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Independent domains of gait in adults : a comparison of different populations

Reference:

Herssens Nolan, Verbecque Evi, Van Criekeing Tamaya, Saeys Wim, Vereeck Luc, Hallems Ann.- Independent domains of gait in adults : a comparison of different populations
Gait and posture - ISSN 0966-6362 - 57:S1(2017), p. 219
Full text (Publisher's DOI): <https://doi.org/10.1016/J.GAITPOST.2017.06.381>
To cite this reference: <https://hdl.handle.net/10067/1522090151162165141>

Independent domains of gait in adults: a comparison of different populations – ESMAC 2017

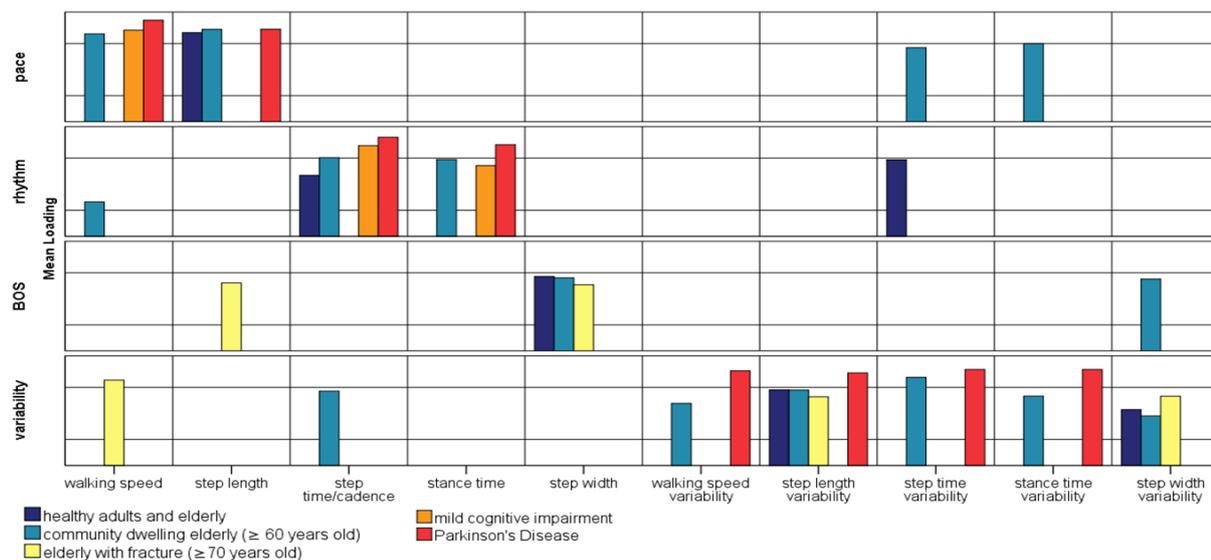
Introduction: Covariance among spatio-temporal parameters of gait (STP) is high, suggesting redundancy (1). Principal Component Analysis (PCA) can be used to extract relevant gait domains from the high-dimensional dataset of STP (1-3). It has been suggested that these domains reflect motor, cognitive or behavioural constraints (1). To evaluate this hypothesis, the number and the nature of gait domains should be compared between different populations faced with different constraints.

Research Question: Are the number and nature of gait domains population-dependent?

Methods: Gait analysis was performed in 102 *healthy adults and elderly* (age 20-89, 50 males) during barefoot walking. A set of 10 STP (Fig. 1) was entered into the PCA (varimax rotation, eigenvalues > 1). PCA results were compared to data from 8 relevant studies (1 – 8) obtained through a systematic literature search in PubMed and Web of Science (keywords: ‘Principal Component Analysis’, ‘Factor Analysis’, ‘Gait’ and ‘Variability’). Studies were included if they exclusively applied PCA on STP during overground walking.

Results: Four key domains were identified: pace, rhythm, base of support (BOS) and variability (Fig.1). Pace, rhythm and BOS show consistency in *healthy adults and elderly, community dwelling elderly, mild cognitive impairment* and *Parkinson’s disease*. However, in an asymmetrical condition (*elderly with a fracture*) consistency of STP loading on these domains is lost. Variability is consistent in pathological conditions but in *healthy adults and elderly* and *community dwelling elderly*, certain STP reflecting variability load on the domains of pace or rhythm.

Figure 1. Absolute values of loadings for each STP on the corresponding gait domains.



Discussion: The results from this study confirm the hypothesis that the number and nature of gait domains are population dependent. This suggests that a model of gait domains provides rationale for selection of gait characteristics to pursue hypothesis-driven research to identify underlying gait mechanisms in aging and pathology and to identify key STP contributing to gait disturbances.

References: (1) Lord et al. 2013, (2) Ayers et al. 2014, (3) Verghese et al. 2007, (4) Verghese et al. 2008, (5) Kirkwood et al. (2016), (6) Hollman et al. (2011), (7) Thingstad et al. (2015), (8) Morris et al. (2016)