00200

COGNITION

Visuospatial working memory as a predictor of gait performance in adults with normal hearing and hearing aid users: a longitudinal perspective

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Abstract

Effective balance and gait control relies on the integration of the somatosensory, visual, and auditory systems. Auditory cues play a crucial role in modifying postural control during walking, particularly in older adults, and the use of hearing aids might improve postural stability and reduce falls in older adults with hearing loss. Moreover, aspects of cognition have been identified as playing an important role in gait control, and, among healthy individuals, visuospatial working memory (VSWM) has been identified as a predictor of gait patterns.

Objectives

This preliminary study aims to investigate whether visuospatial working memory longitudinally predicts gait performance in adults with normal hearing and adults using hearing aids, and if the relationship is group-dependent.

Methods and Materials

One group of normal-hearing participants (n=53, 26 females, mean age= 60.66, SD=8.13) and one group of hearing aid users (n=53, 26 females, mean age= 59.96, SD=8.68) were selected from the N200 study (Rönnberg et al., 2016).

Gait performance was assessed with the 2-minute walking test.

VSWM was evaluated with a variation of the Olsson and Poom test (Olsson and Poom, 2005)

References (selection)

Rönnberg, J., Lunner, T., Ng, E. H. N., Lidestam, B., Zekveld, A. A., Sörqvist, P., Lyxell, B., Träff, U., Yumba, W., Classon, E., Hällgren, M., Larsby, B., Signoret, C., Pichora-Fuller, M. K., Rudner, M., Danielsson, H., & Stenfelt, S. (2016). Hearing impairment, cognition and speech understanding: Exploratory factor analyses of a comprehensive test battery for a group of hearing aid users, the n200 study. *International Journal of Audiology*, *55*(11), 623–642.

Pavlou, M., Costafreda, S. G., Galsworthy, W., Korres, G., & Bamiou, D. E. (2023). The interplay between cognition, functional and dual-task gait in persons with a vestibular disorder versus healthy controls. *Scientific reports*, *13*(1), 10130.

Olsson H, Poom L. Visual memory needs categories. Proc Natl Acad Sci U S A. 2005 Jun 14;102(24):8776-80.

Results

- Hearing aid participants had symmetrical, bilateral, mild-to-severe hearing loss (mean PTA4 34.93 dB, SD=11.63) and had used hearing aids for a year or more; the normal hearing group had an average PTA4 of 10.29 dB (SD= 5.73) in the better ear.
- The overall regression was statistically significant (adjusted R^2 = .04, F(2, 102) = 3.46, p = .03), and showed that VSWM was a statistically significant and positive predictor of gait performance (standardised β=0.25, p=0.01, 95% CI [0.06, 0.44]) (see Fig. 2), although the model explained a relatively small amount of variance. The main effect of group was not statistically significant (p=0.98) and adding the interaction between group and VSWM to the model did not improve the model (adjusted R^2 = 0.04) (see Table 1).
- In our population, better VSWM at T1 was associated with a longer distance walked in the 2-minute walking test at T2. However, group was not found to be a significant predictor of gait performance, and adding the interaction between group and VSWM into the model failed to increase its predictive capacity, indicating that VSWM was equally important regardless of group.

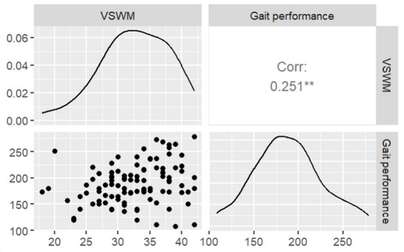

Figure 1
Correlations between continuous variables

Figure 2
Prediction of Visuospatial Working Memory on Gait Performance

Table 1
Regression analysis: predictors of Gait Performance

Predictor Variables	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Regression 1					
Group	-0.004	0.19	-0.39	0.38	0.98
VSWM	0.25	0.10	0.06	0.44	**0.01**
Adj. R^2	0.04				**0.03**
Regression 2					
Group	-0.01	0.19	-0.39	0.38	0.97
VSWM	0.20	0.13	0.06	0.46	0.12
Group*VSWM	0.11	0.20	-0.28	0.50	0.58
Adj. R^2	0.04				0.07

Conclusion

- Visuospatial working memory might be a contributor to gait control in adults with normal hearing and adults using hearing aids, although the contribution was small and other factors might explain the effect.
- When hearing loss is compensated by hearing aids, adults with hearing loss have similar gait performance as normally hearing adults.

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