Effects of Visual Oscillation on Dynamic Balance Control in MS Patients

Grahm Normandall*

Division of Neurology, Department of Medicine, Faculty of Medicine South Shouna Hospital, Jordan

Corresponding Author*
Grahm Normandall
Division of Neurology
Department of Medicine, Faculty of Medicine South Shouna Hospital, Jordan
Email: NormandallG@yahoo.com

Received date: 03-March-2023, Manuscript No: JMSO-23-99122; **Editor assigned:** 6-March-2023, PreQC No. JMSO-23-99122(PQ); **Reviewed:** 24-March-2023, QC No. JMSO-22-99122(Q); **Revised date**: 26-March-2023, Manuscript No: JMSO-23- 99122 (R); **Published date:** 29-March-2023, DOI: 10.35248/2376-0389.23.10.3.489

Abstract

Patients with Multiple Sclerosis (PwMS) experience balance problems when navigating through environments with moving objects or visual tricks that affect how they perceive their own motion. However, it has not been investigated if they can separate an object from self-movement. This study used Virtual Reality (VR) to investigate the effects of medial-lateral oscillations of the visual field and of scene objects on gait in PwMS and healthy age-matched controls.

Keywords: Multiple sclerosis • Electroencephalography • Center of mass

Introduction

The effects of medial-lateral visual field oscillation and visual object motion during treadmill walking on gait variability and balance were investigated in this study in individuals with Multiple Sclerosis (PwMS). It has been shown that MS causes the sensory systems to deteriorate in a variety of ways, some of which include slower somatosensory pathway conduction [1, 2]. Reduced foot feeling, changes in the relationship between muscular strength and gait speed, and deficiencies in position awareness in the lower limbs are characteristics of somatosensory impairment's consequences. PwMS also exhibit changed temporal-spatial gait patterns, greater variability of trunk movement, and variable footfall placement during locomotion, all of which are anticipated to increase the risk of losing one's balance and falling [3–12]. As evidenced by a decline in stability when visual feedback is removed during standing and increased sensitivity to visual stimuli during gait, PwMS may have a greater reliance on the vestibular or visual systems for balance control [13]. This would be done to make up for the effects of the loss in proprioception on balance. The effects of various visual perturbations on body wobble and foot placement during walking were investigated in this study because to the probably enhanced role of vision on gait stability in PwMS. In PwMS, the impacts of the visual scene's overall oscillation and the rotation of its items on balance during treadmill stepping were specifically described [14,15].

Center of Mass

Through the modification of visual feedback, medial-lateral control of dynamic balance, a crucial component of stability during stepping, has been studied. The foundation of keeping an upright posture is the control and movement of the Center of Mass (CoM) with respect to the base of support. Multisensory integration helps to determine the current condition of the body's CoM because the body lacks particular receptors to perceive CoM [16]. Vision may play a significant role in medial-lateral CoM regulation since it is incorporated into sensorimotor control of lateral stability during gait [17]. The positioning of the feet, which is connected to CoM control, is essential for preserving lateral stability throughout gait [18,19]. In turn, environmental visual information is crucial for foot placement, possibly even more so in PwMS who may rely more on vision for gait stability. Medial-lateral oscillations of the visual field, which resemble self-motion, have been used in previous studies to test the sensitivity of CoM sway and foot placement during gait to visual input. Visuomotor entrainment, a reaction to visual oscillation, describes the capacity to synchronize or modify motor responses in response to a visual input.

Age and MS are both associated with an increase in reliance on vision, as seen by visual field-of-view oscillations and their impact on sway and foot placement. It's interesting that PwMS hasn't looked into the impact of item motion inside a scene, which increases the demands on visual processing of movement [20,21].

Gait-related neural processing of object and visual field movements may be compromised in PwMS. PwMS can show signs of cognitive deterioration such as slower processing of visually presented stimuli and impaired automatic visual processing. Since PwMS slow down their gait when completing cognitive tasks at the same time, decreases in information processing speed are anticipated to have an impact on motor performance. Additionally, under conditions of dual-task walking, PwMS exhibit smaller increases in functional near-infrared spectroscopy signals in the prefrontal cortex, which is consistent with diminished attention capacity.

Conclusion

Gait was impacted by medial lateral oscillations of a visual scene shown through a virtual reality headset in both healthy controls and PwMS. This result is supported by higher SW, greater peak-to-peak CoM sway, and increased variability in both measures. A high degree of coherence between medial-lateral CoM motion and scene oscillation suggested a visuomotor effect, and shifts in medial-lateral foot placement also became more frequent. However, the sway of the virtual trees that represented item motion in the picture severely challenged dynamic balance only in PwMS, as seen by higher variability in step width, peak-to-peak CoM sway, and increased shift in medial-lateral foot placement. One explanation is that PwMS struggled to distinguish between self-motion and object motion. Future research may make use of these findings to develop dynamic balance control in PwMS and prevent falls by simulating difficult situations (such grocery stores with moving objects) in a secure laboratory setting.

References

1. Sarah, M., et al. "Demyelination causes adult CNS progenitors to revert to an immature state and express immune cues that support their migration." *J. Neurosci.* 35.1 (2015): 4-20.
2. Moll, N. M., et al. "SOX17 is expressed in regenerating oligodendrocytes in experimental models of demyelination and in multiple sclerosis." *Glia* 61.10 (2013): 1659-1672.

3. Leitner, Dominique F., et al. "Semaphorin4A is cytotoxic to oligodendrocytes and is elevated in microglia and multiple sclerosis." *ASN neuro* 7.3 (2015): 1759091415587502.
4. Marziali, et al. "Transferrin and thyroid hormone converge in the control of myelinogenesis." *Exp. Neurol.* 265 (2015): 129-141.
5. Jiang, Fengjun, Steven W. Levison, and Teresa L. Wood. "Ciliary neurotrophic factor induces expression of the IGF type I receptor and FGF receptor 1 mRNAs in adult rat brain oligodendrocytes." *J. neurosci. res.* 57.4 (1999): 447-457.
6. De Paula, Marcio L., et al. "The PTEN inhibitor bisperoxovanadium enhances myelination by amplifying IGF-1 signaling in rat and human oligodendrocyte progenitors." *Glia* 62.1 (2014): 64-77.
7. Bertrand, B., et al. "Transferrin gene expression visualized in oligodendrocytes of the rat brain by using in situ hybridization and immunohistochemistry." *Proc. Natl. Acad. Sci.* 82.19 (1985): 6706-6710.
8. Espinosa-Jeffrey, A., et al. "Transferrin regulates transcription of the MBP gene and its action synergizes with IGF-1 to enhance myelinogenesis in the md rat." *Proc. Natl. Acad. Sci.* 24.2-3 (2002): 227-241.
9. Bartlett, William P., Xiao-Su Li, et al. "Expression of transferrin mRNA in the CNS of normal and jimpy mice." *J. neurochem*. 57.1 (1991): 318-322.
10. Philip, A., Listowsky, I. "Iron transport and storage proteins." *Annu. rev. biochem.* 49.1 (1980): 357-393.
11. Cabrera, OE Escobar, et al. "Single intracerebral injection of apotransferrin in young rats induces increased myelination." *Dev. neurosci.* 16.5-6 (1994): 248-254.
12. Galovski, Tara E., et al. "Cognitive processing therapy." Evidence based treatments for trauma-related psychological disorders: A practical guide for clinicians. *Cham: Springer Int. Publ.*, 2022. 211-226.
13. Shoshana, R., Brandell, J.R. eds. "Trauma: Contemporary directions in theory, practice, and research." *Sage*, 2011.
14. Bennice, Jennifer A., and Resick, P.A. "A review of treatment and outcome of post-trauma sequelae in sexual assault survivors." *trauma sex. assault: Treat. prev. pract.* (2002): 69-98.
15. Mahadevan, Swaminatha V., and Gus M. Garmel. "An introduction to clinical emergency medicine: guide for practitioners in the emergency department." *Camb. Univ. Press*, 2005.
16. Hans-Christoph, P., et al.," Senior Trauma Patients: An Integrated Approach". *Springer Nat.* 2022.
17. Szumita, Paul M., et al. "Sedation and analgesia in the intensive care unit: evaluating the role of dexmedetomidine." *Am. J. Health-Syst. Pharm.* 64.1 (2007): 37-44.
18. LIPTON, HAL. "The psychological impact of dental injuries." *Clin. Guide Dent. Traumatol., Mosby,* 2007. 190-194.
19. Chen, Anthony J-W., and Novakovic-Agopian, T. "Interventions to improve cognitive functioning after TBI." *Trauma. Brain Inj.: Clin. Guide Diagn. Manag. Rehabil.* (2012): 273-312.
20. Cole, Elaine, ed. Trauma Care: initial assessment and management in the emergency department. *John Wiley Sons*, 2009.
21. Romm, Jill Jillian, and Lishiana Solano Shaffer. "Communicating effectively: The patient-clinician relationship in women's healthcare." *Biopsychosoc. Factors Obstet. Gynaecol., Camb. Univ. Press*, 2017. 21-30.

Cite this article: Normandall G. Effects of Visual Oscillation on Dynamic Balance Control in MS Patients. J Mult Scler 2023, 10(3), 489