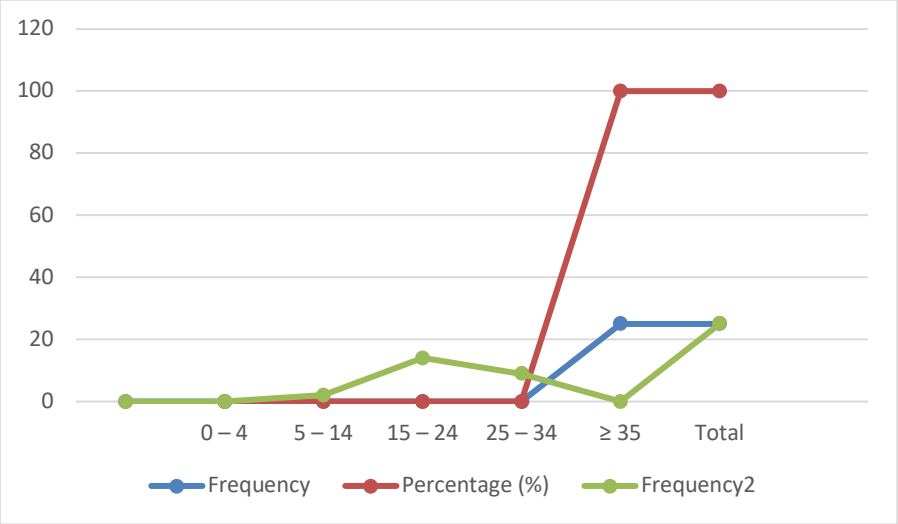
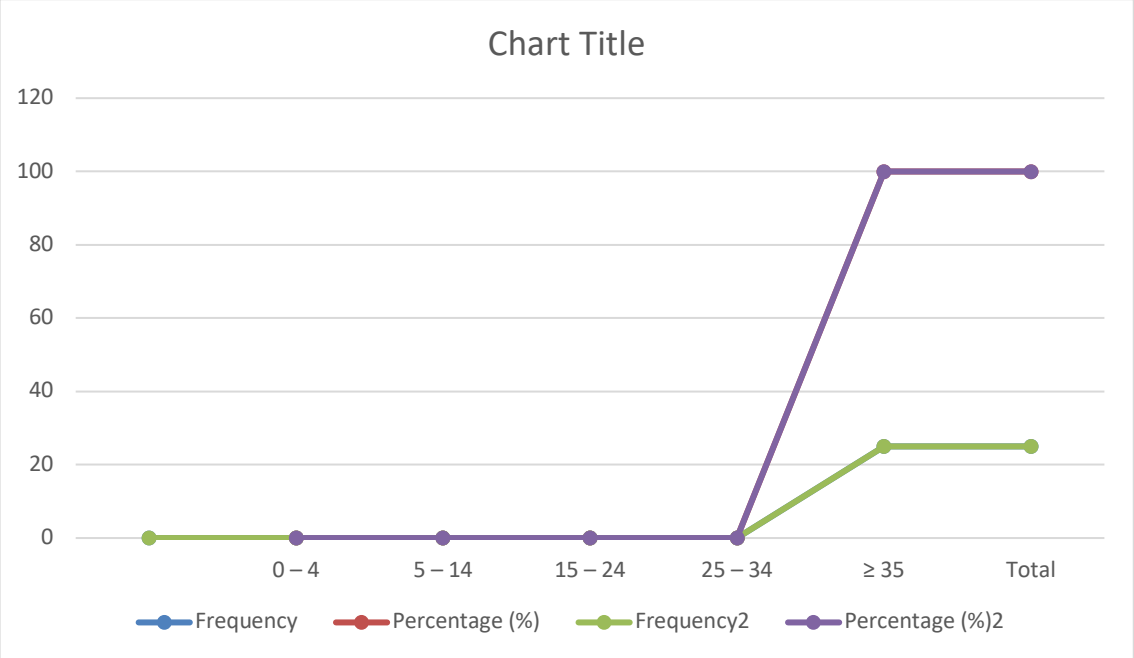


Table 4. Distribution ability functional pretest and posttest in groups control



The Wilcoxon test for the control group showed Z = -3.285 and size effect = 0,657, p = 0.001 (< 0.05), indicating a slight decrease in disability. The experimental group showed Z = -4.377 and effect size = 0,875, p = 0.000, with all data decreasing, proving that back exercises are more effective in improving the function of CLBP PPMI Assalaam employees.

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d. Analysis mark intensity pretest and posttest pain in the group experiment

Table 5. Analysis mark intensity pretest and posttest pain in the group experiment

Measurement Time	Mean	Standard Deviation	Min	Max	P
Pre-test	32, 1	3, 1	26	39	0, 000
Post test	21, 2	2, 9	15	26	

e. Analysis mark intensity pretest and posttest pain in the group control

Table 6. Analysis mark intensity pretest and posttest pain in the group control

Measurement Time	Mean	Standard Deviation	Min	Max	P
Pre-test	32, 8	1, 1	31	36	0, 812
Post test	32, 6	1	31	36	

The test results showed a significant difference between the control and experimental groups with Z = -6.116, p = 0.000. The control group had an average rating of 38.00, which was higher than the experimental group's 13.00, indicating higher pain levels, proving that back exercises are effective in reducing CLBP pain among PPMI Assalaam employees.

f. Analysis mark ability functional pretest and posttest in groups experiment

Table 7. Analysis mark ability functional pretest and posttest in groups experiment

Measurement Time	Mean	Standard Deviation	Min	Max	P
Pre-test	42.9	3	37	47	0, 000
Post test	22, 7	4	11	30	

g. Analysis mark ability functional pretest and posttest in groups control

Table 8. Analysis mark ability functional pretest and posttest in groups control

Measurement Time	Mean	Standard Deviation	Min	Max	P
Pre-test	44, 2	1, 6	41	47	0.001
Post test	45	1, 6	41	48	

The test results showed a significant difference between the control and experimental groups with Z = -6.080, p = 0.000. The average control score of 38.00 was higher than the experimental score of 13.00, indicating higher disability in the control group. The back exercise intervention proved to be more effective in reducing CLBP disability in PPMI Assalaam employees.

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h. Analysis influence group experiments and groups control

Table 9. Analysis influence group experiments and groups control

Variables	N	Mean Rank	Sum of Rank
Back Exercise	25	38, 00	950.00
Education using posters	25	13, 00	325.00

The table shows the analysis of the effects between the back exercise group (25 participants, average rating of 38.00, total of 950) and the poster education group (25 participants, average of 13.00, total of 325). This significant difference indicates that back exercises are more effective. The following is documentation from research on back exercises and posters among PPMI Assalaam employees.

Figure 1. Back exercise

Figure 2. Educational Posters

DISCUSSION

a. Characteristics

Based on age, the highest number of chronic low back pain sufferers are employees aged 51 to 55 years old, accounting for 20 percent. This means that people over the age of 40 have a higher risk of experiencing chronic low back pain due to the aging process (17). As we age, changes occur in the spine, such as a decrease in the height and elasticity of the intervertebral discs, hardening of the bones and joints (osteoarthritis). These conditions reduce the spine's ability to absorb shock and cause nerve irritation, resulting in chronic pain (18).

Based on Body Mass Index (BMI), the most common category is normal, with 10 respondents, which means that most respondents have a weight that is proportional to their height. Recent research shows that a high BMI, especially in the overweight and obese categories, is closely related to an increased risk of chronic lower back pain.

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Conversely, having a normal BMI can reduce the likelihood of experiencing such pain (19).

Based on the duration of sitting per day, employees who sit for less than 10 hours per day are more numerous than those who sit for more than 10 hours per day. The majority of employees sit for less than 10 hours per day, due to work activities and breaks that still allow for changes in sitting position and light physical activity (20). However, prolonged sitting, especially exceeding 7 hours per day, significantly increases the risk of chronic lower back pain. This prolonged sitting causes tension in the back support muscles, decreased oxygen supply to muscle tissue, ligament stiffness, and excessive mechanical pressure on the lumbar spine (21).

b. Impact Test

Pain measurement using VAS provides an overview of the intensity of pain felt by respondents before and after back exercise intervention. The results show that back exercise has been proven to be effective and consistent in reducing pain intensity in PPMI Assalaam employees with chronic low back pain. This excessive BMI increases the load on the spinal structure, thereby increasing the risk of prolonged low back pain (22) Research conducted by Minghao (2025) found that digital health interventions that support self-management of LBP in the workplace effectively improve pain management and function. Additionally, the nature of these employees' work involves prolonged sitting, ranging from 5 to 8 hours daily, which contributes to back muscle strain and increases the risk of spinal disorders. Therefore, the combination of age, excess BMI, and prolonged sitting time are important risk factors that need to be considered to prevent and manage chronic low back pain in these employees so that their health and productivity can be maintained properly (24).

Back exercises can significantly reduce functional disability scores in individuals with chronic low back pain, as measured using instruments such as the Oswestry Disability Index (ODI). These exercises increase the strength and flexibility of the muscles supporting the spine, improve neuromuscular control, and reduce muscle tension and spasms, which are often the cause of functional limitations. The reduction in functional disability has a positive effect on an individual's ability to perform daily activities more optimally, improve posture, and reduce the risk of pain recurrence (25). Core stability exercises work by strengthening the core muscles, improving flexibility, and reducing muscle tension, which is the main cause of lower back pain. Additionally, this exercises improves back function and mobility, resulting in more consistent positive effects compared to the control group that only received conventional treatment or no specific exercise (26). Structured physical exercise remains the most effective primary intervention in reducing pain and improving work function in nonspecific chronic low back pain (27). After the intervention in the first week, there was a decrease in pain and disability among PPMI Assalaam employees. Rhythmic exercise with music can affect brain function and motivation during exercise. Music can boost morale and make people feel happy, so they are more motivated to continue exercising. In addition, regular music rhythms can help the brain and body work more synchronously, resulting in more regular and focused movements.The reduction in disability also indicated that employees' functional ability to perform work activities and daily life had improved (28).

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c. Effect Difference Test

After the exercise was repeated in the experimental group and measured using the Visual Analog Scale (VAS), it was found that the pain experienced was significantly reduced meanwhile the control group that did not receive the exercise showed no change in pain. Back exercises work by strengthening the muscles around the spine and increasing muscle flexibility. It is important to do these exercises regularly to support optimal back function and prevent recurring pain (29). Self-management interventions for lower back pain in the workplace, which combine exercise and education, show moderate effects in reducing pain intensity and disability in workers with CLBP (30).

After back exercises, the group that participated in the exercises experienced a greater reduction in functional disability than the control group, which only received education without exercise. The control group did not experience significant changes in pain intensity (Z -0.238, p=0.812) because they only received education through posters without physical exercise intervention, so it was not effective in reducing CLBP. This program is especially important for employees who sit for long periods of time. Integrating exercise into the work schedule and management support, such as providing special time and encouraging participation, are essential. The group that did not change only received education through posters without physical exercise, so static positions and lack of stretching caused back pain to persist (31).

d. Limitation

This study has limitations, such as the small number of participants, the training period lasting only 5 weeks, and the absence of monitoring or evaluation after the training was completed. This makes it difficult for the results of the study to describe the long-term effects of the training. Therefore, further research with a larger number of participants and longer observation periods is needed to obtain more accurate and convincing results. There are several factors that can interfere with measurement results, such as participants' physical activities outside of the exercise that are not monitored by researchers and the use of painkillers. These factors can affect the level of pain and functional ability being measured, so they must be acknowledged as potential confounders in this study.

CONCLUSION

Based on the results of the research and statistical tests conducted, it can be concluded that back exercises have a significant effect on reducing pain intensity and are effective in improving functional ability in employees suffering from chronic low back pain. There is a significant difference in effect between the group given back exercises and the group given education in the form of posters. The group that received back exercises experienced a reduction in pain and an improvement in functional ability, while the group that received education in the form of posters did not experience significant changes in pain or functional ability. A regular and easy-to-follow exercise program at work can boost morale and reduce fatigue, thereby increasing employee productivity. Therefore, companies should create a regular back exercise schedule as part of their employee wellness program so that these benefits can be maximized.

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RECOMMENDATIONS FOR FUTURE RESEARCH

Further research could involve more people of different ages, genders, and occupations to broaden the results and make them applicable to a wider range of people. In addition, it would be advisable to conduct research over a longer period of time to see if this exercise remains effective in the long term. Tools or technology should also be used to monitor muscles more accurately during exercise to obtain more reliable data. Future research could combine exercise with education or psychological support to improve therapeutic outcomes, help reduce pain, and enhance daily functioning. This approach would make the exercise protocol more comprehensive and useful for various workplaces and communities.

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AUTHOR'S CONTRIBUTION STATEMENT

The role of authors in research and journal writing is to design and conduct research, collect and analyze data, and systematically and clearly compile scientific articles. The main author is responsible for the entire process, including drafting and revising based on feedback. Other authors contribute by assisting in data collection, analysis, or manuscript editing. All authors must contribute substantially and be accountable for the content of the article. In addition, the corresponding author acts as the liaison with the journal during the review and publication process, ensuring smooth communication. Overall, authors play an important role in ensuring the quality, authenticity, and success of research publications.

CONFLICTS OF INTEREST

Potential conflicts of interest in this study could arise if the researcher has a relationship with PPMI Assalaam, for example as an employee or having certain interests in it. This could influence the assessment, as there is a possibility of wanting to show good results. Therefore, it is necessary to disclose any such relationships or interests openly, so that the research results remain honest and trustworthy.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In writing this journal, the author used generative AI technology and DeepL, such as grammar checking and writing assistance applications, to help construct sentences that are clearer and easier to understand. However, all content, ideas, analyses, and conclusions are entirely the author's own. Technology was used only as a tool, not as a substitute for scientific thinking or writing.

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