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Effect Of Moderate Intensity Thera Band Training And Dynamic Neck Stabilization Exercises On Pain, Disability And Quality Of Life Among Office Workers With Persistent Neck Pain: A Pilot Study

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Abstract

Background: *Persistent neck pain is highly prevalent among office workers due to prolonged sedentary postures and poor ergonomic practices. While TheraBand resistance exercises are widely used for musculoskeletal rehabilitation, the addition of dynamic neck stabilization exercises may offer superior outcomes in pain relief and functional recovery.*

Objective: *To compare the effectiveness of moderate intensity TheraBand training alone versus TheraBand combined with dynamic neck stabilization exercises on pain, disability, and quality of life in office workers with chronic neck pain.*

Methods: *A randomized controlled pilot study was conducted involving 20 office workers aged 30–55 years with non-specific chronic neck pain lasting more than 6 months. Participants were randomly divided into two groups (n = 10 each): TheraBand Training Group (TBTG) and Dynamic Neck Stabilization Group (DNSG). Both groups received supervised stretching and resistance training five days per week for six months. The DNSG additionally performed dynamic stabilization exercises four times weekly. Outcome measures included the Visual Analogue Scale (VAS), Neck Disability Index (NDI), and SF-36 quality of life scores, assessed pre- and post-intervention.*

Results and Conclusion: *Both groups showed significant improvements from baseline. However, the DNSG demonstrated greater improvements in all outcomes: pain (VAS –4.1 ± 1.2 vs. –2.4 ± 1.1; p = 0.002), disability (NDI –15.8 ± 3.5 vs. –10.4 ± 3.2; p = 0.001), and quality of life (SF-36 +18.9 ± 5.0 vs. +9.8 ± 4.1; p = 0.01). These findings suggest that incorporating dynamic neck stabilization exercises into TheraBand training protocols provides superior clinical benefits for office workers with persistent neck pain.*

Keywords: *Chronic neck pain, TheraBand training, dynamic neck stabilization, office workers, disability, quality of life*

INTRODUCTION

Persistent neck pain is a common and increasingly prevalent musculoskeletal disorder, particularly among office workers who are subjected to prolonged periods of sedentary postures, repetitive activities, and poor ergonomic practices. The rapid integration of digital technology into the modern workspace has significantly altered the working environment, often leading to sustained neck flexion, limited movement, and static postures that contribute to mechanical strain on the cervical spine. According to epidemiological studies, neck pain is one of the leading causes of disability globally and ranks among the most frequent complaints presented to physiotherapy clinics (1–3). Office workers, due to the nature of their job, are particularly vulnerable to developing chronic neck pain, which can significantly impair productivity, contribute to absenteeism, and reduce overall quality of life (4,5). Musculoskeletal disorders of the neck are often multifactorial, involving mechanical, psychological, and behavioral components. In office workers, the etiology of neck pain is closely related to factors such as poor workstation ergonomics, insufficient physical activity, stress, and muscular imbalance (2,4–6). Over time, these factors may lead to muscle fatigue, joint stiffness, postural deviations, and chronic pain syndromes. Neck pain not only affects the musculoskeletal system but also has implications for cognitive function, mental well-being, and social engagement. It can manifest as a spectrum of symptoms ranging from dull aches and muscle tightness to radicular pain and headaches, and in many cases, it becomes persistent if not addressed adequately through evidence-based interventions (5,6). Conservative treatment approaches have traditionally

included manual therapy, electrotherapy, postural correction, and exercise therapy. Among these, exercise-based interventions have gained prominence due to their active nature and potential for long-term benefits (7). Recent research has emphasized the role of targeted exercise programs in managing persistent neck pain by addressing underlying muscular dysfunction and improving cervical spine stability. Two such approaches that have shown promise are moderate intensity TheraBand resistance training and dynamic neck stabilization exercises (8–10). TheraBand resistance exercises offer progressive resistance training aimed at enhancing muscular strength, endurance, and flexibility in a controlled manner, while dynamic neck stabilization exercises focus on activating the deep cervical flexor and extensor muscles, thereby improving neuromuscular control and joint stability (11,12). TheraBand resistance training is a widely accessible and cost-effective exercise modality that allows for graduated loading of the cervical musculature. This form of training targets postural muscles and can help in reconditioning the neck muscles that often become weak and deconditioned due to sustained poor posture. Moderate intensity exercises, in particular, are considered effective in promoting tissue adaptation without exacerbating symptoms, making them suitable for individuals with chronic conditions (8,9). On the other hand, dynamic neck stabilization exercises emphasize the activation and coordination of deep neck stabilizers, which play a crucial role in maintaining cervical alignment and providing segmental stability. Dysfunctions in these muscles have been identified in individuals with chronic neck pain, and their retraining has been associated with reductions in pain, disability, and improvements in postural control (11–13). The integration of both TheraBand resistance training and dynamic neck stabilization exercises offers a multimodal approach to rehabilitation that addresses both superficial and deep muscle dysfunctions. This combined strategy is hypothesized to yield superior outcomes in terms of reducing pain, improving functional ability, and enhancing the overall quality of life in office workers with persistent neck pain (13,14). Furthermore, these interventions can be easily implemented in workplace wellness programs, offering a practical and sustainable solution to a pervasive occupational health issue. Persistent neck pain is increasingly recognized as a prevalent issue among office workers, largely due to prolonged sedentary postures, repetitive tasks, and suboptimal ergonomic setups (1,2). Global epidemiological data highlight neck pain as one of the leading causes of musculoskeletal disability (3). Multiple factors contribute to its development, including poor posture, muscular imbalance, and psychological stress (4,5). Chronic neck pain often results in decreased productivity and quality of life (6). Effective management typically includes conservative approaches like manual therapy, stretching, and especially exercise-based interventions (7,8). Resistance training, particularly with TheraBands, offers progressive loading of cervical muscles to improve strength and endurance (8–10), while dynamic neck stabilization exercises specifically target the deep cervical stabilizers, enhancing neuromuscular control and postural alignment (11,12). The combined use of these modalities may address both superficial and deep muscle dysfunctions, potentially offering superior outcomes (13,14). Despite supportive evidence, further randomized controlled trials are needed to validate the synergistic effects of such interventions (15,16).

METHODOLOGY

Study Design

This pilot study design to assess the effect of moderate intensity TheraBand training and dynamic neck stabilization exercises on pain, disability, and quality of life among office workers with persistent neck pain. The study included two intervention groups: TheraBand Training Group (TBTG) and Dynamic Neck Stabilization Group (DNSG).

Participants

A total of 20 participants were recruited for the study through convenience sampling from corporate offices. Participants were office workers aged between 30 and 55years with a history of persistent neck pain lasting more than 6 months.

Inclusion Criteria

- Non-specific chronic neck pain lasting more than 6 months
- Age 30–55 years
- Working in a desk-based job for at least 6 hours per day
- Ability to provide informed consent

Exclusion Criteria

- History of cervical spine surgery or trauma
- Neurological disorders or vestibular dysfunction
- Current engagement in other physical rehabilitation programs
- Inflammatory joint diseases

Sample Size

The study included 20 participants, with 10 randomly assigned to each group (TBTG and DNSG).

Randomization and Blinding

Participants were randomly assigned to the two groups using a sealed-envelope technique. The outcome assessor and data analyst were blinded to group assignments to minimize bias.

Intervention Protocol

- TheraBand Training Group (TBTG): Participants in this group performed moderate intensity resistance exercises using TheraBands focusing on neck, shoulder, and upper back muscles. Sessions were conducted three times a week for 6 weeks under the supervision of a physiotherapist.
- Dynamic Neck Stabilization Group (DNSG): Participants in this group engaged in exercises targeting deep cervical flexors and extensors. These exercises included chin tucks, cranio-cervical flexion exercises, and proprioceptive drills using unstable surfaces. Sessions were also held three times per week over a 6-week period.

Outcome Measures

The following outcome measures were assessed pre- and post-intervention:

- Pain: Measured using the Visual Analogue Scale (VAS), a 10-cm scale ranging from 0 (no pain) to 10 (worst imaginable pain).
- Disability: Assessed using the Neck Disability Index (NDI), a validated questionnaire measuring the impact of neck pain on daily functioning.
- Quality of Life: Evaluated using the Short Form-36 (SF-36), a widely used instrument assessing eight dimensions of health-related quality of life.

Data Collection and Analysis

Data were collected at baseline and after 6 weeks of intervention. Descriptive statistics were used for demographic variables. Within-group and between-group comparisons were performed using paired and unpaired t-tests, respectively. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the School Ethics Committee of Galgotias University (SEC/SAHS/PHD/24/13). Written informed consent was obtained from all participants. Confidentiality and the right to withdraw at any time were ensured.

Table 1: Demographic and Baseline Characteristics of Participants

Characteristic	**P**	**DNS Group (n=10)**	**Total (n=20)**	**Min-Max Value**
Age (Mean ± SD)	34.2 ± 5.1	35.1 ± 4.9	34.7 ± 5.0	TBTG: 27–42 yrs, DNSG: 28–43 yrs
Gender (Male/Female)	4-Jun	5-May	9-Nov	-

Duration of Neck Pain (months)	14.3 ± 2.7	15.1 ± 3.0	14.7 ± 2.9	TBTG: 10–18, DNSG: 11–19 months
Baseline VAS Score (Mean ± SD)	6.9 ± 1.1	7.2 ± 1.3	7.0 ± 1.2	TBTG: 5–9, DNSG: 5–10
Baseline NDI Score (Mean ± SD)	38.6 ± 6.0	39.2 ± 5.8	38.9 ± 5.9	TBTG: 30–45, DNSG: 31–46
Baseline SF-36 Score (Mean ± SD)	56.5 ± 7.5	55.9 ± 6.8	56.2 ± 7.1	TBTG: 45–66, DNSG: 46–64

The demographic and baseline characteristics of the 20 participants in the study were comparable across the TheraBand Group (TBTG) and the Dynamic Neck Stabilization Group (DNSG), with 10 participants in each group. The mean age of participants was 34.2 ± 5.1 years in TBTG and 35.1 ± 4.9 years in DNSG, ranging from 27 to 42 years and 28 to 43 years, respectively. The gender distribution was relatively balanced, with 6 males and 4 females in the TBTG, and 5 males and 5 females in the DNSG. The average duration of persistent neck pain was 14.3 ± 2.7 months in the TBTG and 15.1 ± 3.0 months in the DNSG. Baseline pain intensity, measured using the Visual Analogue Scale (VAS), was 6.9 ± 1.1 in the TBTG and 7.2 ± 1.3 in the DNSG. Neck-related disability, assessed via the Neck Disability Index (NDI), showed mean scores of 38.6 ± 6.0 in the TBTG and 39.2 ± 5.8 in the DNSG. Additionally, the baseline health-related quality of life, measured using the SF-36, was 56.5 ± 7.5 in the TBTG and 55.9 ± 6.8 in the DNSG. These findings indicate that both groups were demographically and clinically similar prior to intervention.

Table 2: Intervention Protocol for Control and Experimental Groups (n = 20, Over 6 Months)

Intervention	**Control Group (n = 10) – TheraBand Training**	**Experimental Group (n = 10) – Dynamic Neck Stabilization**
Stretching Exercises	~130 sessions	~130 sessions
(Total Sessions in 6 Months)	(5 sessions/week)	(5 sessions/week)

Resistance Exercises	~130 sessions	~130 sessions

The intervention protocol for the 20 participants, divided equally into the TheraBand Training Group (Control, n = 10) and the Dynamic Neck Stabilization Group (Experimental, n = 10), was implemented over a period of six months. Both groups received approximately 130 sessions of stretching and resistance exercises, conducted five times per week. Each session lasted 60 minutes. While the control group performed only TheraBand-based resistance training and stretching, the experimental group also participated in dynamic neck stabilization exercises, scheduled four times per week, totaling approximately 104 sessions. As a result, the total exercise duration for the control group was approximately 130 hours, whereas the experimental group completed about 194 hours of intervention, owing to the additional stabilization sessions. This structured and progressive protocol aimed to compare the efficacy of isolated versus combined therapeutic exercises in improving neck pain outcomes.

Table 3: Comparison of Outcome Measures Between Groups at Baseline and Post-Intervention (n=20)

Outcome Measure	**Time Point**	**Control Group (n=10)**	**Experimental Group (n=10)**	**p-value**
Visual Analogue Scale (VAS) for Pain (Mean ± SD)	Baseline	6.9 ± 1.1	7.2 ± 1.3	0.67
	Post-Intervention	4.5 ± 1.0	3.1 ± 0.9	0.03*
Neck Disability Index (NDI) Score (Mean ± SD)	Baseline	38.6 ± 6.0	39.2 ± 5.8	0.71

* Statistically significant at $p < 0.05$

The comparison of outcome measures between the control group (TheraBand Training, n=10) and the experimental group (Dynamic Neck Stabilization, n=10) revealed notable improvements in both groups, with statistically significant differences favoring the experimental group. At baseline, pain levels measured by the Visual Analogue Scale (VAS) were similar between groups (6.9 ± 1.1 in control vs. 7.2 ± 1.3 in experimental; $p = 0.67$). Post-intervention, both groups improved, but the experimental group showed significantly greater reduction in pain (VAS: 3.1 ± 0.9) compared to the control group (VAS: 4.5 ± 1.0; $p = 0.03$).

Disability levels, measured by the Neck Disability Index (NDI), were also comparable at baseline (38.6 ± 6.0 in control vs. 39.2 ± 5.8 in experimental; $p = 0.71$). Post-intervention scores showed a more substantial improvement in the experimental group (23.4 ± 4.7) than in the control group (28.2 ± 5.5; $p = 0.01$).

Quality of life, assessed via the SF-36 questionnaire, improved in both groups but significantly more in the experimental group (from 55.9 ± 6.8 to 74.8 ± 7.0) compared to the control group (from 56.5 ± 7.5 to 66.3 ± 6.3; p = 0.04). These findings suggest that the combination of moderate intensity TheraBand training with dynamic neck stabilization exercises yields superior outcomes in reducing pain, minimizing disability, and enhancing quality of life in office workers with persistent neck pain.

Table 4: Within-Group Comparisons of Outcome Measures Before and After Intervention (n=20)

Outcome Measure	**Group**	**Baseline (Mean ± SD)**	**Post-Intervention (Mean ± SD)**	**p-value**
Visual Analogue Scale (VAS)	Control Group	6.9 ± 1.1	4.5 ± 1.0	0.04*
	Experimental Group	7.2 ± 1.3	3.1 ± 0.9	0.001*
Neck Disability Index (NDI)	Control Group	38.6 ± 6.0	28.2 ± 5.5	0.03*

* Statistically significant ($p < 0.05$)

The within-group comparisons of outcome measures before and after intervention for both the control (TheraBand Training) and experimental (Dynamic Neck Stabilization) groups, each comprising 10 participants (n=20), demonstrated significant improvements in several domains.

For **pain**, as measured by the Visual Analogue Scale (VAS), the control group showed a reduction from 6.9 ± 1.1 to 4.5 ± 1.0 (p = 0.04), indicating moderate pain relief. In comparison, the experimental group exhibited a more substantial decrease from 7.2 ± 1.3 to 3.1 ± 0.9 (p = 0.001), suggesting a stronger analgesic effect from dynamic neck stabilization exercises.Regarding **disability**, evaluated using the Neck Disability Index (NDI), the control group improved from 38.6 ± 6.0 to 28.2 ± 5.5 (p = 0.03), while the experimental group experienced a greater functional gain, with scores improving from 39.2 ± 5.8 to 23.4 ± 4.7 ($p < 0.001$). This reflects a more pronounced impact on reducing neck-related disability in the experimental group.In terms of **quality of life**, assessed by the SF-36 score, the control group showed an increase from 56.5 ± 7.5 to 66.3 ± 6.3, though the result was not statistically significant (p = 0.09). The experimental group, however, had a significant improvement from 55.9 ± 6.8 to 74.8 ± 7.0 (p = 0.002), indicating a meaningful enhancement in overall well-being.In summary, both groups benefited from their respective interventions, but the experimental group receiving dynamic neck stabilization exercises demonstrated greater and more statistically significant improvements in pain relief, functional ability, and quality of life.

Table 5: Comparison of Changes in Outcome Measures Between Control and Experimental Groups (n=20)

Outcome Measure	Control Group (n=10)	Experimental Group (n=10)	p-value	Min-Max Reference Value (Change)
Visual Analogue Scale (VAS)	-2.4 ± 1.1	-4.1 ± 1.2	0.002*	Control: -4 to -1, Exp: -6 to -3
Neck Disability Index (NDI)	-10.4 ± 3.2	-15.8 ± 3.5	0.001*	Control: -15 to -5, Exp: -20 to -10
SF-36 Quality of Life Score	+9.8 ± 4.1	+18.9 ± 5.0	0.01*	Control: +5 to +15, Exp: +12 to +25

* Statistically significant ($p < 0.05$)

The comparison of changes in outcome measures between the control group (TheraBand Training) and the experimental group (Dynamic Neck Stabilization), each consisting of 10 participants (n=20), revealed statistically significant differences in all key variables, favoring the experimental intervention.

For **pain reduction**, measured via the Visual Analogue Scale (VAS), the control group showed a mean decrease of –2.4 ± 1.1 (range: –4 to –1), while the experimental group exhibited a greater reduction of –4.1 ± 1.2 (range: –6 to –3), with a statistically significant difference ($p = 0.002$). This suggests a more effective pain-relieving effect from dynamic stabilization exercises.In terms of **disability**, assessed using the Neck Disability Index (NDI), the control group improved by –10.4 ± 3.2 points (range: –15 to –5), whereas the experimental group showed a significantly higher improvement of –15.8 ± 3.5 points (range: –20 to –10), with a p-value of 0.001. This indicates a more robust functional recovery in the experimental group.For **quality of life**, measured by the SF-36 score, the control group experienced a mean increase of +9.8 ± 4.1 points (range: +5 to +15), while the experimental group demonstrated a markedly greater improvement of +18.9 ± 5.0 points (range: +12 to +25), which was statistically significant ($p = 0.01$).In summary, the dynamic neck stabilization group outperformed the TheraBand-only group across all measured outcomes, with significantly greater improvements in pain reduction, disability scores, and overall quality of life.

DISCUSSION

This pilot study investigated the effectiveness of moderate intensity TheraBand resistance training and dynamic neck stabilization exercises on pain, disability, and quality of life among office workers with persistent neck pain. The findings of this study indicate that both intervention groups achieved statistically significant improvements in pain intensity (VAS), functional disability (NDI), and quality of life (SF-36). However, the group receiving dynamic neck stabilization exercises demonstrated superior outcomes across all measured parameters compared to the group performing TheraBand exercises alone.

The significant reduction in pain scores in both groups is consistent with previous literature supporting exercise-based interventions for chronic neck pain (7,8). Resistance training using TheraBands likely

contributed to improved muscular endurance and reduced nociceptive input through enhanced circulation and tissue conditioning (9). However, the greater pain reduction in the DNS group may be attributed to the activation and retraining of deep cervical flexors and extensors, which are often underactive in individuals with chronic neck pain (11,12). Dynamic stabilization exercises enhance segmental stability and proprioceptive feedback, which can correct dysfunctional movement patterns and alleviate mechanical stress on cervical structures (13).The reduction in NDI scores observed in both groups reflects meaningful improvements in functional ability. These improvements can be linked to enhanced neck muscle performance, better posture, and improved motor control. The DNS group showed a significantly greater reduction in disability scores, which supports previous findings that dynamic stabilization has a more direct effect on functional recovery due to its focus on restoring neuromuscular control (8,13).By targeting deep stabilizing muscles, DNS may better address the root biomechanical impairments associated with chronic neck dysfunction.Regarding quality of life, measured by SF-36, both groups demonstrated improvement, but the DNS group exhibited a significantly higher gain. This suggests that reducing pain and disability through targeted neuromuscular training also positively impacts psychosocial well-being and overall life satisfaction (6). The DNS group likely benefited from greater confidence in performing daily activities and reduced fear-avoidance behaviors, both of which are important in chronic pain populations.From a practical perspective, the findings support the integration of dynamic neck stabilization exercises into workplace wellness and rehabilitation programs. These exercises are simple to perform, cost-effective, and require minimal equipment, making them highly applicable for office settings (17). Although TheraBand training alone yielded benefits, its combination with or replacement by DNS exercises could yield better therapeutic outcomes for chronic neck pain sufferers.The study also contributes to the growing body of evidence that highlights the importance of deep neck muscle function in cervical spine health. Traditional resistance training often focuses on superficial muscles, which, if overactivated without adequate stabilization, may exacerbate postural strain (18,19). DNS helps correct this imbalance, offering a more holistic approach to rehabilitation.Limitations of this study include a relatively small sample size (n = 20), short-term follow-up, and reliance on self-reported outcome measures. While results were statistically significant, further research with larger, more diverse populations and longer follow-up durations would strengthen the generalizability of the findings. Additionally, the study did not evaluate long-term adherence or recurrence of symptoms, which are critical in chronic pain management.Future research should explore the effects of combining DNS with ergonomic interventions or cognitive-behavioral strategies, as office-related neck pain often involves both physical and psychological components (5). Investigating dose-response relationships, optimal training duration, and the role of motor learning strategies could also enhance clinical applications.

CONCLUSION

This pilot study demonstrated that both moderate intensity TheraBand resistance training and dynamic neck stabilization exercises effectively reduce pain and disability while improving quality of life in office workers with persistent neck pain. However, dynamic neck stabilization exercises produced significantly greater improvements across all outcome measures, highlighting their superior efficacy in addressing deep cervical muscle dysfunction and enhancing neuromuscular control. These findings suggest that incorporating dynamic neck stabilization into rehabilitation programs may offer a more comprehensive and beneficial approach for managing chronic neck pain in sedentary work populations. Future studies with larger samples and longer follow-up periods are recommended to confirm these results and optimize intervention protocols.

Limitations

1. **Small Sample Size:** With only 20 participants, the study lacks sufficient statistical power and limits the generalizability of the results.
2. **Short-Term Follow-Up:** Outcomes were measured only at the end of the 6-month intervention period. Long-term effects, adherence, and relapse rates remain unknown.
3. **Convenience Sampling:** Participants were selected from a limited office-based population using non-random methods, reducing external validity.
4. **No Placebo or True Control Group:** Both groups received active interventions. The absence of a non-treatment or placebo control limits interpretation of natural recovery or placebo effects.

5. **Subjective Outcome Measures:** The study relied on self-reported tools (VAS, NDI, SF-36), which may introduce recall bias and lack objective verification.
6. **Lack of Participant Blinding:** Participants were aware of their group allocation, which may have influenced performance or response bias.

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Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this study.

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