A Study to Compare the Effectiveness of Sensorimotor Training and Balance Exercise in Subjects with Neck Pain

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Abstract

Aim: To compare the effectiveness of sensori-motor training and balance exercise in subjects with neck pain.

Background: Impaired cervical joint position sense, sensorimotor and balance are associated with neck pain. The presence of cervical musculoskeletal impairement was not specific to cervicogenic headache but was present in various recurrent headache types.

Methodology: This study was a comparative study design with pre and post type, 50 samples were selected based on the inclusion criteria. Group A received balance exercise and Group B received sensorimotor training. Both groups received exercises for 40 mins/session per day for 5 days a week for 12 weeks. Pre and post test measures taken using visual analogue scale, Ammer dizziness diagnostic scale, patient specific functional scale, Tinitee balance scale.

Result: On comparing the mean value of group A and group B on values, it shows significant difference between group A and group B. Group A Seems to be more effective than Group B.

Keywords: *Neck pain, balance exercises, Sensorimotor.*

Introduction

The neck pain is a common musculoskeletal disorder and a costly public health issue. The pain is often persistent or recurrent in nature. The underlying mechanisms for recurrence or persistence remain unclear but could be associated with altered proprioception from the neck muscles. Some patients usually have impaired proprioception and postural instability which account for these symptoms and the impairments can lead to decreased physical performance and increased concerns of falling, particularly the elderly. Dizziness and unsteadiness have been shown to be predictors of both poorer recovery and poorer response to musculoskeletal treatment. Thus it is important to address such symptoms and disturbances in patient with neck pain not only to gain symptomatic relief but also it reverse the impairment to improve physical performance and function[1].In people with neck pain, coordination of head movements,intersegment coordination of the vertebrae of the cervical spine, and postural balance were show to be impaired[2].There is an abundance of receptors in the cervical muscles, and there are multiple cervical central and reflex connections to the vestibular, visual, and

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postural control systems[3]. In particular, the deep portions of the suboccipital muscles have the highest cervical receptor density and are known to have a specific role in these reflex and central connections.[4]

It is estimated that between 10-40% of persons sustaining neck trauma as a result of a motor vehicle crush will go on to have chronic persistent problems. After pain, dizziness and unsteadiness are the next most frequent complaints in those with persistent problems following a whiplash trauma, with up to 70% reporting this complaints.[5].

Cervicogenic dizziness is often related to upper cervical degeneration or a neck injury, such as whiplash. It is thought to result from a perturbation in sensory information from the upper cervical spine[6]. Neck pain has been shown to be associated with balance disturbances and gait speed are also known to decline with ageing.[7] Neck pain is related to impaired postural balance among patients and is highly prevalent among workers with high postural demands.[8] Dysfunction of the cervical receptors in neck disorders can alter afferent input subsequently changing the integration timing and tuning of sensorimotor control.[9]

Disturbances of balance have been found both in patients with whiplash associated disorders and idiopathic neck pain, neck pain precipitated by trauma resulted in greater or different balance impairments.[10] Impaired cervical joint position sense is commonly argued to rely on abnormal cervical input .if true muscle vibration, alternating afferent input, but not in mental interventions should have an effect on head repositioning acuity and neck pain perception.[11] The role of deep cervical flexor muscles in postural support and the knowledge of impaired activation of these muscles in people with neck pain[12]. The deep portions of the sub occipital muscles have the highest cervical receptor density and are known to have a specific role in these reflex and central connections[13]. We found that greater and lesser dysfunction likewise was not related to headache classification or length of headache history. A chance in the nature of headache with age plays an important role in the choice of treatment.[14]

Reduced cervical range of motion is one of the main complaints from patients showing cervical dysfunction and seeking help from therapists[15]. The persistence of nonspecific neck pain may have a significant impact on patients with health status, activity of daily living, and work-related activities resulting in poor quality of life.[16] Cervical afferent information is important to the control of posture, spatial orientation and coordination of the eyes and head[17]

Sensorimotor training emphasizes postural control and progressive challenges to the sensorimotor system to restore normal motor programmes in patient with neck pain. The balance training can effectively improve cervical sensorimotor function and decrease neck pain intensity.

Material and Method

This comparative study was conducted in the physiotherapy department took nearly 3 months to complete the study (January 2019-April 2019).50 samples were selected from 70 volunteers based on inclusion criteria of age group of 45 to 65, insidious neck pain for at least 3 months and headache associated with neck pain, able to follow the instructions and spondylolysthesis and the excluded those with previous history of neck and head trauma or surgery, known vestibular pathology, vertigo or dizziness from ear to brain disorders, sensory nerve pathways. Inflammatory joint disease, cerebellar dysfunction. Both the group received exercise for 40mins/session for 5 days a week for 12 weeks the pre and post-test measurement will be taken before and after 3 months by using VAS, patient specific functional scale, Ammer dizziness diagnostic scale, Tinetti balance scale. Group A received balance exercises and group B received sensory motor training.

Data Analysis: The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 20.0. Paired t-test was adopted to find statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

Table -1: Comparing The Values Of Vas Between Group-A And Group-B In Pre And Post Test Vluaes Using Independent (Student) t –Test

VAS	Group A		Group B		t - Test	Df	95% CI of the difference		SIG (2-tailed)
	Mean	S.D	Mean	S.D			Lower	Upper	
Pre Test	7.12	0.66	7.2	0.67	-0.842	24	-0.54	0.22	0.404*
Post Test	5.0	0.73	5.40	0.86	0.176	24	-0.41	0.49	0.861**

Table -2: Comparing The Values Of Psfs Between Group-A And Group-B In Pre And Post Test Vluaes Using Independent (Student) t –Test

PSFS	Group A		Group B		t–Test	Df	95% CI of the difference		SIG (2-tailed)
	Mean	S.D	Mean	S.D			Lower	Upper	
Pre Test	21.28	1.45	21.36	1.89	-0.168	48	-1.04	0.88	0.868*
Post Test	15.28	1.44	16.08	2.63	1.331	48	-0.40	2.0	0.190**

Table – 3: Comparing The Values Of Adds Between Group-A And Group-B In Pre And Post Test Vluaes Using Independent (Student) t –Test

ADDS	Group A		Group B		t - TEST	Df	95% CI of the difference		SIG (2-tailed)
	Mean	S.D	Mean	S.D			Lower	Upper	
Pre Test	56.48	15.1	57.08	17.95	-0.128	48	-10.03	8.83	0.899*
Post Test	31.9	6.7	33.04	6.54	-0.594	48	-4.91	2.67	0.555**

Table -4: Comparing The Values Of Tbs Between Group-A And Group-B In Pre And Post Test Vluaes Using Independent (Student) t –Test

TBS	Group A		Group B		t-Test	Df	95% CI of the difference		SIG (2-tailed)
	Mean	S.D	Mean	S.D			Lower	Upper	
Pre Test	6.5	1.98	6.2	1.82	0.594	48	-0.76	1.40	0.555*
Post Test	12.6	1.24	12.1	1.15	-1.294	48	-1.12	0.24	0.202**

Results

On comparing the mean values of VAS, both the groups have showed improvement in the post test mean values although the group-A post test mean value (5.0) showing lesser mean value is more effective than Group-B post test mean value (5.40).

On comparing the mean of PSFS, both the groups showed increased PSFS in the post test mean values. But the Group A post test mean value (16.08) showing the higher mean value is more effective than Group B post test mean value (15.28). On comparing the mean of ADDS, both the groups showed increased ADDS in the post test mean values. But the Group A post test mean value (31.09) showing the higher mean value is more effective than Group B post test mean value (33.04).

On comparing the mean of TBS, both the groups showed increased TBS in the post test mean values. But the Group A post test mean value (12.6) showing the higher mean value is more effective than Group B post test mean value (12.1).

Discussion

The present study was conducted with the sample size of 50 subjects to find out the efficacy of sensorimotor and balance exercise in subjects with neck pain. The present data indicates that balance exercise were indeed

efficient in reducing the neck pain, dizziness and in improving the functional activities of the subjects.

In a previous study by Revel et al, evaluated slow motion proprioceptive exercise which mainly concerned with eye-neck coordination for 8 weeks resulted in reduction in neck pain significantly when compared to other training group[18]. Furthermore, Gosselin et al, demonstrated that body performance can be deteriorated by fatiguing on vibrating the neck muscles[19]. Moreover, Roijezon, et al reported conversely improved balance performance was reported after neck coordination exercises[20].

Some evidence suggests that conventional treatment of manual therapy and specific therapeutic exercise directed towards neuromuscular impairments are effective interventions for relieving neck pain[21] and dizziness symptoms[22] and they improve cervical joint mobility and neck muscle performance[23]. However, these interventions are not specifically directed towards impaired cervical proprioception and balance. The effects of exercise and manual therapy on proprioception (joint reposition sense) and balance remain uncertain[24]

However, so far, all previous interventions were specifically targeting the neck muscle and postural control was assessed as the outcome measure. In contrast, additionally in this study, the exercise programs are individualized according to ongoing progress monitoring. It is expected that the findings of this trial will lead to improved clinical practice guidelines for persons with neck pain with impaired joint position sense and balance[25].

The present data highlights the importance of training balance exercise may also beneficially alter sensorimotor function of neck muscles indicated by reduction in dizziness diagnostic tool scores. In summary, the effects of balance training on subjects with neck pain seem to be reduced when comparable to those reported after intervention.

Endurance training has also showed a statistically significant improvement, however lesser the significant than the motor control exercise group[26]. The study concludes that there seems to be evidence that endurance exercise are more beneficial in general exercise program in reducing neck pain and seems to be advantageous.[27] The study concluded that samples in neck stabilization and postural correction showed better significance than stretch and strengthening exercise in reducing pain and disability and improving posture and breathing patterns[28]. This systematic review maximum studies showed that there was some improvement in neck functional abilities and reduction in neck pain in the endurance training group[29] The study concluded that the postural alignment achieved from schroth method is better than that achieved by yoga[30]

Conclusion

The present study concludes that balance exercise were indeed efficient in reducing the neck pain, dizziness and in improving the functional activities of the subjects. Although, In the post treatment analysis, both the groups showed significant change in the outcome measures of VAS, tinetti balance assessment tool, dizziness scale, and patient specific functional scale, the group A has significant changes than the group B.

Conflict of Interest: None

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Ethical Considerations: The manuscript is approved by the Institutional Review board of faculty of physiotherapy(IRB REF NO: IV C- 052/PHYSIO/ IRB/201-2019).

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