DOI: 10.7860/JCDR/2026/88144.23690

Case Report

Physical Medicine and Rehabilitation Section

Effect of Vestibular Rehabilitation and Gaze Stabilisation Exercises in individuals with Motion Sickness: A Case Report

ISHA GOEL[1], SUBHASISH CHATTERJEE[2], MOUSUMI SAHA[3], MRITUNJAY KUMAR[4], KASHISH MAGGU[5]

ABSTRACT

Motion sickness is a vestibular disorder resulting from sensory conflict between visual, vestibular, and somatosensory inputs, leading to symptoms such as nausea, dizziness, sweating and postural instability. Vestibular Rehabilitation Therapy (VRT) is a non-pharmacological intervention that facilitates central vestibular compensation through adaptation and habituation mechanism. The present case report describes the effect of vestibular rehabilitation and gaze stabilisation exercises in a young adult with motion sickness. A 23-year-old female with complaints of motion- induced nausea and dizziness was screened using the Motion Sickness Susceptibility Questionnaire Short-Form (MSSQ- Short). Baseline symptom severity was assessed using the Motion Sensitivity Testing or Motion sensitivity Quotient (MSQ), Motion Sickness Assessment Questionnaire (MSAQ), and Vestibular Rehabilitation Benefits Questionnaire (VRBQ). Following baseline assessment, the subject underwent a four-week vestibular rehabilitation programme consisting of vestibular rehabilitation exercises and gaze stabilisation exercises, performed three sessions per week for four weeks. Post-intervention reassessment showed that there was a considerable reduction in the intensity of motion sickness, along with data on all outcomes measures that show an increase in tolerance of motion as well as visual stimuli. This case report highlights that vestibular based rehabilitation is a safe and effective non-pharmacological management approach for individuals with motion sickness.

Keywords: Dizziness, Habituation, Nausea, Young adult

CASE REPORT

A 23-year-old female presented with complaints of nausea, dizziness and discomfort during travel and exposure to visually moving environments for the past three months. The symptoms were aggravated during head movements and visually provocative situations and were relieved on rest. There was no history of neurological disorder, vestibular pathology, migraine, head injury, or systemic illness. No objective vestibular function tests (e.g., videonystagmography, caloric testing) or neuroimaging was performed, as there were no clinical features suggestive of central or peripheral vestibular pathology. The subject was not on any medication for motion sickness at that time of assessment. There was no history of hearing loss, tinnitus, aural fullness, recurrent ear infections, or prior otological surgery.

On general examination, the subject was moderately built, with a height of 158.4 cm and body weight of 68 kg, resulting in a Body Mass Index (BMI) of 27 kg/m^2. Neurological examination did not reveal any abnormal findings. Based on the presenting complaints, the subject was screened for motion sickness susceptibility using the MSSQ-Short [1], which resulted a high susceptibility to motion sickness.

Baseline assessment of symptom severity was performed using the MSQ [2], MSAQ [3], and VRBQ [4]. The baseline scores showed moderate to severe motion sickness symptoms, (MSQ score of 29.29, MSAQ score of 59.02% and VRBQ of 30.40%) that interfered with day-to-day activities and tolerance to motion and surroundings with complex environments.

Based on the clinical presentation, symptom profile, and absence of neurological or otological red flag signs, the patient was diagnosed with motion sickness.

The participant participated in a structured vestibular rehabilitation programme for a duration of four weeks, with three sessions per week, after the baseline evaluation. Each treatment session lasted for 30-40 minutes approximately, including exercise performance and rest intervals. Exercises for vestibular rehabilitation and gaze stabilisation were part of each session, with a one-minute break in between. Patient tolerance was monitored during each session and exercises were adjusted if excessive discomfort occurred. Exercise intensity and complexity were progressively increased over four-week period based on patient tolerance. Progression involved increasing head movement speed, reducing rest intervals, narrowing base of support and performing tasks with eyes closed. The goal of the intervention was to enhance visual-vestibular interaction, habituate to motion stimuli and facilitate vestibular adaptation. The patient provided written informed consent to participate in the present case study and to publish clinically relevant information and outcomes, with the assurance that her personal details would remain confidential.

Vestibular rehabilitation exercises included moving eyes up and down, slowly, and then quickly for 2 minutes and then to left and right slowly and then quickly for two minutes in standing [Table/Fig-1]. Second was to stand with one arm elevated over the head, with eyes looking at the elevated hand, then bend over and lower the arm diagonally with eyes continuously at the hand until the hand arrives at the opposite foot (5 times) [Table/Fig-2]. Third was to throw the ball from one hand to other following it with eyes in sitting (10 times) [Table/Fig-3]. Fourth, was to walk in a hallway with eyes opened and walk in a hallway with eyes closed (one minute each). Next was to stand with hand on a firm object, eyes closed and March in place counting to 30. Gradually lift off the hand in an attempt not to use it and March for another count to 30. Last, was to place a cushion on the floor 5 ft away from the firm object, a sheet of paper was placed on wall with horizontal line on it at eye level, 10-15 ft away then subject was asked to march in place on cushion looking at the horizontal line, using the firm object for support and count to 30. Symptoms were monitored during each session using patient-reported feedback on dizziness and nausea intensity. Exercises were paused or modified if symptoms increased significantly. Mild transient symptom provocation was noted initially, however, no adverse events occurred and symptoms resolved with short rest intervals.

[Table/Fig-1]: Moving eyes left to right and up and down.

[Table/Fig-2]: Arm elevated over the head, with eyes looking at the elevated hand.

[Table/Fig-3]: Throwing the ball from one hand to other.

Gaze stabilisation exercises were performed using a foveal target (business card with printed words) positioned at approximately one meter from the patient eye level. The subject executed horizontal and vertical head movements while maintaining focus on a fixed target followed by exercises involving opposite movement of the head and target, in this the patient holds the card at arm's length and moved both the head and target simultaneously in opposite directions, ensuring the letters remain in focus throughout the exercise. Additional tasks included eye movements with head and object fixed, and coordinated movement of the head, object, and eyes. Each exercise was done for one minute.

Post-intervention reassessment was conducted at the end of four weeks using the same outcome measures employed at baseline. Comparison of pre and post-intervention scores demonstrated a marked reduction in motion sickness severity across all outcome measures. The participant reported increased tolerance to motion and visually stimulating environments and severity of nausea and dizziness. Pre and post-intervention outcome changes are presented in [Table/Fig-4].

Written informed consent was obtained from the patient for publication of clinical details and images. A scanned copy of informed consent has been included at the end of manuscript.

Outcome measures	Pre-intervention	Post-intervention
MSQ (in %)	29.29	13.67
MSAQ (in %)	59.02	38.80
VRBQ (in %)	30.40	14.44

[Table/Fig-4]: Pre and post change in outcome measures.

A longer term follow-up was not conducted in this case. Future studies should include extended follow-up assessments to evaluate the sustainability of symptom improvement and the potential need for maintenance of vestibular exercises.

DISCUSSION

Motion sickness is a complex vestibular disorder arising from a sensory conflict between visual, vestibular, and somatosensory inputs, leading to symptoms such as nausea, dizziness, sweating and postural instability [5]. Individual susceptibility varies greatly, and previous research has shown a link between higher susceptibility scores and more severe symptoms when exposed to motion [1,6].

While the clinical presentation was consistent with motion sickness, other potential causes of dizziness were considered. Vestibular migraine was unlikely due to absence of migraine history or associated features. Benign Paroxysmal Positional Vertigo (BPPV) was less probable as symptoms were not position specific and no brief episodes of rotational vertigo was reported. Anxiety- related dizziness was also not supported by the clinical history. Overall, the symptom pattern was most consistent with motion sickness triggered by visually provocative environments.

Vestibular rehabilitation relies on the concept of central compensation, such as adaptation, habituation, and sensory substitution. Repeated exposure to controlled vestibular and visual stimuli promotes neural recalibration and decreases motion sensitivity [7,8]. Clinical studies have consistently demonstrated the effectiveness of vestibular rehabilitation in lowering dizziness and improving functional outcomes in individuals with vestibular dysfunction [9,10].

Gaze stabilisation exercises represent a core component of vestibular rehabilitation, because they specifically target Vestibulo-Ocular Reflex (VOR) adaptation. Enhancement in VOR function improves visual stability during head movements, thereby reducing motion-related symptoms [11]. Previous research has indicated that gaze stabilisation exercises can significantly lessen visually induced dizziness and increase tolerance to motion-provoking situations [12,13].

Visual dependence has been identified as one of the main causes of motion-induced discomfort. When exposed to visually complex or dynamic environments, individuals who rely more on visual input are more likely to have symptoms [13,14]. Rehabilitation strategies that include visual tracking, eye-hand coordination and progressive exposure to visual motion have been shown to lessen visual dependence and increase sensory integration [12,14].

Balance and postural control training further support vestibular compensation by encouraging sensory re-weighting. Through exercises that promote reliance on vestibular cues while reducing ocular and somatosensory input, individuals can improve their postural stability and motion tolerance [8,15]. Such interventions have been linked to improve functional outcomes and reduce dizziness in individuals undergoing vestibular rehabilitation [9,15].

Motion sickness encompasses a variety of symptoms, making multidimensional assessment techniques essential to motion sickness research. The MSAQ allows evaluation across gastrointestinal, central, peripheral and sopite-related domains, providing a comprehensive assessment of symptom severity [3]. Similarly, patient-reported outcome measures have demonstrated

Authors name and year of study	Place of study	Population	objective	Outcome measures	Key findings
Reason JT, Brand JJ (1975) [5]	United Kingdom	Individuals with motion sickness	To explain the sensory conflict theory underlying motion sickness	Motion sickness symptoms	Motion sickness results from sensory mismatch between visual and vestibular inputs
Bronstein AM (1995) [13]	United Kingdom	Patients with visual vertigo	To study visual dependence in dizziness	Postural control, visual vertigo	Visual conflict identified as major contributor to dizziness
Yardley L et al., (1998) [16]	United Kingdom	Patients with dizziness	To evaluate exercise therapy for dizziness	Symptom severity, function	Exercise therapy improves dizziness and daily function
Gianaros PJ et al., (2001) [3]	United States	Adults with motion sickness	To develop and validate a multidimensional assessment tool	MSAQ score	MSAQ reliably assesses multiple dimensions of motion sickness
Cohen HS and Kimball KT (2003) [9]	United States	Patients with vestibular disorders	To evaluate effects of vestibular rehabilitation	Dizziness severity, Balance	Vestibular rehabilitation significantly reduced dizziness and improved function
Stanney KM et al., (2003) [17]	United States	Individuals exposed to virtual environments	To study adaptation to motion –inducing environments	Motion sickness symptoms	Adaptation reduces motion sickness severity
Golding JF et al., (2006) [6]	United Kingdom	Healthy adults	To review motion sickness susceptibility	Susceptibility levels	Individual susceptibility predicts motion sickness severity
Golding JF et al., (2006) [1]	United Kingdom	Healthy adults	To identify predictors of motion sickness susceptibility	MSSQ score	Higher MSSQ scores indicate increased susceptibility to motion sickness
Pavlou ME et al., (2007) [12]	United Kingdom	Adults with chronic dizziness	To assess visual dependence in motion sensitivity	Visual motion sensitivity	Visual dependence contributes to motion- induced dizziness
Herdman SJ (2013) [7]	United States	Patients with vestibular dysfunction	To describe principles of vestibular rehabilitation	Symptom reduction	Vestibular rehabilitation promotes adaptation and habituation
McDonnell MN et al., (2015) [10]	Australia	Patients with unilateral vestibular dysfunction	To assess effectiveness of vestibular rehabilitation	Dizziness and functional outcomes	Vestibular rehabilitation significantly improves symptoms
Bertolini G et al., (2016) [14]	Switzerland	Individuals with motion sickness	To review vestibular basis of motion sickness	Motion sickness symptoms	Sensory mismatch between vestibular and visual inputs were explained
Hall CD et al., (2016) [15]	USA	Patients with peripheral vestibular hypofunction	To develop evidence based- clinical practice guideline for vestibular rehabilitation	Dizziness severity, gaze stability, balance, functional outcomes, quality of life	Strong evidence supports vestibular rehabilitation in reducing dizziness, improving gaze stability, postural control and functional independence
Schubert MC Migliaccio AA (2019) [11]	United States	Individuals with vestibular impairment	To review gaze stabilisation and VOR adaptation	VOR function	Gaze stabilisation improves visual stability during head movements

[Table/Fig-5]: Comparison of previous literature and present case report on motion sickness management [1,3,5-7,9-17].

to reflect functional improvements and participation-level changes following vestibular rehabilitation [16].

Emerging evidence also supports the use of vestibular adaptation exercises for managing visually induced motion sickness, especially in stimulated or virtual environments. Over time, adaptation-based training has been linked with increased tolerance to motion stimuli and decreased symptom severity over time [17]. These findings support the use of targeted vestibular exercises as a conservative management strategy for motion sickness. Similar studies are reported in [Table/Fig-5] [1,3,5-7,9-17].

Despite these favourable findings, case reports are not very generalisable by nature. More controlled studies with long-term follow-up are needed to identify the best exercise parameters and establish standardised protocols for motion sickness rehabilitation.

CONCLUSION(S)

The case highlights the potential role of physiotherapy-based vestibular rehabilitation in addressing motion sickness symptoms. A structured exercise program incorporating vestibular and visual components was well tolerated and associated with favourable changes in patient- reported outcomes over a short duration. These findings support the inclusion of targeted vestibular exercises as part of conservative management strategies for motion sickness.

Data sharing statement: The corresponding author can provide the data supporting the study's conclusions upon reasonable request.

Authors' contribution: First and second author planned, conducted the assessment and evaluations, analysed the data, and wrote the manuscript. Third author participated in the planning of the study while both fourth and fifth author revised the manuscript.

REFERENCES

[1] Golding JF. Predicting individual differences in motion sickness susceptibility by questionnaire. Pers Individ Dif. 2006;41(2):237-48.
[2] Shepard NT, Telian SA. Programmatic vestibular rehabilitation. Otolaryngol Head Neck Surg. 1995;112(1):173-82.
[3] Gianaros PJ, Muth ER, Mordkoff JT, Levine ME, Stern RM. A questionnaire for the assessment of the multiple dimensions of motion sickness. Aviat Space Environ Med. 2001;72(2):115-19.
[4] Morris AE, Lutman ME, Yardley L. Measuring outcome from vestibular rehabilitation, part II: Refinement and validation of a new self-report measure. Int J Audiol. 2009;48(1):24-37.
[5] Reason JT, Brand JJ. Motion sickness. New York: Academic Press; 1975.
[6] Golding JF. Motion sickness susceptibility. Auton Neurosci. 2006;129(1-2):67-76.
[7] Herdman SJ. Vestibular rehabilitation. Curr Opin Neurol. 2013;26(1):96-101.
[8] Shumway-Cook A, Woollacott MH. Motor control: Translating research into clinical practice. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2007.
[9] Cohen HS, Kimball KT. Increased independence and decreased vertigo after vestibular rehabilitation. Otolaryngol Head Neck Surg. 2003;128(1):60-70.
[10] McDonnell MN, Hillier SL. Vestibular rehabilitation for unilateral peripheral vestibular dysfunction. Cochrane Database Syst Rev. 2015;(1):CD005397
[11] Schubert MC, Migliaccio AA. New advances regarding adaptation of the vestibulo-ocular reflex. J Neurophysiol. 2019;122(2):644-58.
[12] Pavlou M, Davies RA, Bronstein AM. The assessment of increased sensitivity to visual stimuli in patients with chronic dizziness. J Vestib Res. 2007;16(4-5):223-31.
[13] Bronstein AM. Visual vertigo syndrome: Clinical and posturography findings. J Neurol Neurosurg Psychiatry. 1995;59(5):472-76.
[14] Bertolini G, Straumann D. Moving in a moving world: A review on vestibular motion sickness. Front Neurol. 2016;7:14.
[15] Hall CD, Herdman SJ, Whitney SL, Cass SP, Clendaniel RA, Fife TD, et al. Vestibular rehabilitation for peripheral vestibular hypofunction: An evidence-based clinical practice guideline: From the American Physical Therapy Association Neurology Section. J Neurol Phys Ther. 2016;40(2):124-55.
[16] Yardley L, Beech S, Zander L, Evans T, Weinman J. A randomized controlled trial of exercise therapy for dizziness and vertigo in primary care. Br J Gen Pract. 1998;48(429):1136.
[17] Stanney KM, Hale KS, Nahmens I, Kennedy RS. What to expect from immersive virtual environment exposure: Influences of gender, body mass index, and past experience. Hum Factors. 2003;45(3):504-20.

PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala, Haryana, India.
2. Professor, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala, Haryana, India.
3. Assistant Professor, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala, Haryana, India.
4. Postgraduate Student, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala, Haryana, India.
5. Postgraduate Student, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala, Haryana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Subhasish Chatterjee,
Professor, Department of Physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, MMDU, Mullan, Ambala-133207, Haryana, India.
E-mail: subhasishphysio@mmumullana.org

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Feb 19, 2026
- Manual Googling: Apr 11, 2026
- iThenticate Software: Apr 14, 2026 (5%)

ETYMOLOGY: Author Origin

EMENDATIONS: 5

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Feb 12, 2026**
Date of Peer Review: **Feb 24, 2026**
Date of Acceptance: **Apr 16, 2026**
Date of Publishing: **Jul 01, 2026**