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Effectiveness of motor control exercise and isometric neck exercise on nonspecific neck pain

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Abstract
Background and Objectives: Neck pain is defined as pain in the neck with or without pain referred into one or both upper limb. Non-specific Neck Pain refers to neck pain (with or without radiation) whose underlying cause cannot be traced to any specific systemic disease The motor control exercises are the therapeutic approach which mainly focuses on motor control, activation of deep cervical muscles, and aims to retrain the optimal control and co-ordination of the cervical muscles. Isometric exercise is used as a special technique in proprioceptive neuromuscular facilitation to improve the endurance and strengthens the muscles in a weak portion of the range. Goal of this study is to find out the effectiveness of motor control exercise and isometric neck exercise in reducing pain and disability when used in combination
Methods: This was randomized controlled trial conducted among patients with non specific neck pain. 30 subjects participated in the study in which 15 were in experimental group and 15 were in the control group. Prior to the study a consent was signed and the procedure was explained to the subjects. Duration of the intervention was 3 weeks, and outcome measure used to rate the pain, disability and fear are visual analogue scale, neck disability index and fear avoidance beliefs questionnaire scale.
Results: The study result suggest that there is a significant improvement in the scores on neck disability index and visual analogue scale and fear avoidance beliefs questionnaire for the experimental group post intervention. By comparing the pre-test and post-test neck disability scores mean change is 28.93is the difference between pre-test and post test (37.07-8.13). In VAS mean change is 4.20 is the difference between pre and post test (6.47-2.27). In FABQ mean change is 26.20is the difference between pre and post test (39.47-13.27).
Conclusion: Statistically it is observed that, the isometric neck exercise and motor control exercise leads to a significant improvement in strength, decrease neck pain, decreased fear of the subjects under study. Based on the performed study, it can be concluded that isometric neck exercise and motor control exercise can be performed as a daily routine to improve strength and to decrease pain on neck.

Keywords: INE-isometric neck exercise, MCE-motor control exercise, NSNP- non specific neck pain, VAS-visual analogue scale, NDI-neck disability index, FABQ-fear avoidance belief questionnaire

Introduction
Neck pain is defined as pain in the neck with or without pain referred into one or both upper limb [1]. Neck muscles can be strained from poor posture such as leaning over computer or hunching over workbench. Neck pain can caused by muscle strains, nerve compression, injuries etc. Different types of neck pain are there neuropathic neck pain, mechanical neck pain, central neuropathic pain, non specific neck pain. Non-specific Neck Pain refers to neck pain (with or without radiation) whose underlying cause cannot be traced to any specific systemic disease [2]. Non-specific neck pain may be attributed to numerous structures in the neck and surrounding regions, such as the muscles, joint structures, ligaments, intervertebral disks, and neural structures [2]. Nonspecific neck pain is a common type of neck pain that is induced by nonspecific musculoskeletal diseases. Such diseases may occur repeatedly, resulting in a vicious cycle of chronic pain (pain persisting for more than 3 months).
To improve the functional status and the quality of life of patient with neck pain. It is important to know the structure that produce pain and disability. Motor control can be defined as the capacity of how the central nervous system produces of useful movements that are coordinated and integrated with the rest of the body and the environment. The motor control exercises are the therapeutic approach which mainly focuses on motor control, activation of

deep cervical muscles, and aims to retrain the optimal control and co-ordination of the cervical muscles. Motor control therapeutic exercise (MCTE) for the neck is a motor relearning program that emphasizes the coordination and contraction of specific neck flexor, extensor, and shoulder girdle muscles. Motor control exercise can increase motor control and reduce pain and disability in patients with neck pain. [3] Motor control exercise focus on motor control, activation of deep cervical muscle, it aims to retrain The optimal control and coordination of cervical muscle. The exercise targets the deep flexor muscle of the upper cervical region, the longuscapitis and longuscollis muscle.

The isometric exercise also is effective to reduce muscle spasm. It helps in reduce pain and strengthening neck muscles. Isometric exercise is commonly used to increase muscle performance. Although no joint movement occurs, isometric exercise is considered functional because it provides a strength base for dynamic exercise and because many postural muscles work primarily in an isometric fashion [4].

Isometric exercise is used as a special technique in proprioceptive neuromuscular facilitation to improve the endurance and strengthens the muscles in a weak portion of the range [5]. Both motor control exercise and isometric neck exercise are in same continuum, how ever very less literature in available related to the combined effect of including both these forms of exercise to design an experimental programme. Hence this research was conducted to gain clarity regarding the utility of combining Motor Control exercise and Isometric neck exercise in patients with non specific neck pain.

Need for the study

Ample literature exist regarding the effectiveness of Motor control exercise and Isometric neck exercise in regarding complaints related to the Non Specific Neck Pain. They are also effective in reducing the pain and disability caused by Non Specific Neck Pain. However there is ambiguity regarding the effectiveness of using both the exercise forms as a continnum.

Aims

To evaluate the effectiveness of motor control exercise and isometric neck exercise in treatment of Non-Specific Neck Pain.

Literature Review

1. Jonathan Price, *et al.* 2020 [10]

"Effectiveness and optimal dosage of exercise training for chronic non-specific neck pain. A systematic review with a narrative synthesis". Twenty-six trials from 3990 citations (n = 2288 participants) investigated fifteen ET programmes. High RoB and low sample sizes reduced evidence quality. Clinical heterogeneity prevented meta-analyses. A range of ET programmes reduce pain/disability in the short term (low to moderate evidence). Pillar exercises reduce pain/disability in the intermediate term (low level evidence). Moderate to very large pain reduction is found with ET packages that include motor control + segmental exercises (low to moderate evidence). No high-quality trials investigated long term outcomes. Increased frequency of motor control exercises and progressively increased load of pillar exercise may improve effectiveness.

2. Arianne p Verhagen (2020) [1]

Physiotherapy management of neck pain. Conclusion of this study is that Manual therapy, exercise and education usually in combination seem to be the preferred evidence-based physiotherapy treatments for most patients with neck pain

3. Addala Suvarna Raju, *et al.*, 2019 [11]

Conducted a comparative study on' deep cervical flexors training and neck stabilization exercise in subjects with chronic neck pain'. The results revealed that deep cervical flexors training is more effective than neck stabilization exercise.

4. Richa Suri *et al.*, 2018 [12]

Conducted a comparative study on 'effects of neck stretching and neck stabilization exercises on pain and disability in non specific chronic neck pain. Results suggests that both the groups showed almost equal effectiveness but neck stabilization exercise group showed with more improvement in pain and disability as compared to neck stretching exercise group.

5. Hoang Duc Luan *et al.*, 2018

Conducted a cross sectional study on 'musculoskeletal disorders: prevalence and associated factors among district hospital nurses in Haiphomg, Vietnam. The study results showed that women were 2.1 times more likely to develop musculoskeletal disorders than men.

6. Proper Kl *et al.*, March 2003

Conducted a study on 'The effectiveness of work site physical activity programs on physical activity, physical fitness and health'. This study revealed that there is a marked increased effectiveness of work site physical activity programs on above mentioned domains such as physical activity, physical fitness and health.

7. Isabel Moreira-silva PhD et. a l, 2014

Conducted a study 'The effect of workplace physical activity programs on musculoskeletal pain. A systematic Review and Meta-analysis'. This article reviews that effectiveness of physical activity interventions at the work place reduces musculoskeletal pain among employees.

8. Amir Bahrami-Ahmadi *et al.*, October 2016

Conducted a study 'The effect of work related stress on development of neck and shoulder complaints among nurse in one tertiary hospital in Iran'. And it revealed that the incidence of the new cases of neck and shoulder pain was significantly higher in the exposed group compared to the unexposed group.

9. Shereen Louw *et al.*, November 2017

This systemic review revealed that the effectiveness of therapeutic exercise versus no therapeutic exercise on reducing neck pain and improving quality of life in office workers with non specific neck pain.

10. CaioVitor Dos Santos Genebra *et al.*, July 2017

Conducted a study 'Prevalence and factors associated with neck pain: a population – based study'. The study result revealed that the prevalence of neck pain was 20.3%. The adjusted analyses showed that individuals who were widowers or separated, had a low income or low educational level worked while sitting and leaning, and who reported having two or more diseases remained associated with neck pain.

11. Surendar Babu et al., 2016
Conducted a study 'Work related neck pain (WRNP) among desk job workers of tertiary care hospital, New Delhi, India'. This study revealed that Work-related neck pain is a leading cause of disability and absenteeism. There is dearth of information about burden and determinants of work-related neck pain in health facility in India

12. Shaji John Kachanathu *et al.*, 2014
A Comparative Study on Effect of Different Positional Isometric Neck Exercises Training on Neck Pain and Functional Ability in Patients with Neck Pain. isometric exercise groups in neutral or functional positions had better improvement especially in terms of pain reduction and neck functional ability.

13. Warda Hassan *et al.*,2016
Comparison of effectiveness of isometric exercise with and without stretching exercise in nonspecific cervical pain effectiveness of Isometrics with Stretching was more than Isometrics alone.

14. Steven Z. George *et al.*, 2011
Fear-Avoidance Beliefs and Clinical Outcomes for Patients Seeking Outpatient Physical Therapy for Musculoskeletal Pain Conditions., cervical, upper extremity, lumbar, or lower extremity complaints, fear-avoidance beliefs may have a similar influence on intake and change scores for pain intensity and function. General assessment of fear-avoidance beliefs using the FABQ-PA, especially to predict change scores, may be appropriate for use in patients with various musculoskeletal pain conditions.

15. Rajalaxmi V. *et al.*, (2019)
Efficacy of Motor Control and Endurance Exercises in Neck Pain: A Pilot Study: Motor control exercise has high impact on neck pain and led to marked relief in pain intensity, disability and in improving the endurance of the neck muscle. Endurance training has also showed a statistically significant improvement, however lesser the significant than the motor control exercise group. In contrast, the conventional exercise has found to reduce the pain and disability, although there was no significant improvement in the endurance of the muscle.

16. Amanda Hidalgo *et al.*, 2015
Effectiveness of motor control therapeutic exercise programmed combined with motor imagery on the sensorimotor function of the cervical spine: A randomized controlled trail.

17. Sowmya M.V *et al.*
Isometric Neck Exercises versus Dynamic Neck Exercises in Chronic Neck Pain. The results that are obtained that, dynamic neck exercises has proved to be much more effective method than isometric neck exercises in the treatment of patients with chronic neck pain.

18. William J. Hanney *et al.*, (2010)
Motor control exercise for persisted non specific neck pain. The addition of motor control exercise to an exercise programme does not appear to be more effective than a standard exercise programme

Materials and Methods

Materials Used
- Goniometer
- Data collection book
- Copy of outcome measures

Study Setting
Study was conducted in
1. Physiotherapy department Indo American Hospital, Chemmanakary, Vaikom, Kottayam, Kerala.
2. Physiotherapy department Indo American Hospital, Vaikom, Kottayam, Kerala
3. Kinder Multi-speciality hospital, Kochi

Study Design
- Randomized Comparative Experimental Study

Sampling Method
- Simple Random sampling

Sample Size
- 30 subjects with neck pain selected from study setting

Study Duration
15/11/2021-6/6/2022

Selection Criteria
A. Inclusion criteria
1. Subjects with neck pain more than 4 in visual analogue scale
2. Age between 22-40years
3. Having history of neck pain for greater than 3 months
4. Score on neck disability index; less than 30 %.

B. Exclusion Criteria
1. Known case of Disc prolapse, spinal canal stenosis
2. History of severe trauma
3. Pregnancy
4. History of surgical treatment of neck
5. 5 Subject taking medical treatment for any other disease condition

Study Procedure
After getting permission from administration in all the study setting, neck pain patients coming at the hospital were explained about the research study. Those interested in participating in the study were included after explain all the risk and benefits in participating in this study. After that consent form was taken. The study population included 30 patients fulfilling both exclusion and inclusion criteria. By using lottery method they were allocated randomly to 2 groups experimental group A and control group B. Group A has given isometric and motor control exercise.
Group B did not under gone any treatment, asked to physically active and follow their ongoing activities.

Group A: Experimental Group Subjects were informed about the study then the subjects were assessed and Base line measurement were taken. The exercise taught depends upon the severity and irritability of patients symptoms and his or her ability to learn the exercise. The therapeutic exercise programme consisted of warm up session, active ROM
exercise in the available pain free range at the cervical spine and shoulder, motor control exercise and isometric neck exercise are given.

Neck warm up and mobility exercise: Include Cervical

flexion, extension, side flexion & rotation of available ROM was performed. Each exercise was performed 2 times a day for 10 repetitions.

- **Isometric Exercise:** isometric exercises for cervical flexors, extensors, and side flexors. The hold time for these isometric exercises were 5 seconds. These exercises was performed twice a day for 10 repetitions.
- **Motor Control Exercise:** The therapist would instruct the patient to lie in crooked position without pillow placed under neck, may place a towel under the head if not comfortable, then ask the patient to look at a point straight up the ceiling and then look at a spot on the wall just above the knee. Feel the back of the head slide up the bed as to perform a slow gentle nod. While doing the exercise place the hand on front of the neck to feel superficial muscle. Stop at the point when the muscles began to harden. Hold the position for 10 sec and repeat the exercise 10.

Fig 1: Neck side flexor isometrics(right)

Fig 2: Neck side flexor isometrics(left)

Fig 3: Neck forward flexor isometrics

Fig 4: Neck extensor isometrics

Fig 5: Motor Control Exercise

Outcome measures

1. Neck Disability Index

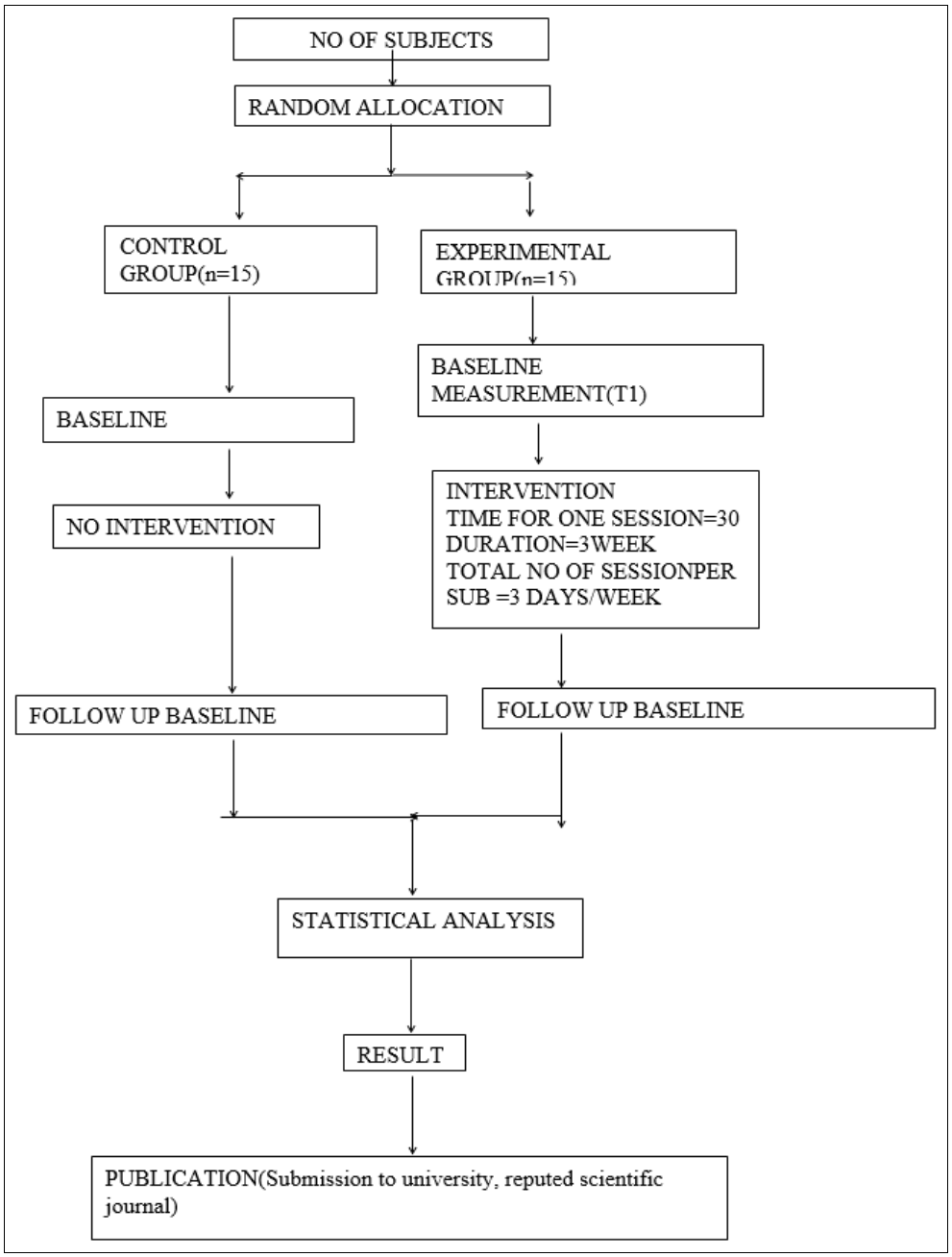
The NDI is a modification of the Oswestry Low Back Pain Disability Index. It is a Patient completed, condition specific functional status questionnaire with 10 items including pain, personal care, lifting, reading, headache, concentration, work, driving, sleeping and recreation. The test can be interpreted as a raw score, with a maximum score of 50 or as a percentage.
0 points or 0% means: no activity limitations.
50 points or 100% means: complete activity limitations.
A higher score indicates more patient rated disability.

2. Visual Analogue Scale (VAS)

The visual analogue scale is a psychometric response scale which can be used in questionnaires. It is a measurement instrument for subjective characteristics or attitudes that cannot be directly measured. It will be presented as 100 mm horizontal line on which patient's pain intensity is represented by a point between the extremes of "no pain at all" and "worst pain imaginable". It's simplicity, reliability and validity as well as its ratio scale properties make the VAS the optimal tool for describing pain severity or intensity.

3. The Fear-Avoidance Beliefs Questionnaire (FABQ)

The Fear-Avoidance Beliefs Questionnaire (FABQ)is a patient reported questionnaire which specifically focuses on how a patient's fear avoidance beliefs about physical activity and work may affect and contribute to their neck pain and resulting disability. The questionnaire consists of 16 items in which a patient rates their agreement with each statement on a 7-point Likert scale. Where 0= completely disagree, 6=completely agree. There is a maximum score of 96. A higher score indicates more strongly held fear avoidance beliefs. There are two subscales within the FABQ; the work subscale (FABQw) with 7 questions (maximum score of 42) and the physical activity subscale (FABQpa) with 4 questions (maximum score of 24). The numbers in parentheses below designate which items from the FABQ are included in each subscale.



Flow chart 1: Describing the methodology (Figure no 6)

Statistical Analysis

All the data entered in Microsoft excel. Independent sample t test was used for comparison with in the group. The comparison between the pre and post measurement of NDI, mean change is the 28.93 is the difference between pre-test and post-test (37.07-8.13). Since the *t-value*, 13.65 is greater than the *table value* 4.073, $p< 0.01$, there is a significant difference existing between the pre-test and post-test disability index scores among individuals in the experimental group. By comparing the pre-test and post-test VAS scores in the experimental group, Mean change 4.20 is the difference between pre-test and post-test (6.47-2.27). Since the t-value, 12.860 is greater than the table value 4.073, $p< 0.01$, there is a significant difference existing between the pre-test and post-test pain scores among individuals in the experimental group. By comparing the pre –test and post –test FABQ scores in the experimental group, mean change 26.20 is the difference between pre test and posttest (39.47-13.27) since the t value, 8.83 is greater than the table value 4.073, $p<0.01$, there is a significant difference existing between the pre –test and post-test fear avoidance score among individuals in the experimental group.

Results

Statistical analysis

Statistical analysis of Neck disability index using t-tests

Table 1: Comparison of Pre-test Post-test Neck disability index in Experimental and Control Groups

Group	Pre-test mean	SD	Post-test mean	SD
Experimental	37.07	9.64	8.13	9.05
Control	37.33	8.96	36.00	8.03

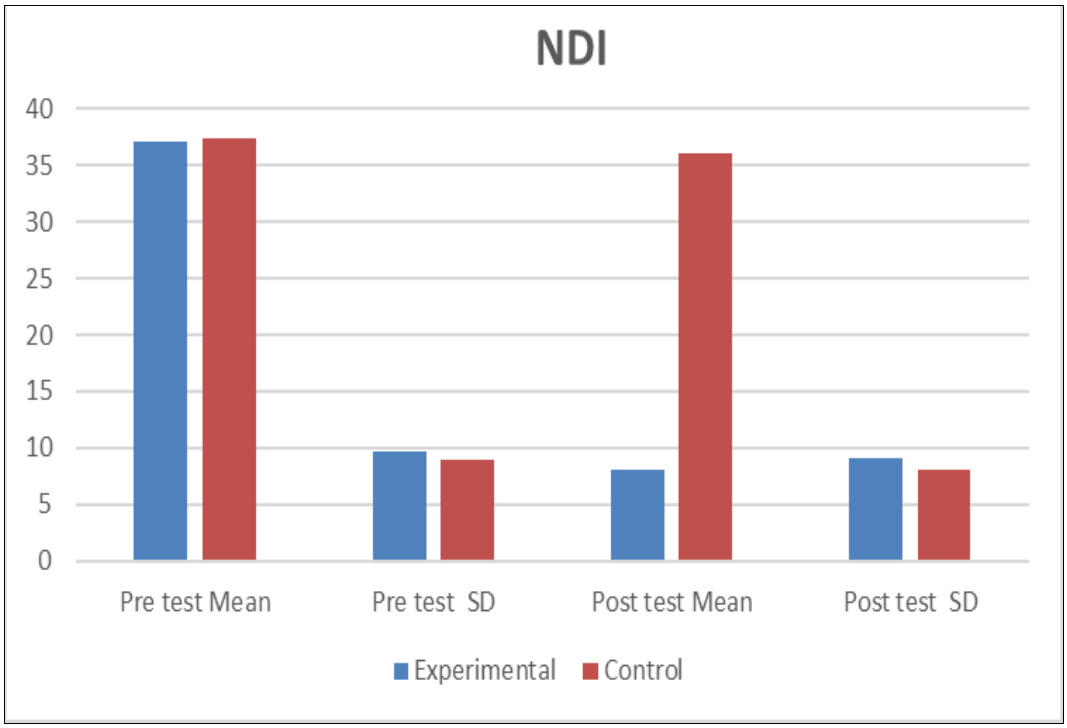


Fig 6: NDI

Table 2: Mean, S.D. and t-value to compare Pre-test & Post-test Neck Disability Index in Experimental Group

Test	Mean	SD	Mean Change	N	*t*	df	Table value	p-value
Pre-test	37.07	9.647	28.93	15	13.65	14	4.073	<0.001
Post test	8.13	9.054						

The mean column displays the mean pre-test and post-test disability index scores among individuals in the experimental group. SD is the standard deviations of the scores in pre & post respectively. Mean change 28.93 is the difference between pre-test and post-test (37.07-8.13). Since the t-value, 13.65 is greater than the table value 4.073, $p< 0.001$, there is a significant difference existing between the pre-test and post-test disability index scores among individuals in the experimental group. The disability index has highly significantly reduced in the post test. This proves the effect of neck isometric exercise and motor control exercise.

Table 3: Mean, S.D. and t-value to compare Pre-test Post-test Neck Disability Index In Control Group

Test	Mean	SD	Mean Change	N	*t*	Df	Table value	p-value
Pre-test	37.33	8.96	1.33	15	1.348	14	1.341	*0.2*
Post-test	36.00	8.03						

The mean column displays the mean pre-test and post-test disability index scores among individuals in the control group. SD is the standard deviations of the scores in pre & post respectively. Mean change 1.33is the difference between pre-test and post-test (37.33-36.00). Since, $p<$value is 0.2 >0.05 we do not reject the null hypothesis that there is no significant difference existing between the pre-test and post-test disability index scores among individuals in the control

group. This shows the effect of pre-exercises.
So we have seen that there is no significant reduction in disability index among the individuals in experimental group as well as in control group.
It was found that homogeneity among disability index scores in the pre-test between experimental and control groups and hence prove the effect of isometric exercise and motor control exercise by comparing the post-test disability index scores between experimental and control groups.

Table 4: Mean, S.D. and t-value to compare the pre-test Neck Disability Index scores between Experimental and Control Groups using t-test

Group	Pre-test Mean	S.D.	Difference in mean	N	t	df	Table value	p-value
Experimental	37.07	9.64	0.67	30	078	28	1.310	*0.93*
Control	37.33	8.96						

The Mean column in the t test table displays the mean pre-test disability index scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (3.067) shows the difference between mean in two groups (37.07-37.33). Since the t-value 078, p-value0.93>0.05, there is no significant difference in pre-test disability index scores between the experimental and the control groups. So we can consider the groups as homogenous in the baseline level.

Table 5: Mean, S.D. and t-value to compare the post-test Neck Disability Index scores between Experimental and Control Groups using t-test

Group	Mean	S.D.	Difference in mean	N	t	df	Table Value	p-value
Experimental	8.13	9.05	27.867	30	0.649	28	3.646	0.001
Control	36.0	8.03						

The Mean column in the t test table displays the mean post-test disability index scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (-27.8) shows the difference between post-test mean in two groups (8.13-36.0). Since the *t-value* 0.64 is greater than the *table value* 3.646, *p-value*< 0.01, there is a significant difference in post-test disability index scores between the experimental and the control groups.
Hence isometric and motor control exercise has significant high effect as compared with pre-exercises.

Statistical analysis of pain using t-tests

Table 6: Comparison of Pre-test Post-test pain in Experimental and Control Groups

	Pre-test mean	SD	Post-test mean	SD
Experimental	6.47	1.457	2.27	1.486
Control	6.53	1.552	6.40	1.404

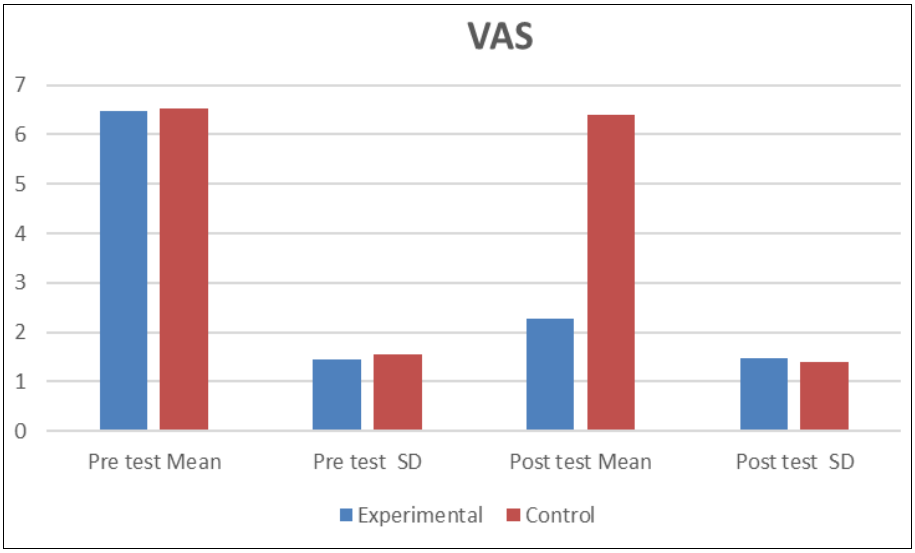


Fig 7: Comparison of Pre-test Post-test pain in Experimental and Control Groups

Table 7: Mean, S.D. and t-value to compare Pre-test & Post-test pain in Experimental Group

Test	Mean	SD	Mean Change	N	*t*	df	Table value	p-value
Pre-test	6.47	1.457	4.200	15	12.860	14	4.073	0.001
Post-test	2.27	1.486						

The mean column displays the mean pre-test and post-test pain scores among individuals in the experimental group. SD is the standard deviations of the scores in pre & post respectively. Mean change 4.20 is the difference between pre-test and post-test (6.47-2.27). Since the t-value, 12.860 is greater than the table value 4.07, $p< 0.01$, there is a significant difference existing between the pre-test and post-test pain scores among individuals in the experimental group. The pain

has significantly reduced in the post test. This proves the effect of therapeutic exercise program on pain.

Table 8: Mean, S.D. and t-value to compare Pre-test & Post-test pain In Control Group

Test	Mean	SD	Mean Change	N	*t*	*Df*	*Table value*	*p-value*
Pre-test	6.53	1.552	0.13	15	0.299	14	1.341	*0.769*
Post-test	6.40	1.404						

The mean column displays the mean pre-test and post-test pain scores among individuals in the control group. SD is the standard deviations of the scores in pre & post respectively. Mean change 0.13 is the difference between pre-test and post-test (6.53-6.40). Since the t value, 0.769 p value is 0.769>0.05, there is no significant difference existing between the pre-test and post-test pain scores among individuals in the control group.

So we have seen that there is no significant reduction in pain among the individuals in experimental group than in control group.

It was found that homogeneity among pain scores in the pre-test between experimental and control groups and hence prove the effect of therapeutic exercise program by comparing the post-test pain scores between experimental and control groups.

Table 9: Mean, S.D. and t-value to compare the pre-test pain scores between Experimental and Control Groups using t-test

Group	Pre-test Mean	S.D.	Difference in mean	N	t	df	Table value	p-value
Experimental	6.47	1.45	0.067	30	0.121	28	1.310	0.904
Control	6.53	1.55						

The Mean column in the t test table displays the mean pre-test pain scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores intwo groups. The difference (0.067) shows the difference between mean pre-test in two groups (6.47 -6.54). Since the t-value 0.121 p value 0.904> 0.05, there is no significant difference in pre-test pain scores between the experimental and the control groups. So we can consider the groups as homogenous in the baseline level.

Table 10: Mean, S.D. and t-value to compare the post-test pain scores between Experimental and Control Groups using t-test

Group	Mean	S.D.	Difference in mean	n	t	df	Table value	p-value
Experimental	2.27	1.486	4.133	30	7.829	28	3.646	0.001
Control	6.40	1.404						

The Mean column in the t test table displays the mean post-test pain scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (4.13) shows the difference between post-test mean in two groups (2.27-6.40). Since the t-value 7.82, is greater than the table value 3.646, p-value< 0.01, there is a highly significant difference in post-test pain scores between the experimental and the control groups. The pain in the experimental group is significantly low.

Hence therapeutic exercise programs significant high effect as compared with control group.

Statistical analysis of Fear avoidance beliefs questionnaire using t-tests

Table 11: Comparison of Pre-test Post-test Fear avoidance beliefs questionnaire in Experimental and Control Groups

Group	Pre-test mean	SD	Post-test mean	SD
Experimental	39.47	9.06	13.27	9.96
Control	39.00	9.76	39.40	7.81

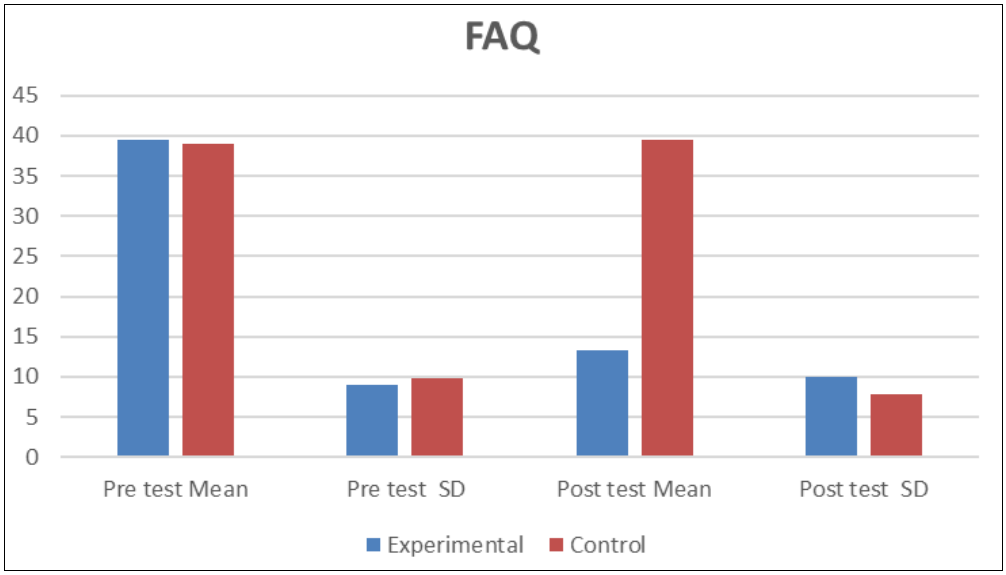


Fig 8: VAS

Table 12: Mean, S.D. and t-value to compare Pre-test & Post-test Fear avoidance beliefs questionnaire in Experimental Group

Test	Mean	SD	Mean Change	N	t	df	Table value	p-value
Pre-test	39.47	9.06	26.20	15	8.831	14	4.073	0.001
Post test	13.27	9.96						

The mean column displays the mean pre-test and post-test disability index scores among individuals in the experimental group. SD is the standard deviations of the scores in pre-& post respectively. Mean change 26.20 is the difference between pre-test and post-test (39.47-13.27). Since the *t-value*, 8.831is greater than the table value 4.073, $p< 0.001$, there is a significant difference existing between the pre-test and post-test fear avoidance belief scale scores among individuals in the experimental group. The fear avoidance belief score has highly significantly reduced in the post test. This proves the effect of neck isometric exercise and motor control exercise.

Table 13: Mean, S.D. and t-value to compare Pre-test Post-test Fear avoidance beliefs questionnaire In Control Group

Test	Mean	SD	Mean Change	N	t	df	Table value	p-value
Pre-test	39.00	9.769	0.400	15	0.395	14	1.341	0.699
Post-test	39.40	7.818						

The mean column displays the mean pre-test and post-test pain scores among individuals in the control group. SD is the standard deviations of the scores in pre & post respectively. Mean change 0.400 is the difference between pre-test and post-test (39.00-39.40). Since the t value,0.395,p value is 0.6> 0.05, there is no significant difference existing between the pre-test and post-test fear avoidance scores among individuals in the control group. As compared to the experimental group the control group shows less significant difference.

So we have seen that there is no significant reduction in fear avoidance among the individuals in experimental group than in control group.

It was found that homogeneity among pain scores in the pre-test between experimental and control groups and hence prove the effect of therapeutic exercise program by comparing the post-test pain scores between experimental and control groups.

Table 14: Mean, S.D. and t-value to compare the pre-test Fear avoidance beliefs questionnaire scores between Experimental and Control Groups using t-test

Group	Pre-test Mean	S.D.	Difference in mean	N	t	df	Table Value	p-value
Experimental	39.47	9.06	0.893	30	1.36	28	1.310	0.89
Control	39.40	7.81						

The Mean column in the t test table displays the mean pre-test pain scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (0.893) shows the difference between mean pre-test in two groups (39.47-39.40). Since the t-value 1.36, p value is 0.89>0.05, there is no significant difference in pre-test fear scores between the experimental and the control groups. So we can consider the groups as homogenous in the baseline level

Table 15: Mean, S.D. and t-value to compare the post-test Fear avoidance beliefs questionnaire scores between Experimental and Control Groups using t-test

Group	Mean	S.D.	Difference in mean	n	t	df	Table value	p-value
Experimental	13.27	9.960	26.133	30	7.994	28	3.646	0.001
Control	39.40	7.818						

The Mean column in the t test table displays the mean post-test fear avoidance scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (26.133) shows the difference between post-test mean in two groups (13.27-39.40). Since the t-value 7.994, is greater than the table value 3.646, p-value< 0.01, there is a highly significant difference in post-test fear avoidance scores between the experimental and the control groups. The pain in the experimental group is significantly low.

Hence therapeutic exercise programs significant high effect as compared with control group.

Discussions

The purpose of this study was to find out the combined effect of motor control exercise and isometric neck exercise of nonspecific neck pain. In this study Indo American Hospital at Vaikom, Chemmanakary, Bcf college of physiotherapy, Kinder Hospital was taken into consideration. Subjects were selected after screening for fulfillment of inclusion and exclusion criteria. After explaining the procedure willing patients was included in this study. The willing patients was randomly divided into 2 group equally (Experimental and control group)

Control group continued with their ongoing activities and experimental group underwent the therapeutic exercise for neck pain. The treatment time was 30 minutes per session for 3 times per week. Total duration of treatment session was 3 week.

Motor control exercise is a popular form of exercise that aim in restore coordination and efficient use of the muscle that control and support the neck. The physiological basis of motor control training is based on relearning principles of movement pattern and functional activities facilitating corrected neck muscle behaviour.

The mechanism of pain reduction after giving isometric exercise might be due to increase in endorphins that occur usually after training and better neuromuscular control. The strong muscle contraction happens during isometric exercise which activate muscle stretch receptors. These afferents from the receptors causes endogenous opioids to be released and also causes the release of beta endorphins from the pituitary gland, these secretions may cause decrease in pain.

Rajalaxmi v. *et al.*, (2019) found that Motor Control Exercise has high impact on neck pain and led to marked relief in pain intensity, disability and in improving the endurance of the neck muscle. Motor control exercises produced statistically significant changes in all the variables of the neck region in the post-intervention measurement rather than the endurance and conventional training group.

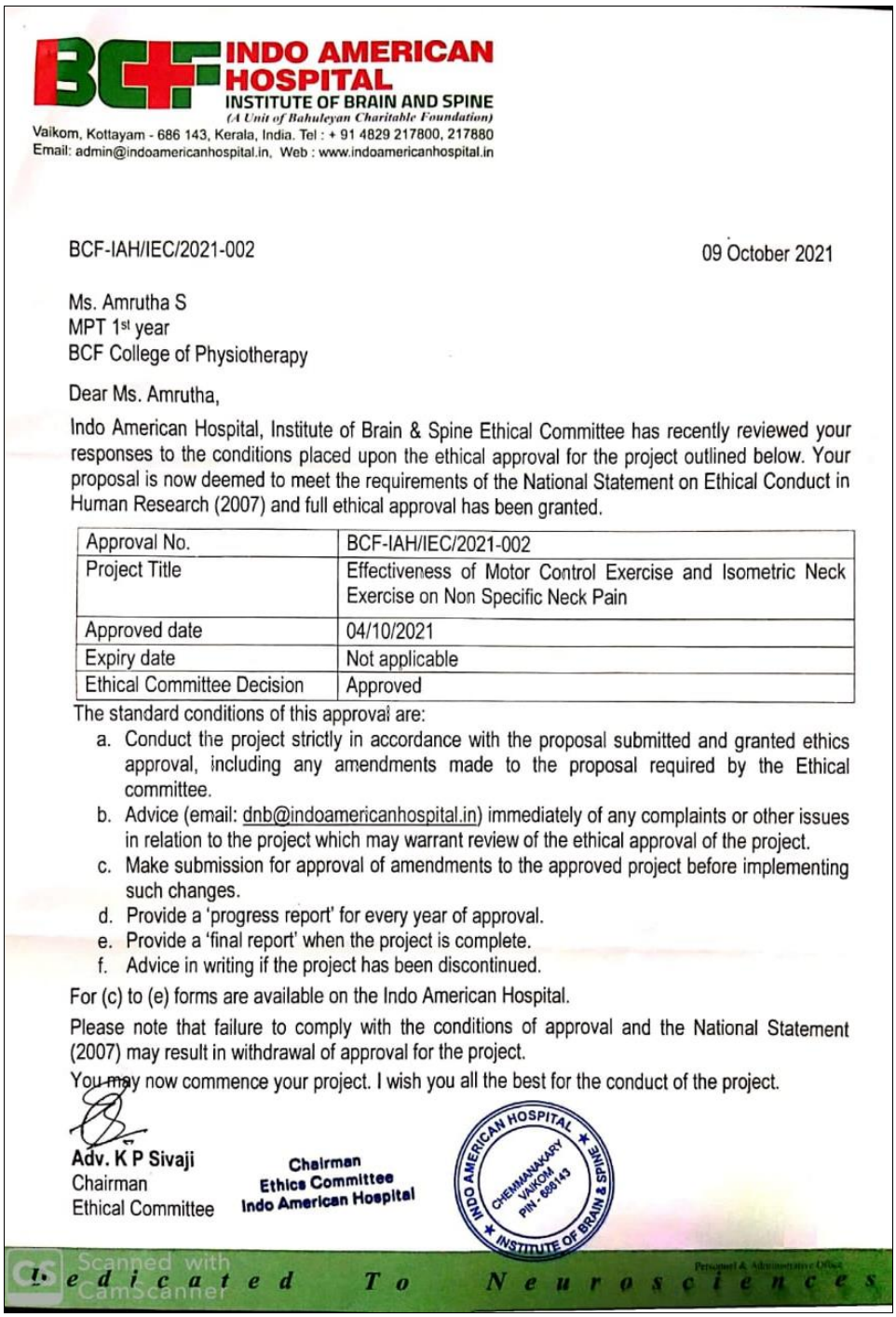
Shaji john kachanathu *et al.*, 2014 found that the isometric exercise groups in neutral or functional positions had better

improvement especially in terms of pain reduction and neck functional ability.

On statistical analysis of Visual Analogue Scale scores, the mean pre-treatment pain score of control and experimental group was 5.93 and 6.47 and mean post treatment pain scores of control and experimental group was 4.73 and 1.87respectively, indicates that there is a considerable decrease in pain in experimental group.

On statistical analysis the mean pre-treatment NDI scores of experimental and control group were 37.07 and34.0 and mean post-treatment NDI scores of experimental and control group was 5.07 and 32.07 respectively. This shows there is a significant difference existing between the experimental and control group.

On statistical analysis the mean pre-treatment FABQ scores of experimental and control group were 39.47 and 38.27and mean post-treatment FABQ scores of experimental and control group was 11.33and 32.67 respectively. This shows there is a significant difference existing between the experimental and control group.



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BCF-IAH/IEC/2021-002 09 October 2021

Ms. Amrutha S
MPT 1st year
BCF College of Physiotherapy

Dear Ms. Amrutha,

Indo American Hospital, Institute of Brain & Spine Ethical Committee has recently reviewed your responses to the conditions placed upon the ethical approval for the project outlined below. Your proposal is now deemed to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007) and full ethical approval has been granted.

Approval No.	BCF-IAH/IEC/2021-002
Project Title	Effectiveness of Motor Control Exercise and Isometric Neck Exercise on Non Specific Neck Pain
Approved date	04/10/2021
Expiry date	Not applicable
Ethical Committee Decision	Approved

The standard conditions of this approval are:

a. Conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the Ethical committee.
b. Advice (email: dnb@indoamericanhospital.in) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project.
c. Make submission for approval of amendments to the approved project before implementing such changes.
d. Provide a 'progress report' for every year of approval.
e. Provide a 'final report' when the project is complete.
f. Advice in writing if the project has been discontinued.

For (c) to (e) forms are available on the Indo American Hospital.

Please note that failure to comply with the conditions of approval and the National Statement (2007) may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.

Adv. K P Sivaji
Chairman
Ethical Committee

Chairman
Ethics Committee
Indo American Hospital

INDO AMERICAN HOSPITAL * CHEMMANAKARY VAIKOM PIN - 686143 * INSTITUTE OF BRAIN & SPINE *

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Conclusion

Statistically it is observed that, the isometric neck exercise and motor control exercise leads to a significant improvement in strength, decrease neck pain, decreased fear of the subjects under study. Based on the performed study, it can be concluded that isometric neck exercise and motor control exercise can be performed as a daily routine to improve strength and to decrease pain on neck. However, as the study was carried out in a small sample size and for short duration with no follow up analysis the generalizability is to be taken consciously

Ethical Approval: Approved

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