HSPI The Open Access Publisher

J N P R JOURNAL OF NOVEL PHYSIOTHERAPY AND REHABILITATION
ISSN 2573-6264

Research Article

Comparison of Patient Satisfaction and Quality of Life Among Post-elbow Fracture Stiffness Patients Undergoing Proprioceptive Neuromuscular Facilitation Stretching *vs.* Passive Stretching

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Abstract

Background: Post-fracture prolonged immobilization or post-operative elbow stiffness is relatively common and markedly interferes with normal upper extremity function.

This study aims to evaluate and compare the levels of patient satisfaction and quality of life in individuals with post-elbow fracture stiffness who undergo Proprioceptive Neuromuscular Facilitation (PNF) stretching versus those who receive passive stretching.

Methodology: This (six months) analytical comparative cross-sectional study was conducted at various healthcare institutions. The sample consisted of 377 patients using non-probability convenient sampling. Inclusion criteria included specific types of elbow fractures, a minimum immobilization period of three weeks, and limited range of motion (ROM). Exclusion criteria covered various medical and psychological conditions. Standardized questionnaires Short Form 36 Health Survey Questionnaire (SF-36) and Patient Satisfaction Questionnaire (PSQ-18) were used for measuring Quality of life and patient satisfaction. Data analysis was done using SPSS version 22.

Results: Short Form 36 Health Survey Questionnaire scores were significantly higher in the PNF Stretching group (mean 82.34 ± 6.63) compared to the Passive Stretching group (mean 63.98 ± 14.42), with a *p* - value of 0.000. Similarly, Patient satisfaction questionnaire scores were significantly higher in the PNF Stretching group (mean 77.61 ± 4.43) compared to the Passive Stretching group (mean 70.93 ± 8.49), with a *p* - value of 0.000. These findings indicate that there is a statistically significant difference observed between the two groups.

Conclusion: There is a statistically significant difference observed between both groups as the patients undergoing PNF stretching have higher satisfaction and better quality of life, in comparison to the passive stretching group.

More Information

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Submitted: August 25, 2023
Approved: September 04, 2023
Published: September 05, 2023

How to cite this article: Azeem J, Ahmed J, Hamid MF, Javed A, Javed S. Comparison of Patient Satisfaction and Quality of Life Among Post-elbow Fracture Stiffness Patients Undergoing Proprioceptive Neuromuscular Facilitation Stretching *vs.* Passive Stretching. J Nov Physiother Rehabil. 2023; 7: 029-034.

DOI: 10.29328/journal.jnpr.1001053

Keywords: Elbow stiffness; Proprioceptive neuromuscular facilitation stretching; Passive stretching

Introduction

The elbow joint exhibits a heightened predisposition to stiffness, although the exact underlying cause remains incompletely understood [1].

It is important to note that even a 5 percent restriction in elbow joint flexibility and freedom of motion can result in an 80% decrease in the overall functionality of the upper limb [2]. Elbow stiffness manifests as a limited Range of motion approximately 10% - 15% of patients with elbow injuries do not fully recover and encounter motion restrictions [3,4].

Elbow stiffness can arise from various factors, categorized as either intrinsic or extrinsic causes. Intrinsic stiffness is commonly associated with arthritic conditions, dissecans and osteoarthritis. External inflexibility typically is brought about by contracture formation following trauma, affecting structures such as the capsule of the joint, ligaments, adjacent tendons, as well as the skin [1,5]. After an injury, the body

undergoes a healing process characterized by inflammation and the release of inflammatory agents [6]. However, the precise mechanisms underlying these phenomena require further investigation [7]. Extended immobilization can have detrimental effects on elbow motion, as it may trigger contracture and fibrosis of the joint capsule while causing structural deformities in the surrounding periarticular regions [3,8]. This can impart the development of secondary joint arthrosis, exacerbating symptoms of stiffness, discomfort, and less stability at the elbow [9-11].

Recognizing the continuous connection between mental and physical well-being can contribute to better patient outcomes [12,13]. Following elbow joint fractures and subsequent immobilization complications highlight the need for cautious implementation of physiotherapy interventions [2]. Rehabilitation programs play a crucial role in achieving an optimal range of motion, enabling individuals to regain independence in their daily living activities and return to work [14]. Various interventions are employed to address elbow stiffness, including Stretching and strengthening techniques, continuous passive motion, electrotherapy approaches, and stable progressing bracing among others [15,16].

According to reports, a range of 5% to 15% of patients who undergo surgery for elbow fractures may experience subsequent elbow stiffness [17]. Therefore, it is crucial to seek the resolution of the patient for this issue promptly [9,18].

Stretching techniques used in physiotherapy include static stretching and PNF stretching [19,20]. The Major purpose of these stretching exercises for strengthen the Fibroconnective tissue's ability to adjust for tensile pressures while increasing its ability to undergo both elastic and plastic deformation [8]. Furthermore, proprioceptive input is sent to the brain via spindles of muscles and Golgi tendon organs because they are sensitive to variations in expanse and force, sequentially [21-23].

Methodology

Approval was taken from IRB (Institutional Review Boards of University of South Asia, Lahore), with an approval number of 142. It was a months-long analytical comparative cross-sectional study, a type of observational study. Data has been collected from Mayo Hospital, Jinnah Hospital, Central Park Teaching Institute, Minhaj Clinic and Sadiq Clinic. This study has recruited 377 participants.

The inclusion criteria were participants aged 18 to 50 years who had met the eligibility standards; 1) individuals with elbow stiffness following surgical treatment for fractures of the humerus bone and radius/ulna fractures (proximal), without any damage to ligament, at least duration of immobility of three weeks [15,24], elbow stiffness resulting from a traumatic event [12], range of motion less than 100 degrees [12,25].

The study employed the following exclusion criteria: trauma related to burns or injuries to the central nervous system [12], pre-existing diagnosis of depression or anxiety prior to the traumatic event [12,26], lack of willingness to participate in the study [6,12], patients with pathological fractures [15], individuals who had undergone revision surgeries [15], cases involving injuries and neurovascular disorders [15], dislocated elbow, pulled elbow [27], cubital tunnel syndrome [28], osteoarthritis of the elbow, gout, rheumatoid arthritis [29], osteochondritis dissecans, olecranon bursitis/students' elbow, cubital bursitis/bicipitoradial bursitis, any injury due to repetitive movements, carcinoma [30,31].

The participants for this study were selected using a non-probability convenience sampling method, focusing on patients who were undergoing rehabilitation for post-fracture elbow stiffness from the above-mentioned data collection sites. Before data collection, the research team thoroughly explained the study procedures to the participants and obtained their informed consent, ensuring that they understood the purpose and implications of the research. Data was gathered through self-administered questionnaires, specifically the short form 36 health survey questionnaire and patient satisfaction questionnaire questionnaires, which are established tools for assessing quality of life and patient satisfaction. Subsequently, the collected questionnaire responses were analyzed using IBM SPSS version 22, allowing for a comprehensive examination of the data.

Descriptive statistics for quantitative variables i.e., age, quality of life, and patient satisfaction score; we calculated the mean (average) of quantitative variables with standard deviation calculation. For descriptive statistics for qualitative data i.e. gender distribution, history of road traffic accidents, surgical history, and physiotherapy technique; we did frequency calculation to determine the number of occurrences along with percentage calculation. In inferential statistics, we conducted a one-way analysis of variance ANOVA as we had continuous variables (Short Form 36 Health Survey Questionnaire score, Patient satisfaction questionnaire) and categorical variables (physiotherapy techniques either proprioceptive neuromuscular facilitation or passive stretching) side by side so, in order to compare mean difference of Short Form 36 Health Survey Questionnaire score (SF-36), Patient satisfaction questionnaire (PSQ-18) between both groups; we have used ANOVA.

Results

The study population consisted of a total of 377 participants, with 218 (57.8%) being male and 159 (42.2%) female (Table 1). Patients were divided into 2 groups on the basis of techniques they were undergoing. Passive stretching was performed for 188 patients, which accounts for 49.9% of the total population. PNF stretching, on the other hand, was performed for 189, making up 50.1% of the total population.

Among the participants, 172 individuals (45.6%) reported no history of road traffic accidents, indicating a significant portion of the sample did not experience such accidents. On the other hand, 205 participants (54.4%) reported a history of road traffic accidents (Table 2) (Figure 1). Additionally, 241 individuals (63.9%) reported no surgical history, indicating a majority of the participants did not undergo any surgical procedures. Conversely, 136 participants (36.1%) reported having a surgical history, indicating a considerable proportion had previously undergone surgical interventions (Table 3) (Figure 2).

The mean age of the recruited patients was calculated to be 36.46 years, representing the average age of the participants in the study. The standard deviation was reported as 8.7, indicating that the ages of the recruited patients varied, on average, by approximately 8.7 years from the mean age (Table 4) (Figure 3).

Table 1: Frequency of Gender distribution in both groups.

Gender	Distribution variable	Frequency (%)
Male	Passive Stretching	113 (51.8%)
	Proprioceptive Neuromuscular Facilitation Stretching	105 (48.2%)
	Total	218 (100%)
Female	Passive Stretching	75 (47.2%)
	Proprioceptive Neuromuscular Facilitation Stretching	84 (52.8%)
	Total	159 (100%)

Table 2: Frequency of History of Road Traffic Accident.

History of Road Traffic Accident.	Frequency (%)
No	172 (45.6%)
Yes	205 (54.4%)
Total	377 (100%)

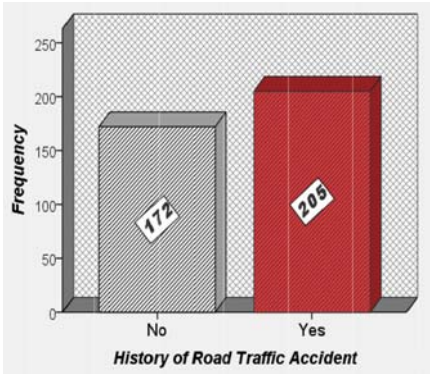

Figure 1: Frequency of history of road traffic accident.

Table 3: Frequency of Surgical History.

Surgical History	Frequency (%)
No	241 (63.9%)
Yes	136 (36.1%)
Total	377 (100%)

Table 4: Mean Age of Recruited Patients.

Distribution variable	Mean ± SD
Age	36.46 ± 8.7

In terms of quality of life scores assessed using the SF-36 questionnaire, the Passive Stretching group had a mean score of 63.98 with a standard deviation of 14.42, while the PNF Stretching group had a mean score of 82.34 with a standard deviation of 6.63. The *p* - value associated with the statistical analysis was reported as 0.000, indicating a statistically significant difference in SF-36 scores between the Passive Stretching and PNF Stretching groups (Table 5).

Regarding patient satisfaction scores assessed using the PSQ-18 questionnaire, the Passive Stretching group had a mean score of 70.93 with a standard deviation of 8.49, while the PNF Stretching group had a mean score of 77.61 with a standard deviation of 4.43. The *p* - value associated with the statistical analysis was reported as 0.000, indicating a statistically significant difference in PSQ-18 scores between the Passive Stretching and PNF Stretching groups. Overall, the study findings suggest that there were significant differences in both quality of life scores (SF-36) and patient satisfaction scores (PSQ-18) between the Passive Stretching and PNF Stretching groups. The PNF Stretching group demonstrated higher scores in both measures compared to the Passive Stretching group (Table 5).

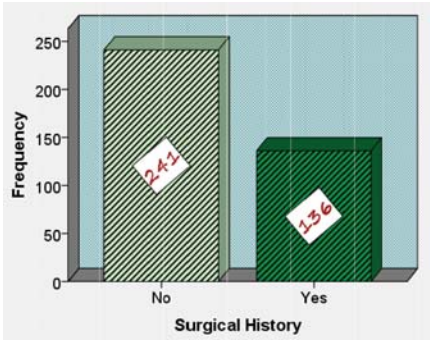

Figure 2: Frequency of surgical history.

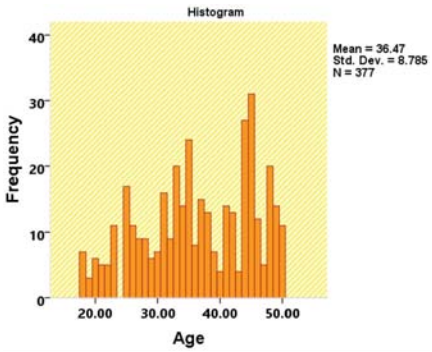

Figure 3: Mean age of recruited patients.

Table 5: One-way ANOVA table of mean score of SF-36 for measuring Quality of Life and PSQ-18 for Measuring Patient Satisfaction.

Distribution variables	No. of participants	Mean ± SD for SF-36	Mean ± SD of PSQ-18 for	*p* - value
Passive stretching	188	63.98 ± 14.42	70.93 ± 8.49	0.000
Proprioceptive neuromuscular facilitation Stretching	189	82.34 ± 6.63	77.61 ± 4.43	
Total	377	73.18 ± 14.49	74.28 ± 7.54	

Discussion

In this study, it was demonstrated that there was a difference in quality of life and patient satisfaction among post-elbow fracture stiffness patients undergoing proprioceptive neuromuscular facilitation stretching versus passive stretching. This study population consisted of a total of 377 participants, with 218 (57.8%) being male and 159 (42.2%) female divided into 2 groups; passive stretching was performed for 188 patients, which accounts for 49.9% of the total population., on the other hand, PNF stretching was performed for 189, making up 50.1% of the total population. In a previous study, a total of 40 individuals diagnosed with posttraumatic elbow stiffness were allocated into two distinct groups: the group undergoing proprioceptive neuromuscular facilitation (PNF) stretching (n = 20) and the group undergoing static stretching (n = 20). Prior to the initiation of the intervention, no notable disparities were observed between the two groups concerning demographic and clinical factors [19].

In the current study, the mean age of the recruited patients was calculated to be 36.46 years, representing the average age of the participants in the study. The standard deviation was reported as 8.7, indicating that the ages of the recruited patients varied, on average, by approximately 8.7 years from the mean age. In the previous study, age was 39.21 (7.28) years and 43.47 (7.43) years in the PNF and static stretching group [19,32].

In the current study, the gender distribution is; 113 males which accounts for 51.8% of the total male participants underwent passive stretching on the other hand, 105 males representing 48.2% of the total male participants, underwent PNF stretching while 75 females, constituting 47.2% of the total female participants were underwent passive stretching exercises on the other hand, 84 females, accounting for 52.8% of the total female participants were engaged in PNF stretching. In the previous study, females were 13 in the PNF stretching group while males were 7 (n = 20). On the other hand, males were 11 and females were 9 in and Static stretching group (n = 20) [19].

In the current study, among the participants 172 individuals (45.6%) reported no history of road traffic accidents, indicating a significant portion of the sample did not experience such accidents. On the other hand, 205 participants (54.4%) reported a history of road traffic accidents. In a previous study, all patients were with posttraumatic elbow stiffness [19].

In the current study, 241 individuals (63.9%) reported no surgical history, indicating a majority of the participants did not undergo any surgical procedures. Conversely, 136 participants (36.1%) reported having a surgical history, indicating a considerable proportion had previously undergone surgical interventions. In the previous study, recruited patients were managed in the PNF stretching group for Surgery 12 (60%) (n = 20) and for Conservative treatment 8 (40%), and in the Static stretching group (n = 20) 13 (65%) were managed surgically while Conservative treatment patients were 7 (35%) [19].

In the current study, QoL assessed using the SF-36 questionnaire, the Passive Stretching group had a mean score of 63.98 with a standard deviation of 14.42, while the PNF Stretching group had a mean score of 82.34 with a standard deviation of 6.63. patient satisfaction scores assessed using the PSQ-18 questionnaire, the Passive Stretching group had a mean score of 70.93 with a standard deviation of 8.49, while the PNF Stretching group had a mean score of 77.61 with a standard deviation of 4.43. While in the previous study objected measures were disabilities of the arm, shoulder, and hand score ($F_{1,35}$=4.89), elbow flexion active range of motion ($F_{1,35}$=3.87), Visual Analog Scale score for rest ($F_{1,35}$=5.04), and VAS score for activity ($F_{1,35}$=7.25) [19].

In a previous study, regarding participant self-assessment, a higher proportion of individuals in the proprioceptive neuromuscular facilitation stretching group reported feeling much better after the six-week intervention period. Specifically, 85% of the participants (n = 17/20) in this group indicated significant improvement, while only 55% (n = 11/20) of those in the static stretching group reported the same. Additionally, 15% of the participants (n = 3/20) in the PNF stretching group and 45% (n = 9/20) in the static stretching group reported feeling slightly better. These differences in self-assessed improvement were statistically significant [19,33].

In the current study, it is overall shown that the PNF stretching group demonstrated higher scores in both measures compared to the passive stretching group. However, the previous study also concluded that the structured exercise programme combined with PNF stretching might be effective in patients with posttraumatic elbow stiffness with regard to improving function, elbow flexion ROM, and pain at rest and during activity [19].

One of the previous concluded that performing stretching at least 5 days a week for at least 5 min per week using static stretching may be beneficial to promote ROM improvements [34].

In the current study, only PNF stretching seems to be more effective in increasing elbow flexibility but, in a previous study, it was concluded that both Static Stretching and PNF stretching can be effective in increasing flexibility [35].

In a previous study, it was concluded that both stretching exercises (passive static stretching and PNF) have the same effect on increasing flexibility. Based on the mean results, it turns out that the difference in the average value obtained by the PNF group is greater than the passive static stretching

exercise group. So, it can be concluded that the PNF exercise has a better effect on increasing flexibility [36], so the results of this current study can be accepted as true.

In a previous study, it was determined that higher stretching intensity can lead to a greater reduction in muscle stiffness regardless of age, static stretching was found to effectively decrease muscle stiffness.(Hirata et al., 2020) while the results of the current study are not in line with the previous study.

A previous study reported that where the outcome measure was articular ROM, low-quality evidence suggests differences in range of motion when comparing various techniques, but the overall effectiveness of PNF stretching remains inconclusive for improving rom in healthy young adults [28].

In the current study, SF-36 Scores were observed in both groups i.e., in Passive Stretching group Mean score of 63.98 with a standard deviation of 14.42, the PNF Stretching group Mean score of 82.34 with a standard deviation of 6.63 with a *p* - value=0.000 (indicating a statistically significant difference). On the other hand, PSQ-18 Scores observed in the Passive Stretching group Mean score of 70.93 with a standard deviation of 8.49 while in the PNF Stretching group Mean score of 77.61 with a standard deviation of 4.43 with a *p* - value of 0.000 (indicating a statistically significant difference).

Indeed, there was a notable absence of comparative studies investigating the effects of proprioceptive neuromuscular facilitation stretching compared to passive stretching on patient satisfaction and QoL, particularly in cases of post-elbow fracture. Therefore, conducting a study in this domain has served to bridge this knowledge gap and has provided valuable insight into the field of physiotherapy for several reasons.

Firstly, the study involved a substantial sample size of 377 participants, providing robust data for analysis. This large sample size enhances the generalizability of the findings to a broader population of individuals with elbow stiffness after fractures or surgeries.

Secondly, the study's division of patients into two groups based on the stretching techniques used, passive stretching and PNF stretching, allows for a direct comparison of the effectiveness of these approaches in improving patient outcomes. This comparative analysis is valuable for clinicians and researchers in choosing the most suitable intervention for similar patient cases.

Furthermore, the study's examination of various demographic and clinical factors, such as the history of road traffic accidents and surgical procedures, adds depth to the understanding of the patient population under investigation. This information can guide clinicians in tailoring treatments to specific patient profiles.

The significant differences observed in both quality of life (SF-36) and patient satisfaction (PSQ-18) scores between the two stretching groups highlight the potential benefits of PNF stretching in enhancing patient well-being and overall satisfaction with their treatment. This finding contributes to the growing body of evidence supporting the effectiveness of PNF stretching in rehabilitation protocols for individuals with elbow stiffness.

Conclusion

In conclusion, the results indicate that individuals who underwent Proprioceptive Neuromuscular Facilitation stretching as part of their rehabilitation program for post-elbow fracture stiffness exhibited improved quality of life and higher levels of patient satisfaction compared to those who received Passive Stretching. These findings highlight that there is a statistically significant difference between both groups as the potential benefits of incorporating PNF stretching exercises into the management of post-elbow fracture stiffness, emphasizing its positive impact on functional outcomes and patient well-being.

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