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RESEARCH ARTICLE
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Effect of Sustained Natural Apophyseal Glides and Myofascial Release on Chronic Nonspecific Neck Pain: Randomized Controlled Trial

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ABSTRACT

Objectives: Considering the comparative effects of different therapeutic modalities on Chronic nonspecific neck pain (CNSNP), the combined and tangled treatment may significantly impact treatment programs. The study aimed to investigate the impacts of Mulligan's sustained natural apophyseal glides (SNAGs) in combination with Myofascial release on pain, pain pressure sensitivity, functional disability, and range of motion (ROM) in CNSNP cases.

Methods: 54 cases diagnosed with CNSNP were assigned randomly to this clinical trial. Cases aged 20 to 45 years were allocated to either Group A, who obtained SNAGs, group B, who experienced MFR, or Group C, who got the combined intervention (SNAGs combined with MFR). This investigation evaluated the combined effects of SNAGs and MFR in CNSNP on pain intensity through the visual analog scale (VAS), Pain sensitivity through the pressure pain threshold (PPT), functional disability through the Neck Disability Index (NDI), and range of motion through a cervical range of motion instrument (CROM).

Results: There was a substantial decline in VAS, NDI, and a marked increase of PPT and neck ROM at post-treatment compared with pre-treatment in the three groups. According to the effects of the combined strategy, there was a statistical disparity in results concerning Pain pressure sensitivity, functional disability, and cervical ROM.

Conclusion: The findings of this study stressed the idea that the combined effect between SNAGs and myofascial releases was more effective and promising than the unimodal methodology.

Keywords: *CNSNP, Manual therapy, SNAGs, MFR, combined effect*

INTRODUCTION

Chronic neck pain (NP), which is acknowledged as a medical and social issue with numerous features, is one of the main reasons people see physicians and miss work. (Azemi-Xhakli, Gashi, & Marmullakaj, 2022). In North Africa and the Middle East, the prevalence of NP was projected to be 3917.3-5022.4%, or 288.7 million individuals, in 2017. (Safiri et al., 2020).

About 30% and 50% of the global population suffers from neck pain every year, according to yearly prevalence estimates. According to the Global Burden of Diseases, Injuries, and Risk Factors Study 2019 (Genebra, Maciel, Bento, Simeo, & Vitta, 2017), 223 million individuals worldwide suffer from neck pain, making it one of the top 5 musculoskeletal problems.

Chronic neck pain is defined as having a duration of more than 12 weeks. (Hoy, Protani, De, & Buchbinder, 2010). Compared to people with other types of neck pain, patients with CNSNP report a lower quality of life and more pain interruptions. (Binder et al., 2008). More research has revealed that CNSNP patients have less consistent postural control than healthy persons. (Saadat et al., 2018;Ruhe, Fejer, & Walker, 2011).

One possible cause of CNSNP is a discrepancy in cervical spine position in addition to motor control of the head caused by differences in proprioception of the neck muscles and joints (Treleaven, 2008). It has been established that central nervous system neuropathic pain (CNSNP) is linked to alterations in kinesthesia and the proprioceptive system, such as postural stability disruption and joint position sense differences (Gómez, Escribá, Oliva-Pascual-Vaca, Méndez-Sánchez, & Silvia Puente-González, 2020). Furthermore, CNSNP patients experience fascial limitations, which are theorized to induce unnecessary tension in other body regions via fascial continuity, resulting in increased pain, decreased range of motion (ROM), and ultimately limited function (López-De-Uralde-Villanueva et al., 2017).

Numerous studies on CNSNP showed that manual therapy significantly decreased spinal excitability, and pain sensitivity and increased function and ROM (Bronfort, Haas, Evans, Leininger, & Triano, 2010; Vincent, Maigne, Fischhoff, Lanlo, & Dagenais, 2013).

The field of manual therapy benefits as more and more therapists start to apply Brian Mulligan's techniques in their work. The use of pain-free spinal manual therapy techniques known as Sustained natural apophyseal glides (SNAGs), which involve concurrent accessory joint gliding and active physiological motion with overpressure just at the end range, is one of the many methods described in the literature for treating chronic neck pain. (Hing, Hall, & Mulligan, 2019).

Many studies have shown that Mulligan's SNAGs is one of the most effective manual treatment techniques in terms of its effects on proprioception, function, ROM, as well as pain (Bowler, Browning, & Lascurain-Aguirrebeña, 2017) (Reid, Callister, Katekar, & Rivett, 2014b). SNAGs were also proven for their immediate effects on mechanical low back pain and cervical mechanical pain (Hussein, Morsi, & Abdelraoof, 2021)

Contrarily, Myofascial release is a type of soft tissue therapy utilized to treat chronic pain by decreasing inflammation and increasing blood flow to the affected area. As previously mentioned, (Tozzi, Bongiorno, & Vitturini.,2011; Cerezo-Téllez et al.,2018) found that myofascial release was beneficial in alleviating mechanical neck pain and enhancing functional capabilities by releasing limits of movement originating in soft tissues.

The effects of both mulligan's SNAGs and Myofascial release have been studied, but their combination has been generally overlooked in the past (Rezkallah & Abdullah, 2018; Arguisuelas, Lisón, Sánchez-Zuriaga, Martnez-Hurtado, & Doménech-Fernández, 2017). Both approaches have been proven effective, but the way they develop may differ as they use various mechanisms of action.

Several studies have assessed the efficacy of various manual approaches for treating CNSNP, focusing on their practicality and effectiveness in treating this clinical disease (Hidalgo, Hall, Cagnie, & Pitance, 2016; Fredin & Lors, 2017). Rezkallah suggested in 2018 that combining SNAGs and exercise or MFR with training could help those with CNSNP experience less pain, more significant active neck movement, and a reduced degree of functional disability (Rezkallah & Abdullah, 2018). Many studies investigated SNAGs and myofascial release on CNSNP, whether as comparative studies or even in separate studies(Bhat et al., 2021)

Recently, Combined protocols and programs have been invading the treatment plans with their definite success and bright improvements in pain rating scales, neck disability indexes, global rating of change, ROM, and improving the level of fatigability. A systematic review and other many other studies and investigations showed that the combination of different manual techniques with exercise or not for the treatment of neck pain is way better than using separate techniques (K Fredin, Practice, & 2017, n.d.; B Hidalgo, Hall, Bossert, …, & 2017, n.d.; Jang, Kim, of, & 2011, 2011; Wang, Jiang, & Gao, 2022)

Until now, there is a gap in the literature about studying the combined effect of these techniques and investigating their impact on managing CNSNP concerning four main variables: pain, function, and ROM.

The current academic work aims to compare and evaluate the impact of combining these two manual approaches on pain, function, and ROM in people with CNSNP.

METHODS

Ethical considerations

The study has been approved (No: P.T.REC/012/003351) by the Ethical Board of the Faculty of Physical Therapy at Cairo University. A record for this study was created in the Clinical Trials Registry (NCT05061121). Each individual involved in the study gave their informed written consent and was aware of their right to quit at any time.

Design

A single-blinded, randomized, controlled trial.

Setting

This academic investigation was done in the outpatient clinic of physiotherapy at Misr university for science and technology

Sample size estimation

The ideal sample size was gauged using G*Power. Using F tests for multivariate analysis of variance MANOVA effects and interactions, a reasonable sample size of 54 cases was identified. This number produced a Type I error of 0.05, power of 0.95 (1-a error probability), and an effect size of 0.45. To make up for dropouts, 70 cases were enrolled.

Patient recruitment and allocation

Male and female cases (20-45) of varying ages visited the physiotherapy outpatient clinic at Misr University for Science and Technology (Rezkallah & Abdullah, 2018). For the previous twelve weeks or longer, patients experiencing continuous neck pain that has no clear organic or pathologic origin. Through an orthopedic specialist, the patients were diagnosed with CNSPN, and diagnostic procedures, including X-rays and magnetic resonance imaging (MRI), failed to report evident pathological findings (Bernal-Utrera, Gonzalez-Gerez, Anarte-Lazo, & Rodriguez-Blanco, 2020). All participants were conscious and cooperative.

Cases who fulfilled the investigation's inclusion aspects were randomized to either group (A), who received SNAGs only on the cervical spine, or group(B), who received MFR only, or group (C), who received a combination of SNAGs and MFR. Individuals were randomized into different groups utilizing a computer-generated block randomization method, with the allocation remaining concealed until the recipient opened a numbered, sealed envelope containing an assignment card.

Exclusion criteria

People with radial neck pain, neck pain accompanied by vertigo, osteoporosis, psychological issues, metabolic disorders, vertebral fractures, tumors, and red flags (night pain, severe muscle spasm, unexplained weight loss) who have recently received physical therapy management (Bernal-Utrera et al., 2020).

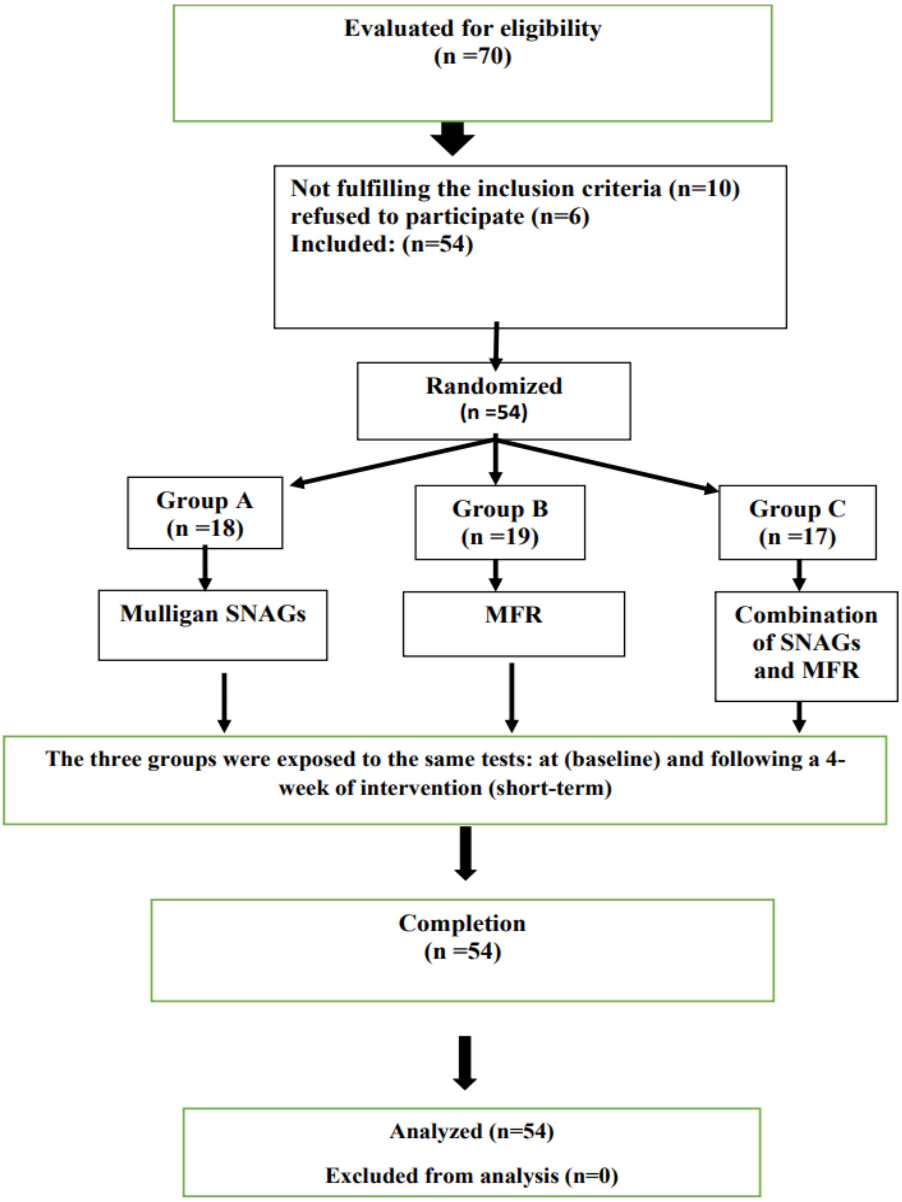

FIG 1: flow diagram of the study

Outcome measures

The three pre- and post-intervention groups received the identical assessment. Using the visual analogue scale (VAS), pressure pain threshold (PPT), neck disability index (NDI), and CROM instrument, pain, disability, and ROM were assessed in the cervical spine.

Assessment methods

Visual Analogue Scale

A pain VAS is a continuous scale that resembles a line with two verbal pain descriptors at each end, one for each severe symptom: “no pain at all” at the left end of the line (score of 0) and “maximum pain” at the right end of the line (score of 1). (score of 100).To prevent clustering of scores around a single digit, we avoided using any scores in the middle (Modarresi et al., n.d.; Phillips et al., 2022). Numerous studies examined the validity and reliability of the VAS for evaluating pain from various sources (Boonstra, Schiphorst Preuper, Reneman, Posthumus, & Stewart, 2008).

Following 8 weeks of treatment, patients were asked to report how much pain they were still experiencing compared to their first pain report (post-treatment).

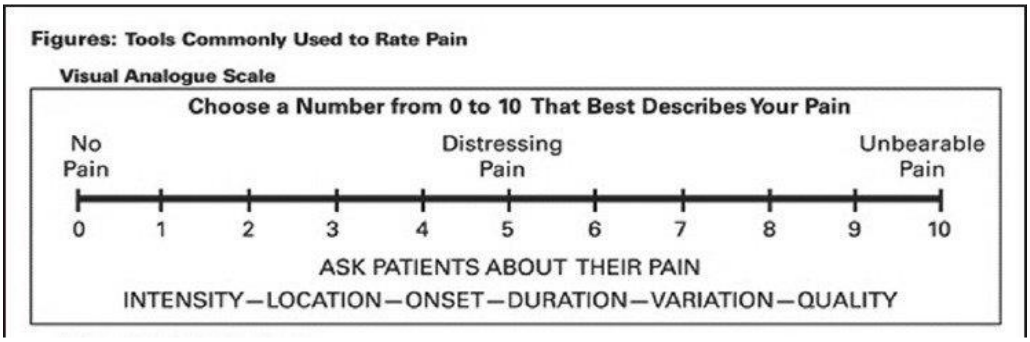

FIG 2: visual analogue scale

Pressure pain threshold (PPT)

Assessment of pressure pain threshold (PPT) with algometry constituted a hybrid test between patient-reported questionnaires and more scientific, objective diagnostic methods. It gives a quantitative score on a linear scale, but that value can change depending on operator skill, patient understanding, and their relationship. The pain threshold was evaluated bilaterally at the upper trapezius muscle angle via three separate trials, with a mean score being determined. As anaesthesia of the skin only impacts the results of smaller probes, the pain threshold evaluated with a probe 1. 6 mm in diameter or greater reflects the tenderness of deep tissues. Clinicians were urged to take PPT into consideration while assessing patients with neck pain. (Walton, Levesque, Payne, & Schick, 2014).

The pressure pain threshold was assessed at baseline before and after eight weeks of intervention.

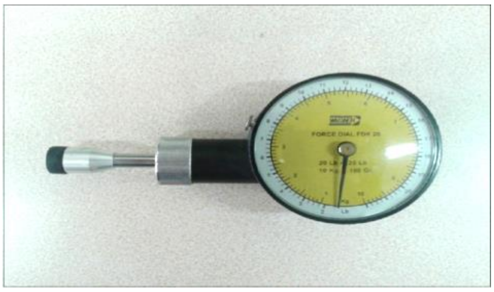

FIG 3: Pressure pain threshold (PPT)

Pressure algometer

Transparent grading sheet

This sheet was adopted to identify TrPs and ensure that manual procedures were applied precisely to the same target spot throughout the therapy sessions. The sheet is constructed of transparent malleable plastic that can bend to fit the shape; it is divided into 1 cm2 units and is 30 cm long, with the numbers 1 through 30, 20 cm wide, and is listed from A to T. (Gomaa et al., 2016)

FIG 4: Transparent grading sheet (adopted from Gomaa et al., 2016).

FIG 5: The placement of transparent grading sheet on patient neck

FIG 6: The placement of algometry on the patient neck

Neck Disability Index (NDI)

There are ten sections in this index; seven are concerned with ADLs, two are concerned with pain, and one is concerned with concentration. Scores range from 0 to 5, with 0 indicating a maximum function and 5 indicating a minimum. Quantitative NDI ratings are presented as a percentage. As the score rises, so does the individual's level of disability. The NDI has a high degree of internal consistency. Patients completed the NDI to produce a score (out of 50) that reflected the degree to which they were impacted by neck pain (Macdelilld et al., 2009; Vernon & Mior, 1991; Young et al., 2009)

There has been proper translation, cultural adaptation, and validation of the NDI questionnaire for usage in various languages and communities. This provides a valid and reliable evaluation standard in Arabic for eastern studies and clinical practice, facilitating communication between doctors and researchers and leading to more accurate results (Shaheen, Omar, & Vernon, 2013).

Cervical Range of Motion Device (CROM)

The Cervical Range of Motion Device (CROM) differs from the universal goniometer in that it is affixed to the head throughout the evaluation. The CROM has acceptable intratester and intertester reliability(Capuano-Pucci et al., 1991). The CROM may provide the clinician with many benefits. There is no chance of palpation error because the device is affixed to the head. The meters can be read quickly and easily. The device is comfortable because of its lightweight design (Audette, Dumas, Côté, & De Serres, 2010; Tousignant & Breton, 2006).

Upper cervical rotation may be measured accurately with the CROM equipment. Clinically, this mean that therapists can get a benefit from the CROM to assess upper and total cervical mobility in more dimensions. It could also detect upper-cervical range-of-motion restrictions caused by disease or movement dysfunction (Gugliotti et al., 2020).

FIG 7: The Cervical Range of Motion Device (CROM),

FIG 8

Blinding

A standardized technique was utilized to make sure that all cases were put in the same posture throughout each test and given similar instructions. All evaluations were carried out by the same physiotherapist, who was blinded to the cases' treatment group.

Intervention

Treatment Methods

Mulligan`s cervical "SNAGs" mobilization technique

The patients were instructed to sit with their backs supported and the therapist positioned behind them. The therapist will apply an anterosuperior accessory gliding across the superior spinous process or facet joint of the affected movement segment using the medial edge of the distal phalanx of one thumb in conjunction with the pad of the other thumb 45-degree angle of the thumb slope. The other fingers of the therapist are placed on the side of the neck in a raising position. The therapist elevates the spinous process in a direction consistent with the plane indicated by the surfaces of the treated facet joints. (toward the ears).

The pain level was identified, and the therapist positioned his thumbs on the transverse process of that area. The patient then actively made the painful movement while the therapist directed that vertebra throughout the movement and opposed it when returning to neutral. It was done in three sets of ten reps, with force delivered perpendicular to the joint plane (Benjamin Hidalgo et al., 2017; Hing et al., 2019; Walton et al., 2014).

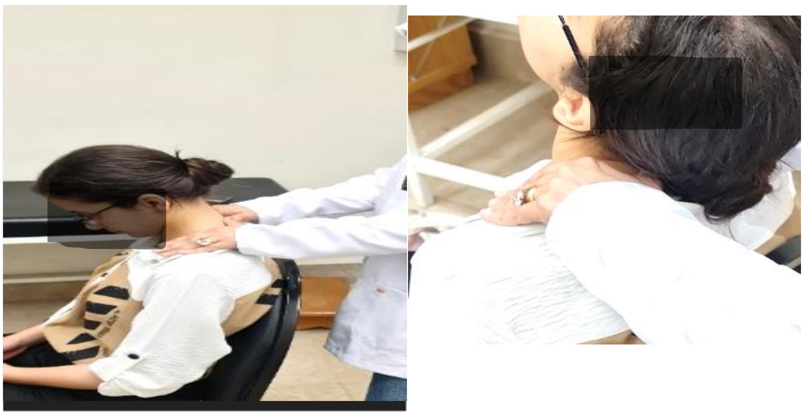

FIG 9: Applying Mulligan SNAGs

Myofascial release therapy

Applying gentle, continuous pressure into the Myofascial connective tissue constraints to relieve pain is the goal of the hands-on Myofascial Release technique, which is both safe and very effective. Release of limitations, such as trigger points, muscle stiffness, and soft tissue dysfunctions, which may cause discomfort and restrict motion in many body regions, is the goal of this therapy (Scariati, 1991).

Positive structural changes, including increased range of motion, decreased discomfort, and, notably, increased fascial mobility, may occur by using gentle, hands-on approaches to the entire body (Shacklock, 2005).

Cross-Hand Release of the Lateral Neck

The patient should be in a supine position, without a pillow, with the arm and wrist straight, the shoulder externally rotated, and the palm up. Turn the person's neck and head away from the side being treated. At the corner, edge, or top of the treatment table, sit or stand. Put two hands, one inferior to the patient's jaw (the body of the mandible), using it as a handle, and the other two superior to the patient's jaw, pointing them towards the patient's top of the head. Place one hand, skin on skin, on the patient's chest with the palm contacting the collarbone and fingers pointing towards the patient's elbow on the same side. Follow each delicate release in three dimensions as you lean into the patient to the tissue depth barrier. Do not push the tissue into the skin or slide or glide across it. Use the method for a minimum of five minutes (Carlesso et al., 2010). As shown in figure (10)

FIG 10 : Cross-Hand technique

Data Analysis

The comparison of subject characteristics between groups was done using MANOVA testing. Chi-squared test was employed to compare the distribution of sexes among the groups. The Shapiro-Wilk test was utilized to determine whether all variables had a normal data distribution. The homogeneity between groups was examined using Levene’s test for homogeneity of variances. To examine effects on VAS, PPT, NDI, and cervical ROM within and between groups, a mixed MANOVA analysis was conducted. For following multiple comparisons, post-hoc analyses employing the Bonferroni correction were performed. All statistical tests had a significance level of p 0.05. The statistical program for social studies (SPSS) version 25 for Windows was used for all statistical analysis. (IBM SPSS, Chicago, IL, USA).

RESULTS

Subject characteristics

Table (1) showed the subject characteristics of the group A, B and C. There was no marked disparity between groups in age, weight, height, BMI and sex distribution ($p > 0.05$).

TABLE 1: Basic characteristics of participants.

	Group A	**Group B**	**Group C**	**p-value**
Age, mean ± (SD), years	22.55 ± 1.85	22.57 ± 1.83	22.35 ± 1.61	0.91
Weight, mean ± (SD), kg	71.92 ± 10.56	70.91 ± 8.01	70.55 ± 7.4	0.89
Height, mean ± (SD), cm	168.5 ± 5.96	166.84 ± 5.5	166.17 ± 3.98	0.41
BMI, mean ± (SD), kg/m²	24.64 ± 2.02	25.48 ± 2.69	25.58 ± 2.72	0.47
Sex, n (%)				
Females	8 (44%)	13 (68%)	11 (65%)	0.28
Males	10 (56%)	6 (32%)	6 (35%)	

SD, standard deviation; p-value, level of significance

Effect of treatment on VAS, PPT, ODI and cervical ROM

Mixed MANOVA reflected a clear interaction between treatment and time (F = 4.40, p = 0.001, partial eta squared = 0.48). There was a significant main effect of time (F = 200.59, p = 0.001, partial eta squared = 0.97). There was a significant main effect of treatment (F = 1.75, p = 0.04, partial eta squared = 0.26).

Within-group comparison

There was an apparent decrease in VAS and NDI and a noticeable increase in PPT post-treatment compared with pre-treatment in the three groups (p < 0.001). (Table 2).

There was a marked increase in cervical ROM in the three groups post-treatment compared with that pre-treatment (Table 3).

Between-group comparison

There was no prominent disparity between groups pre-treatment (p > 0.05). There was no clear disparity in VAS, flexion, and extension between groups post-treatment (p > 0.05).

There was a marked increase in PPT and a clear decrease in group C's NDI compared with group A and B (p < 0.05). There was no clear variance in PPT and NDI between group A and B (p > 0.05). (Table 2).

There was a crystal-clear increase in the right and left bending ROM of group C compared with that of group A and B (p < 0.01). There was a noticeable increase in right and left rotation ROM of group C compared with that of group B (p < 0.05). There was no clear disparity right and left rotation between group A and C (p > 0.05).

No marked disparity has been noticed in right and left bending and right and left rotation ROM between group A and B (p > 0.05). (Table 3).

TABLE 2: Mean VAS, PPT, and NDI pre and post-treatment of groups A, B, and C:

	Group A	Group B	Group C	p-value		
	mean ± SD	mean ± SD	mean ± SD	A vs B	A vs C	B vs C
VAS						
Pre-treatment	9.06 ± 0.81	8.64 ± 0.53	8.9 ± 0.71	0.15	0.75	0.51
Post-treatment	4.36 ± 1.41	4.32 ± 1.59	3.31 ± 1.52	0.99	0.11	0.12
MD	4.7	4.32	5.59			
	p < 0.001	p < 0.001	p < 0.001			
PPT (kg)						
Pre-treatment	1.39 ± 0.26	1.42 ± 0.32	1.36 ± 0.26	0.94	0.92	0.77
Post-treatment	2.62 ± 0.45	2.67 ± 0.49	3.69 ± 0.77	0.97	0.001	0.001
MD	-1.23	-1.25	-2.33			
	p < 0.001	p < 0.001	p < 0.01			

NDI (%)						
Pre-treatment	17.16 ± 1.38	16.47 ± 2.19	17.64 ± 2.06	0.51	0.74	0.16
Post-treatment	10.05 ± 2.41	10.52 ± 1.98	8.35 ± 1.49	0.75	0.04	0.006
MD	7.11	5.95	9.29			
	p < 0.001	p < 0.001	p < 0.001			

SD, Standard deviation; p-value, Level of significance

TABLE 3: Mean cervical ROM pre and post-treatment of groups A, B, and C:

ROM (degrees)	Group A	Group B	Group C	p-value		
	mean ± SD	mean ± SD	mean ± SD	A vs B	A vs C	B vs C
Flexion						
Pre-treatment	36.11 ± 3.46	38.31 ± 3.77	37.29 ± 2.82	0.12	0.56	0.64
Post-treatment	47.55 ± 2.52	47.47 ± 2.09	47.64 ± 3.18	0.99	0.99	0.79
MD	-11.44	-9.16	-10.35			
	p < 0.001	p < 0.001	p < 0.001			
Extension						
Pre-treatment	45.11 ± 2.92	47.42 ± 3.43	46.58 ± 3.58	0.11	0.39	0.73
Post-treatment	57.77 ± 2.64	56.57 ± 2.17	56.82 ± 2.55	0.31	0.49	0.95
MD	-12.66	-9.15	-10.24			
	p < 0.001	p < 0.001	p < 0.001			
Right side bending						
Pre-treatment	34 ± 3.62	35.68 ± 4.12	35.76 ± 3.92	0.39	0.38	0.99
Post-treatment	43.11 ± 2.29	44.73 ± 3.38	47.41 ± 2.09	0.16	0.001	0.01
MD	-9.11	-9.05	-11.65			
	p < 0.001	p < 0.001	p < 0.001			
Left side bending						
Pre-treatment	36.33 ± 4.56	36.31 ± 4.33	37.05 ± 3.39	1	0.86	0.85
Post-treatment	43.66 ± 2.41	44.94 ± 3.06	47.29 ± 1.4	0.25	0.001	0.01
MD	-7.33	-8.63	-10.24			
	p < 0.001	p < 0.001	p < 0.001			
Right Rotation						
Pre-treatment	62.33 ± 3.64	62.52 ± 7.91	60.12 ± 5.93	0.99	0.53	0.47
Post-treatment	75.66 ± 3.01	73.15 ± 4.82	76.47 ± 2.78	0.11	0.79	0.02
MD	-13.33	-10.63	-16.35			
	p < 0.001	p < 0.001	p < 0.001			
Left rotation						
Pre-treatment	63.77 ± 3.75	65.68 ± 4.81	64.41 ± 4.07	0.36	0.89	0.64
Post-treatment	75.77 ± 1.81	74.68 ± 3.43	77.76 ± 2.41	0.42	0.07	0.003
MD	-12	-9	-13.35			
	p < 0.001	p < 0.001	p < 0.001			

SD, Standard deviation; p-value, Level of significance

DISCUSSION

Within the frame of the current academic paper, the impact of Pain, function, and ROM were investigated in 3 groups; group A (SNAGs group), group B (myofascial release group), and Group C (the combined effect group). After ongoing investigations of fifty-four cases relative to the baseline (pre-treatment), measurements were recorded after 8 weeks of intervention (post-treatment). The findings reflected a substantial disparity regarding all the study outcomes. However, groups showed marked disparity regarding pain sensitivity, function, and ROM.

Firstly, improvements significantly proven after 8 weeks of treatment were supported by many previous studies. Considering the Vas, in 2022, a study was conducted using SNAGs techniques for chronic neck pain was significantly effective in relieving pain and improving ROM(Saleem, Zahoor, Rana, …, & 2022).

An additional academic work dates back to 2018 has focused on the short- and medium-term benefits of the Mulligan concept in individuals with persistent mechanical neck pain. The results showed that the patient's pain and function SNAGs improved markedly over the midterm interval (Konstantinos, 2018). On the other hand, A 4-week intervention using MFR for people with chronic neck pain effectively reduced the presence of active TrPs as people with NP have the highest prevalence rates of myofascial trigger points (MTrPs)(Cabrera-Martos et al., 2020). Discussing the combined effect of the two interventions, there was no statistical difference; however, improvements were obtained on an individual level.

Significant improvements in pain sensitivity using the PPT algometer that has been recorded were supported by wide-reaching studies. Since myofascial trigger points (MTrPs) are one of the most common complaints associated with CNSNP, the results of the two interventions (SNAGs and MFR) increased according to the PPT algometer relative to the combined effect records.

On another level, results were not measured through the pain threshold. However, the pain threshold showed a marked disparity in this academic work, and the scientific explanation is induced a reflex inhibition of pain or reflex muscle relaxation by altering the discharge of proprioceptive. Applying SNAGs has been demonstrated in numerous studies to have an immediate effect on relieving pain in chronic nonspecific low back pain (Hussein et al., 2021).

Another study found that MFR and a combination of transcutaneous electrical nerve stimulation (TENS) and ultrasound were similarly beneficial in treating myofascial trigger points; however, clinically, myofascial release seemed more efficient pain reduction using along with functional improvement (Zutshi et al. 2021).In contrast with this study, we applied MFR on CNSNP for a group, and the other group MFR was combined with SNAGs resulting in increased results in both groups; however, the combined effect was more effective.

Testing functional disability was one of the essential variables in this study, as it's the major concern for most patients and therapists. In this study, we tested function using NDI, and data were recorded at baseline (pre-treatment) and post-treatment. The results revealed a substantial difference in all groups and significant improvement in function according to the combined effect group. Highlighting the combined modalities' effect was critical, especially in improving function. In 2014, individuals with CNSNP who were treated with a combination of SNAGs manual physiotherapy techniques and Isometric Exercise reported more significant improvements both in pain and function than those who had obtained SNAGs manual physiotherapy (Ali, Shakil-ur-Rehman, & Sibtain, 2014)

In the current study, the effect of SNAGs and MFR has been investigated separately and combined each in individual groups on a range of motion. SNAGs treatment enhanced cervical ROM, and the impacts were preserved for 12 weeks following treatment (Reid et al. 2014). In our study, outcome measures of ROM were recorded at baseline pre-treatment and post-treatment after 8 weeks of the intervention, resulting in a crystal-clear increase and restoration of ROM, especially side bending and rotation. Both SNAGs and MFR, in conjunction with strengthening exercises, can reduce the pain and functional limitations caused by nonspecific back pain. However, in the case of restricted lumbar flexion range of motion, Mulligan SNAGs have a more noticeable short-term effect than MFR (Vignesh Bhat, Patel, Eapen, Shenoy, & Milanese, 2021).

Based on the outcomes of the current academic work, it has been concluded that SNAGs and MFR effectively increased cervical ROM, especially the rotation and the side-bending ranges.

LIMITATIONS

The follow-up tracking of the patients was not available to get the best results of the combined effect strategy trial. Subsequently, it is crucial to take this point into account with the futuristic academic research.

CONCLUSIONS

For individuals with CNSNP, the combined effect of SNAGs and Myofascial release showed improvement over almost all the variables, which are as follows in pain sensitivity and functional ability, and finally, the cervical rotation and bending ROMs, suggesting applying the combined intervention in treatment programs of cases of CNSNP as a desirable choice.

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Credit authorship contribution statement

Amal A. Morsi: Conceptualization, Methodology, Data curation, preparation, Software, Validation, Writing e review & editing. Visualization, Investigation

Supervision

Yasser M. Aneis: Conceptualization, Methodology, Software, Data curation, Writing e original draft, preparation, Visualization, Investigation, Supervision, Software, Validation, Writing e-reviews & editing

Hanaa Kenawy Atta: Conceptualization, Methodology, Software, Data curation, Writing e original draft, preparation, Visualization, Investigation, Supervision, Software, Validation, Writing e-review & editing.

Mohamed safwat hamza: Conceptualization, Methodology, Supervision

Declaration of competing interest

The authors have declared no conflict of interest.

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