

# VU Research Portal

## Human Balance Control: Effects of Fear and Attention in Standing and Walking

Melker Worms, J.L.A.

2017

### **document version**

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

Melker Worms, J. L. A. (2017). *Human Balance Control: Effects of Fear and Attention in Standing and Walking*.

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)

## Summary

A fall is one of the main causes of injury-related hospitalisation and injury-related deaths. Besides physical degeneration, fear of falling and attentional focus strategies are related to fall risk and decline of balance performance. The aim of this research was to expose the mechanisms by which fear of falling and attentional focus affect human balance control. We used galvanic vestibular stimulation (GVS) to induce vestibular balance reflexes while participants stood at ground level and on a narrow walkway at 3.85 m height to induce fear of falling. Using questionnaires and skin conductance measurements, a fear of falling at height was confirmed. Full-body kinematics was collected to measure the vestibular balance response. We concluded that fear modifies vestibular balance control and proposed a mechanism in which both the short- and medium-latency reflexes functionally contribute to whole body balance.

Furthermore, the literature suggests that fear of falling could impair balance mechanisms in elderly through changes in attentional focus. Therefore, we also investigated the effect of attentional focus (internal vs. external focus and reinvestment) and fall history on walking stability in healthy older adults. Participants' gait was perturbed through randomly occurring unilateral treadmill decelerations to evoke balance recovery movements. Using full body kinematics, coefficients of variation of spatiotemporal gait parameters and local divergence exponents were calculated to assess gait performance of balance recovery responses and unperturbed gait. Fallers showed increased gait variability and decreased gait stability, however no effects of attentional focus were found. The benefits of an external focus of attention on motor performance do not seem to apply to gait in elderly. Continued investigation into attentional focus effects and fear of falling on gait including effects of partial internal focus and continuous gait perturbations, might further clarify the relations between fear of falling and attentional focus and how they could affect fall risk. Follow-up studies with clinical subgroups could further clarify the relation between fear of falling, attentional focus and balance performance.