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Effect of Vestibular Telerehabilitation in Motion Sickness Among Healthy Individuals- A Randomized Control Trial

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ABSTRACT

Background

Motion sickness encompasses a group of symptoms that arise due to actual or perceived motion of an individual or their environment. This can induce a stress response resulting in various autonomic manifestations. Vestibular therapy enhances both static and dynamic balance by utilizing the brain's neuroplasticity. Telerehabilitation is a modern approach that extends therapeutic services beyond conventional clinical settings using digital platforms.

Objective

This study aimed to find the impact of vestibular telerehabilitation on motion sickness in healthy adult individuals.

Methods

42 healthy individuals between the ages of 18 and 40 were split into two groups at random: Group A (experimental group, n = 21) and Group B (control group, n = 21). Over the course of six weeks, the intervention plan called for twice-daily, five-minute sessions. The Motion Sickness Assessment Questionnaire (MSAQ), the Misery Scale (MISC), and the Motion Sensitivity Quotient (MSQ) were used to measure motion sickness symptoms both before and after the intervention.

Results

Motion sickness symptoms were shown to have decreased statistically significantly (p<0.05) in the experimental group following six weeks of vestibular telerehabilitation. Comparative analysis between the groups revealed that Group A experienced significantly greater improvement (p<0.05) than Group B.

Conclusion

According to the study's findings, vestibular telerehabilitation is a useful and successful strategy for lowering motion sickness symptoms in healthy people.

INTRODUCTION

Motion sickness is a disorder in which people, usually in excellent health, get sensations including nausea, vomiting, and dizziness while they move passively.[1] It manifests in various forms including car, sea, and air sickness, and can also be triggered by certain visual stimuli like 3D movies. The hallmark symptoms include queasiness, vomiting, changes in skin tone (pallor), increased sweating, excessive salivation, a sensation of stomach unease, along with fatigue, lethargy, and drowsiness—all collectively described as sopite syndrome.[2] Studies suggest that up to 60% of individuals experience some degree of motion sensitivity, and about one-third of the population may suffer from these symptoms during travel by different modes.[3] This condition often starts in early childhood and may persist subtly into later life, contributing to chronic low-level motion sensitivity. Furthermore, Motion sickness is generally more prevalent among women, which has been linked to hormonal factors such as menstruation, pregnancy, contraceptive use, and cortisol fluctuations.[4]

Motion sickness occurs when there is a mismatch between the sensory information that the brain expects and the actual input from the visual, vestibular, and somatosensory systems, according to Reason and Brand's sensory conflict theory.[5] Studies have shown that people with complete vestibular dysfunction do not develop motion sickness, even in situations that typically trigger it.[6] Essentially, motion or sensory input that the nervous system cannot interpret or adapt to properly may trigger unusual activation of pathways that connect the vestibular system to autonomic functions, ultimately leading to motion sickness.[7]

Evidence also suggests that gradually increasing exposure to motion stimuli can improve tolerance and reduce symptoms. An individual's susceptibility to motion sickness is believed to be influenced by how sensitive the vestibular system is, as well as its ability to adapt and retain those adaptations.[8]

The vestibulo-ocular reflex is one of the many ways the vestibular system contributes to the preservation of orientation and balance.This reflex enables the eyes to stabilize vision during head movements. When the brain is unable to properly adapt to the VOR, a mismatch occurs between visual and vestibular input, potentially leading to motion sickness. [9]

Treatment strategies for motion sickness include pharmacological, behavioral, physical, and dietary approaches. Medications such as H1 antihistamines, anticholinergics, and antiemetics are commonly used. However, prolonged use of these drugs may hinder the brain's compensatory processes, as they can reduce the nervous system's ability to habituate to motion stimuli. This lack of neural adaptation can delay recovery.[10]

Non-drug interventions have also been explored with promising results. These include autogenic feedback, habituation training, guided imagery, nutritional support, plant-based therapies, music therapy, and breathing techniques. [11]

Vestibular rehabilitation is one such non-pharmacological approach that has been extensively documented in the literature for managing motion sickness. It employs neuroplasticity-based methods to enhance both static and dynamic balance, as well as to refine the interaction between visual and vestibular systems.[12] The primary goal is to retrain the vestibulo-ocular reflex and progressively desensitize individuals to motion stimuli through repeated exposure.

Telerehabilitation is an emerging technology where rehabilitation is provided beyond the area of traditional healthcare facilities. This has bridged the physical, financial, and logistic gap in patient care delivery. Video-based telerehabilitation includes direct therapy sessions, consultation, disease monitoring, and patient and caregiver education irrespective of the distance[13].A study by Rosa Ortiz and Roberto Cano et al. found that telerehabilitation is effective in treating Multiple sclerosis patients.[14] a study by Steven Truijen et al. found that Telerehabilitation has demonstrated its value as a supportive extension to traditional therapy, especially in post-clinical rehabilitation settings.[15]

Given the established success of telerehabilitation in various patient populations and the proven efficacy of vestibular rehabilitation in managing motion sickness, this study was designed to investigate the combined approach. Specifically, the objective was to evaluate the effectiveness of vestibular telerehabilitation in reducing motion sickness symptoms among healthy individuals.

MATERIALS AND METHODS

This study was carried out between March and December 2022 using a randomized controlled trial methodology. Participants were recruited from various regions across India. The inclusion criteria specified individuals aged between 18 and 40 years[16], those who voluntarily agreed to participate, individuals experiencing symptoms of motion sickness, and those with access to internet-enabled smart devices such as smartphones, tablets, or laptops. The exclusion criteria included individuals diagnosed with acute or chronic vestibular disorders, a history of ear surgery, presence of neurological conditions, or those currently taking medications to manage motion sickness.

The tools and equipment utilized in the study included a laptop or smartphone for online sessions, questionnaires for assessments, a chair and couch for exercise performance, a measuring tape, a stopwatch for timing sessions, and a scoring sheet for documenting results.

SAMPLE SIZE ESTIMATION

The study required 42 individuals in total, based on an expected large effect size of 0.80, statistical power of 80%, and a significance threshold of 0.05. Participants were randomly assigned to one of two groups, the control group or the intervention group, after their eligibility was confirmed.

OUTCOME MEASURES

- **Primary Outcome Measure:** Motion Sensitivity Quotient (MSQ)
- **Secondary Outcome Measures:** Motion Sickness Assessment Questionnaire (MSAQ), Misery Scale (MISC)

Both the institutional research review committee and the institutional ethics committee approved the study. Forty-two individuals with motion sickness diagnoses were enlisted. Written informed consent was obtained after each participant was fully briefed about the study's methods.

For every subject, baseline evaluations and demographic information were gathered. Following that, participants were divided into two groups at random using tables and computer-generated random numbers:

- **Group 1 (Experimental Group):** Received Vestibular Telerehabilitation
- **Group 2 (Control Group):** Received Diaphragmatic and slow-paced breathing exercises

Both groups continued their regular training programs throughout the study period.

Intervention Protocol:

Sessions were conducted twice daily for 5 minutes each, 7 days a week, over a 6-week period.

Outcome assessments were performed by blinded assessors who were unaware of group allocations.

Participants were comfortably seated on a chair to perform the following exercises:

Exercise 1 - Head Shake: The participant completed ten head rotations in ten seconds by moving their head from right to left and back again. Then, while keeping their eyes on the direction the head was pointed, they turned their head as far as was comfortable.After completing the initial 10 turns, the subject rested for 10 seconds before performing another set of 10 turns within the subsequent 10 seconds.

1. **Exercise 2 - Head Nod:** The subject nodded their head up and down 10 times in 10 seconds. Next, they tilted their head as far forward as comfortably possible while keeping their gaze directed where the head pointed. After finishing the first 10 nods, the subject rested for 10 seconds and then repeated another 10 nods within the next 10 seconds.
2. **Exercise 3 - Head Shake with Eyes Closed:** The subject repeated the head shaking exercise described in Exercise 1 but with their eyes closed. After completing 10 turns, the subject waited for 10 seconds, then performed 10 additional turns within 10 seconds.
3. **Exercise 4 - Head Nod with Eyes Closed:** The subject carried out the head nod exercise as in Exercise 2, but with eyes closed. Following 10 nods, a 10-second rest was taken before performing 10 more nods over the next 10 seconds.
4. **Exercise 5 - Shake and Fixate:** The subject held one finger pointed upward in front of them and executed the head shake exercise while maintaining fixed gaze on the finger, without moving their eyes. After 10 turns, they rested for 10 seconds and then completed another 10 turns in 10 seconds.
5. **Exercise 6 - Nod and Fixate:** The subject held a finger pointed sideways in front of them and performed the head nod exercise while fixating on the finger without eye movement. After 10 nods, the subject rested for 10 seconds before performing 10 additional nods in 10 seconds.

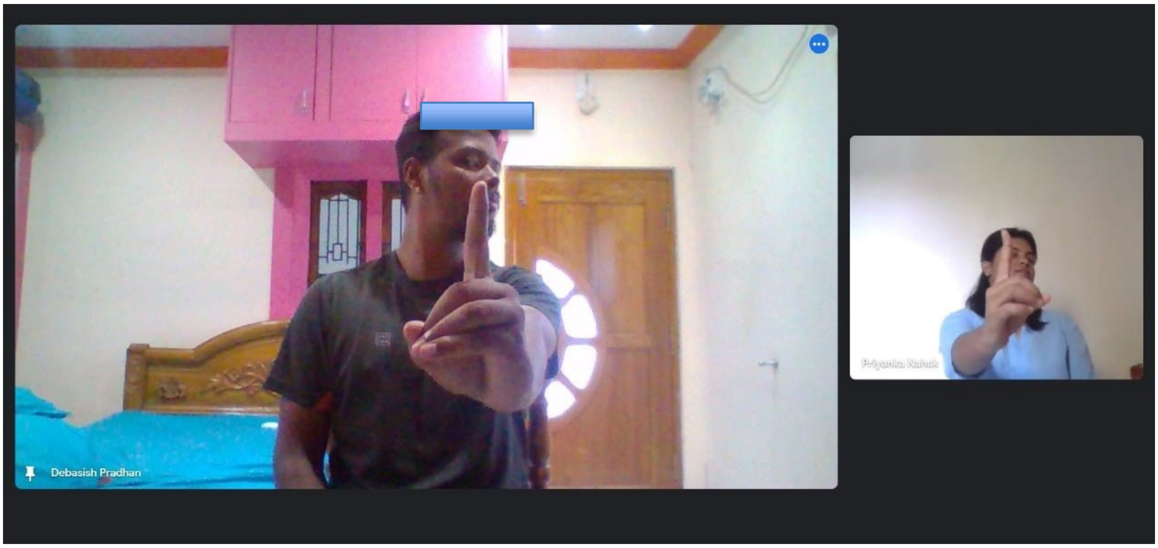


Fig- 1. Subject performing Shaking movement with eyes open and fixed gaze

Diaphragmatic Slow-Paced Breathing

Participants were instructed to avoid any actions that might increase discomfort during the breathing exercises. To begin, subjects were asked to rest comfortably in a relaxed position. They then paused and rested for 5 seconds before initiating the breathing practice. The breathing rate was guided to be between 3 and 7 breaths per minute. Each session lasted 5 minutes, conducted twice daily, 7 days a week, for a total duration of 6 weeks.

Fig-2

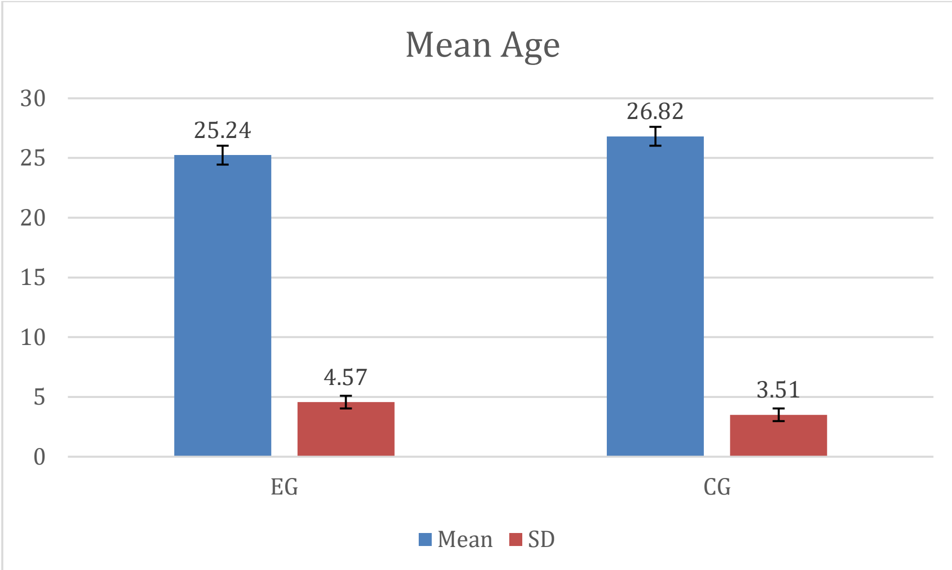
Diaphragmatic breathing exercise in telegraphic mode

STATISTICAL ANALYSIS

SPSS version 29.0 (SPSS Inc., Chicago, IL) was used to analyze the data, and a significance level of $p < 0.05$ was established. The data's normality was evaluated using the Shapiro-Wilk test. For data that had a normal distribution, descriptive statistics contained means and standard deviations; for data that did not, they included medians with interquartile ranges. When comparing groups (before and after the intervention), paired t-tests were utilized for normally distributed data and the Wilcoxon signed-rank test for non-normal data. The Mann-Whitney U test was used for variables that did not meet the normality assumption, and independent t-tests for variables that were normally distributed in between-group comparisons (experimental vs. control).

TABLE 1.1.Mean Age nalysis

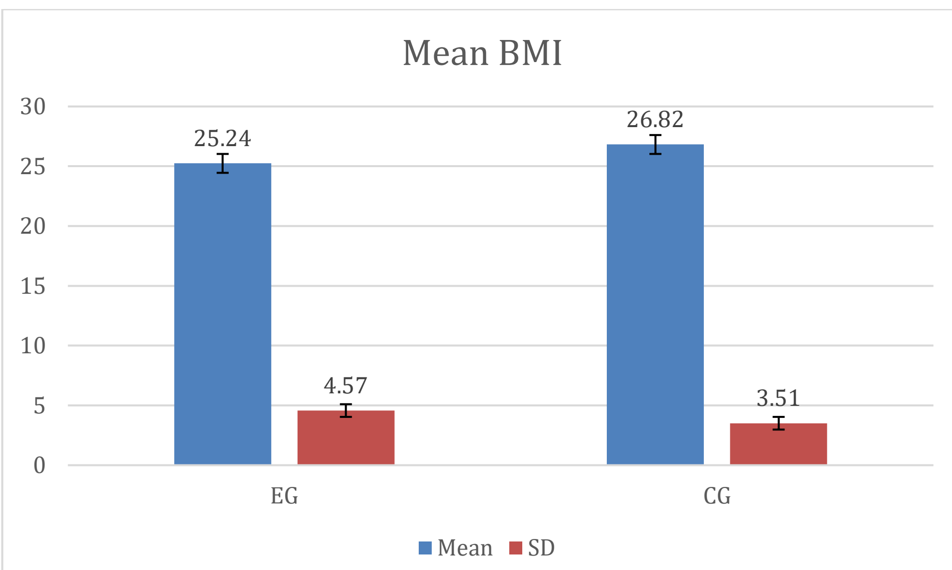
Group	Mean	SD
Experimental group	28.38	4.66
Control group	32.57	4.87



Graph- 1.1 Mean Age Analysis

TABLE 1.2.Mean BMI Analysis

Group	Mean	SD
Experimental group	25.24	4.57
Control group	26.82	3.51

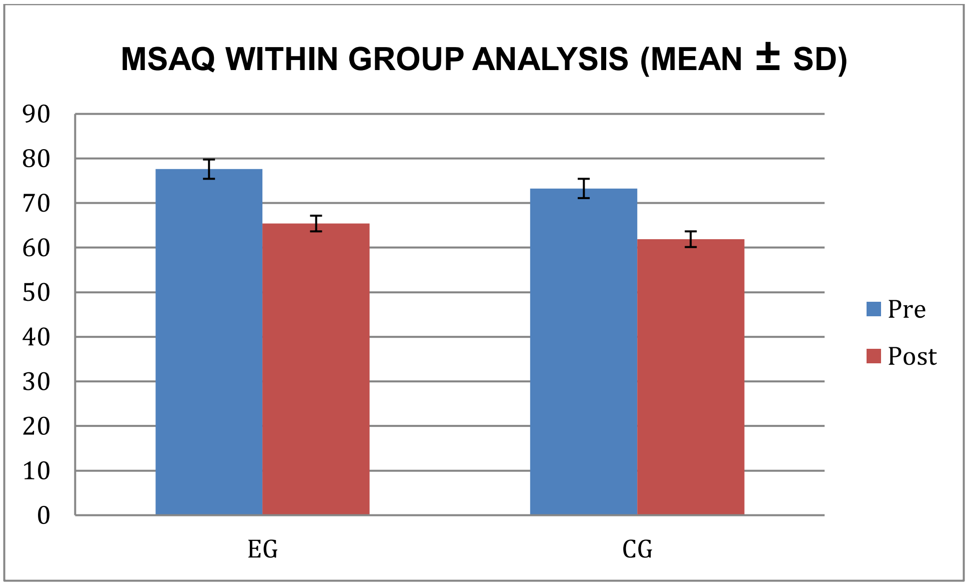


Graph- 1.2 Mean BMI Analysis

MSAQ analysis with paired t test indicates statistically significant difference within the group in Vestibular Rehabilitation group ($p < 0.05$), Control group ($p < 0.05$).The difference in mean value was reported as follows,experimental group > CON group

TABLE 1.3 MSAQ MEASURE FOR WITHIN GROUP ANALYSIS

Group	Pre MSAQ	Post MSAQ	P value	Mean diff
Experimental Group	77.61 ±10.88	65.42 ±11.86	0.001	12.66
Control Group	73.28 ±7.97	61.90 ±8.37	0.001	11.38

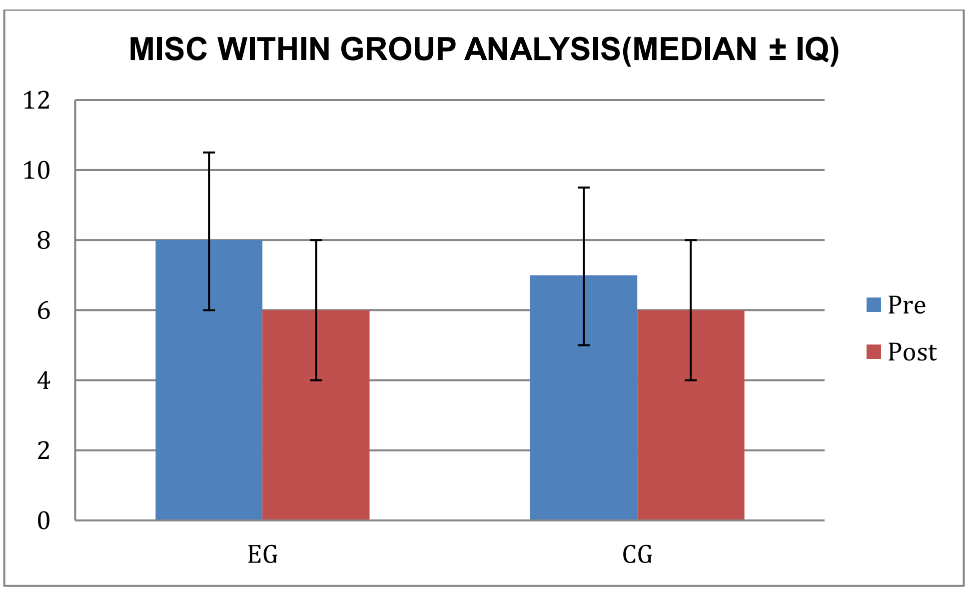


Graph 1.3 MSAQ MEASURE FOR WITHIN GROUP ANALYSIS

Analysis of the Misery Scale using the Wilcoxon signed-rank test revealed a statistically significant difference within both the Vestibular Rehabilitation group and the Control group ($p < 0.05$). The experimental group showed a greater mean change compared to the control group.

TABLE 1.4 MISC MEASURE FOR WITHIN-GROUP ANALYSIS

Group	Pre MISC	Post MISC	P value	Mean diff
Experimental Group	8 ±2.5	6 ±2	0.001	2
Control Group	7 ±2	6 ±2	0.001	1

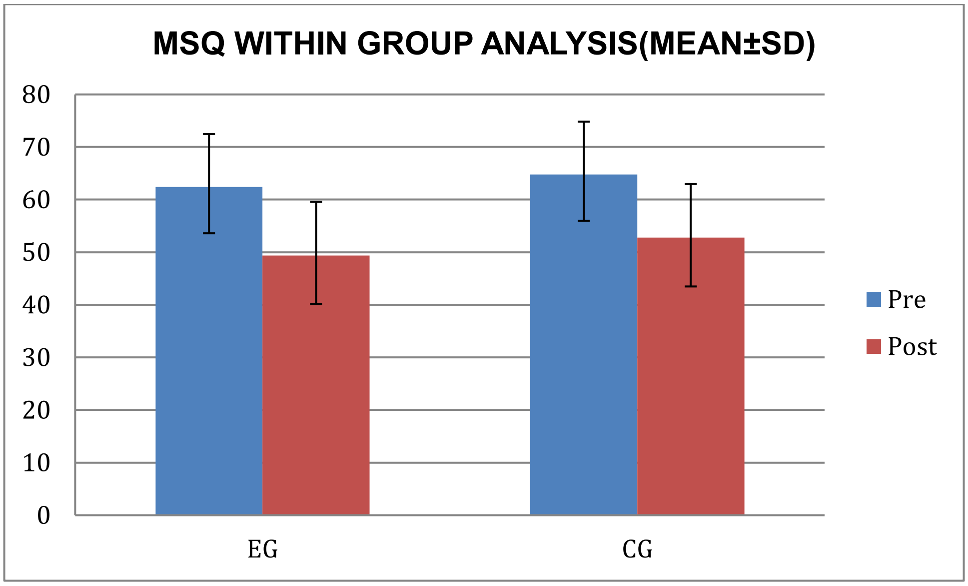


Graph 1.4 MISC MEASURE FOR WITHIN-GROUP ANALYSIS

MSQ analysis with paired t test indicates statistically significant difference within the group in Vestibular Rehabilitation group ($p < 0.05$), Control group ($p<0.05$).The difference in mean value was reported as follows, experimental group > CON group

TABLE 1.5 MSQ MEASURE FOR WITHIN GROUP ANALYSIS

Group	Pre MSQ	Post MSQ	P value	Mean diff
Experimental Group	62.42 ±10.03	49.38 ±10.19	0.001	13.04
Control Group	64.80 ±8.82	52.76 ±9.27	0.001	12.04

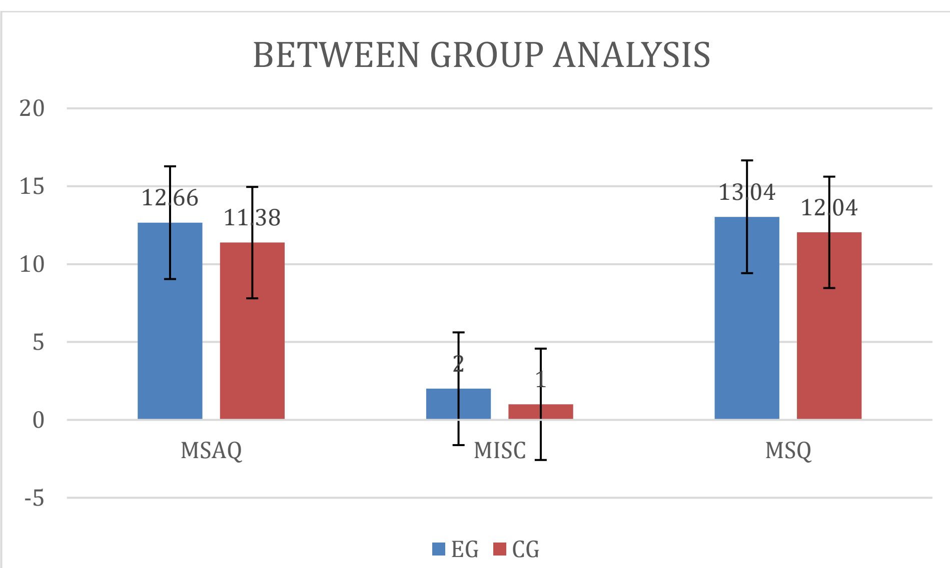


Graph 1.5 MSQ MEASURE FOR WITHIN GROUP ANALYSIS

In the independent t-test for the between-group comparison, the results revealed a statistically important difference ($p < 0.05$) on the MSAQ scores where the experimental group outperformed the control group. The Mann-Whitney U test demonstrates that there is a statistically important difference ($p < 0.05$) on the MISC scores from the experiment and the control groups with the experimental group outperforming the control group. Whereas results from the independent t-test did not show the same difference ($p > 0.05$) in MSQ scores between the two groups.

TABLE 1.5 BETWEEN GROUP ANALYSIS

Outcome	Post mean	P value
MSAQ	1.28	0.010
MISC	2.47	0.014
MSQ	1.00	0.75



Graph 1.6 BETWEEN GROUP ANALYSIS

BETWEEN-GROUP ANALYSIS

The independent t-test showed there was a statistically significant ($p < 0.05$) difference in MSAQ scores, with the experimental group outperforming the control group. The Mann-Whitney U test also showed there was a statistically significant difference ($p < 0.05$) between groups on the Misery Scale (MISC), with the experimental group once again having better outcomes. However, the independent t-test performed on the Motion Sensitivity Quotient (MSQ) showed no significant difference ($p > 0.05$) between the experimental and control groups.

DISCUSSION

The purpose of this study was to assess how vestibular telerehabilitation (VTR) affected the symptoms of motion sickness in healthy people. 42 motion-sick individuals were recruited; The control group also included 21 participants who performed diaphragm slow-paced breathing exercises. The experimental group receiving vestibular telerehabilitation also included 21 participants. The Motion Sickness Assessment Questionnaire, Motion Sensitivity Quotient , and Misery Scale were used to assess the motion sickness symptoms.

We hypothesized that vestibular telerehabilitation would lead to a significant decrease in motion sickness symptoms among healthy participants. The findings support this hypothesis, as VTR demonstrated significant improvements in two outcome measures, MSAQ and MISC, leading to acceptance of the alternative hypothesis.

Both groups showed significant post-intervention improvements after 6 weeks in MSAQ and MISC scores, with the vestibular telerehabilitation group demonstrating a larger effect size. This aligns with the known mechanisms of vestibular rehabilitation, which targets the reduction of visual-vestibular mismatch a key factor in motion sickness,thus alleviating symptoms. Nonetheless, additional research involving larger samples and a wider age range is needed to validate these results.

The vestibular telerehabilitation protocol used was similar to that described by Vincent A. van Vugt et al.[21] Consistent with their findings in chronic vestibular syndrome, our VTR group exhibited better tolerance and symptom reduction compared to controls.Vestibular telerehabilitation likely reduces gastrointestinal and sopite symptoms through habituation of the vestibular system via repetitive practice and auditory feedback. Repeated workouts encourage neural adaptation and compensation, which leads to partial or total symptom cure even though they initially cause dizziness. Additionally, these activities improve quality of life by assisting patients in overcoming avoidance and fear behaviors linked to disorientation.[16,30]

The control group performed diaphragmatic slow-paced breathing exercises delivered via tele-mode. These exercises are known to reduce central and sopite symptoms by enhancing parasympathetic nervous system activity. Matthew Edward Brannon Russell et al.[18] highlighted that diminished parasympathetic tone may precipitate motion sickness symptoms, and interventions enhancing parasympathetic activity could alleviate these symptoms. Breathing control stimulates the vagus nerve, inducing baroreflex responses that lower heart rate and increase heart rate variability—a reliable physiological index of parasympathetic tone[36].Russell et al.[18] suggested that diaphragmatic breathing combined with slowed respiration effectively increases parasympathetic tone, protecting against motion sickness during exposure to provocative stimuli.

Between-group analyses on the MSAQ and MISC scales revealed significant differences favoring the experimental group, which showed better tolerance to motion sickness and fewer symptoms such as nausea and vomiting. The repeated head nodding and shaking exercises in vestibular rehabilitation promote vestibular adaptation and reduce movement-provoked dizziness. Psychological habituation to symptoms and decreased avoidance behavior also contribute to these improvements. These positive outcomes of vestibular rehabilitation align with prior randomized controlled trials in older populations in general practice settings.[30]

The absence of a significant between-group difference in MSQ may reflect that both interventions VTR and slow-paced breathing were effective in managing vestibular provoked dizziness. The MSQ is designed to quantify sensitivity to position-induced motion[25]. Since diaphragmatic breathing is known to reduce sympathetic activity and stress arousal, it may have indirectly enhanced motion tolerance via stress-response modulation[34].

Furthermore, the control group's intervention focused on sustained, low-arousal breathing, which likely improved vagal tone, thereby reducing nausea and vertigo-related discomfort. This aligns with findings from studies involving vagus nerve stimulation and baroreflex feedback mechanisms in motion sickness contexts [18,20].

Moreover, a recent systematic review by Nuara et al.[14] concluded that telerehabilitation offers comparable efficacy to conventional therapy while improving adherence and access particularly important for non-urban populations. Our study expands this evidence base by showing that even in non-patient, healthy individuals, VTR is both feasible and effective.

LIMITATIONS

Sample size was less, Follow-up was not taken, Only qualitative measurements were taken, Female Participants were more than male Participants

FUTURE RECOMMENDATION

Future study should focus on comparison between vestibular telerehabilitation and vestibular rehabilitation, Post-intervention follow-up should be included, should focus more of quantitative measure outcome, should focus on inventing new quantitative measures for motion sickness

CONCLUSION

Based on our study's findings, we conclude that Vestibular Telerehabilitation effectively reduces motion sickness.

LIST OF ABBREVIATIONS

1. **ABSMARI –** Abhinav Bindra Sports Medicine and Research Institute
2. **BMI –** Body Mass Index
3. **PNS-**Peripheral nervous system
4. **IQ-** Interquartile Range
5. **MISC-** Misery Scale
6. **MSAQ-** Motion Sickness Assessment Questionnaire
7. **MSQ-** Motion Sensitivity Quotient
8. **MST-** Motion sensitivity test
9. **SD-** Standard Deviation
10. **SEC-** Seconds
11. **SPSS –** Statistical package for social science
12. **VTR-** Vestibular Telerehabilitation

REFERENCES

- Bertolini G, Straumann D. Moving in a moving world: a review on vestibular motion sickness. Frontiers in neurology. 2016 Feb 15;7:14.
- Zhang LL, Wang JQ, Qi RR, Pan LL, Li M, Cai YL. Motion sickness: current knowledge and recent advance. CNS neuroscience & therapeutics. 2016 Jan;22(1):15-24.
- Warwick-Evans L, Symons N, Fitch T, Burrows L. Evaluating sensory conflict and postural instability. Theories of motion sickness. Brain research bulletin. 1998 Nov 15;47(5):465-9.
- Yates BJ, Miller AD, Lucot JB. Physiological basis and pharmacology of motion sickness: an update. Brain research bulletin. 1998 Nov 15;47(5):395-406.
- Ortiz-Gutiérrez R, Cano-de-la-Cuerda R, Galán-del-Río F, Alguacil-Diego IM, Palacios-Ceña D, Miangolarra-Page JC. A telerehabilitation program improves postural control in multiple sclerosis patients: a Spanish preliminary study. International journal of environmental research and public health. 2013 Nov;10(11):5697-710.
- Truijen S, Abdullahi A, Bijsterbosch D, van Zoest E, Conijn M, Wang Y, Struyf N, Saeys W. Effect of home-based virtual reality training and Telerehabilitation on balance in individuals with Parkinson's disease, multiple sclerosis, and stroke: a systematic review and meta-analysis. Neurological Sciences. 2022 May;43(5):2995-3006.
- *Rastogi P, Khatua SS. Motion Sickness Desensitisation Therapy: An Indian Experience. Indian Journal of Aerospace Medicine. 2014 Dec 31;58(2):8-11.*
- Ipshita A, Drishti P, Lalit G, Supriya A. Vestibular rehabilitation training on balance among individuals with neck pain. Oral Sphere J Dent Health Sci. (2025); 1(3): 149-155. https://doi.org/10.63150/osjdhs.2025.12
- Szturm T, Reimer KM, Hochman J. Home-based computer gaming in vestibular rehabilitation of gaze and balance impairment. Games for health journal. 2015 Jun 1;4(3):211-20.
- Rine RM, Schubert MC, Balkany TJ. Visual-vestibular habituation and balance training for motion sickness. Physical therapy. 1999 Oct 1;79(10):949-57.
- Cha YH, Golding JF, Keshavarz B, Furman J, Kim JS, Lopez-Escamez JA, Magnusson M, Yates BJ, Lawson BD. Motion sickness diagnostic criteria: consensus document of the classification committee of the Bárány society. Journal of Vestibular Research. 2021 Jan 1;31(5):327-44.
- Rahimzadeh G, Tay A, Travica N, Lacy K, Mohamed S, Nahavandi D, Pławiak P, Qazani MC, Asadi H. Nutritional and Behavioral Countermeasures as Medication Approaches to Relieve Motion Sickness: A Comprehensive Review. Nutrients. 2023 Mar 7;15(6):1320.

- Han BI, Song HS, Kim JS. Vestibular rehabilitation therapy: review of indications, mechanisms, and key exercises. Journal of Clinical Neurology. 2011 Dec 1;7(4):184-96.
- Nuara A, Fabbri-Destro M, Scalona E, Lenzi SE, Rizzolatti G, Avanzini P. Telerehabilitation in response to constrained physical distance: an opportunity to rethink neurorehabilitative routines. Journal of neurology. 2022 Feb;269(2):627-38.
- Krueger WW. Controlling motion sickness and spatial disorientation and enhancing vestibular rehabilitation with a user-worn see-through display. The Laryngoscope. 2011 Jan;121(S2):S17-35.
- Ugur E, Konukseven BO. The potential use of virtual reality in vestibular rehabilitation of motion sickness. Auris Nasus Larynx. 2022 Oct 1;49(5):768-81
- Alahmari KA, Sparto PJ, Marchetti GF, Redfern MS, Furman JM, Whitney SL. Comparison of virtual reality based therapy with customized vestibular physical therapy for the treatment of vestibular disorders. IEEE Transactions on Neural Systems and Rehabilitation Engineering. 2013 Dec 18;22(2):389-99
- Russell ME, Hoffman B, Stromberg S, Carlson CR. Use of controlled diaphragmatic breathing for the management of motion sickness in a virtual reality environment. Applied psychophysiology and biofeedback. 2014 Dec;39:269-77.
- De Vestel C, De Hertogh W, Van Rompaey V, Vereeck L. How do patients with chronic dizziness experience a web-based home rehabilitation programme for customised vestibular therapy ('WeBaVeR')? A qualitative study. International Journal of Medical Informatics. 2023 Feb 1;170:104927.
- Gianaros PJ, Muth ER, Mordkoff JT, Levine ME, Stern RM. A questionnaire for the assessment of the multiple dimensions of motion sickness. Aviation, space, and environmental medicine. 2001 Feb;72(2):115.
- van Vugt VA, van der Wouden JC, Essery R, Yardley L, Twisk JW, van der Horst HE, Maarsingh OR. Internet based vestibular rehabilitation with and without physiotherapy support for adults aged 50 and older with a chronic vestibular syndrome in general practice: three armed randomised controlled trial. bmj. 2019 Nov 5;367.
- Haciabbasoğlu R, Araci A, Günizi H. Are Telerehabilitation Exercise Practices Effective in Patients Diagnosed with Benign Paroxysmal Positional Vertigo?. Indian Journal of Otolaryngology and Head & Neck Surgery. 2023 Apr;75(Suppl 1):557-67.
- Cowings PS, Toscano WB. Autogenic-feedback training exercise is superior to promethazine for control of motion sickness symptoms. The Journal of Clinical Pharmacology. 2000 Oct;40(10):1154-65.
- Keshavarz B, Golding JF. Motion sickness: current concepts and management. Current opinion in neurology. 2022 Feb 1;35(1):107-12.
- Akin FW, Davenport MJ. Validity and reliability of the Motion Sensitivity Test. Journal of rehabilitation research and development. 2003 Sep 1;40(5):415-22.
- Meldrum D, Herdman S, Vance R, Murray D, Malone K, Duffy D, Glennon A, McConn-Walsh R. Effectiveness of conventional versus virtual reality–based balance exercises in vestibular rehabilitation for unilateral peripheral vestibular loss: results of a randomized controlled trial. Archives of physical medicine and rehabilitation. 2015 Jul 1;96(7):1319-28.
- Bergeron M, Lortie CL, Guitton MJ. Use of virtual reality tools for vestibular disorders rehabilitation: a comprehensive analysis. Advances in medicine. 2015 Oct;2015.
- Bos JE, Bles W, Groen EL. A theory on visually induced motion sickness. Displays. 2008 Mar 1;29(2):47-57.
- Yardley L, Barker F, Muller I, Turner D, Kirby S, Mullee M, Morris A, Little P. Clinical and cost effectiveness of booklet based vestibular rehabilitation for chronic dizziness in primary care: single blind, parallel group, pragmatic, randomised controlled trial. Bmj. 2012 Jun 6;344.
- Geraghty AWA, Essery R, Kirby S, et al. Internet-based vestibular rehabilitation for older adults with chronic dizziness: a randomized controlled trial in primary care. Ann Fam Med 2017;15:209-16. doi:10.1370/afm.2070
- Kuiper OX, Bos JE, Diels C, Cammaerts K. Moving base driving simulators' potential for carsickness research. Applied Ergonomics. 2019 Nov 1;81:102889.
- Alyahya D. Effect of vestibular adaptation exercises on chronic motion sensitivity. Loma Linda University; 2015.
- Hain TC. Neurophysiology of vestibular rehabilitation. NeuroRehabilitation. 2011 Jan 1;29(2):127-41.
- Rahimi MD, Hassani P, Kheirkhah MT, Fadardi JS. Effectiveness of eye movement exercise and diaphragmatic breathing with jogging in reducing migraine symptoms: A preliminary, randomized comparison trial. Brain and Behavior. 2023 Jan;13(1):e2820.
- Martarelli, D., Cocchioni, M., Scuri, S., & Pompei, P. (2011). Diaphragmatic breathing reduces exercise-induced oxidative stress. *Evidence-Based Complementary and Alternative Medicine, 2011*, 1–7. https://doi.org/10.1093/ecam/nep169
- Cottin, F., Médigue, C., Leprêtre, P. M., Papelier, Y., Koralsztein, J. P., & Billat, V. (2008). Heart rate variability during exercise performed below and above ventilatory threshold. *Medicine & Science in Sports & Exercise, 40*(4), 683–691. https://doi.org/10.1249/MSS.0b013e31816200d6