FUNCTIONAL PARAMETERS FOR THE IDENTIFICATION OF FUTURE FALLERS

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Introduction

Falls are a considerable health threat for aging populations and have also become a serious economic burden for western societies [Heinrich, 2010]. As a result, considerable effort has been invested in tools for early identification of fallers. However, the success of these tools remains unsatisfactory [Gates, 2008], which might result from the general pre-selection of self-reported and insensitive clinical tests. Functional parameters of balance, gait and muscular control are thought to provide more sensitive measures of the patient's current neuromotor condition [Singh, 2012], as well as contain essential information regarding susceptibility to future falls [Ganz, 2007]. In order to avoid parameter pre-selection, the aim of this study was to analyse a comprehensive set of functional parameters, identify the principal components of the data, and assess the efficacy of these components to stratify fallers and non-fallers.

Methods

Eighty-two elderly women (aged 69±5; height 162±7cm; weight 69±12kg) were classified as retrospective fallers (faller: F; n=40), while the remainder had reported no fall within the previous 12 months (non-faller: NF; n=42). Subjects completed a battery of functional tests, including gait assessment, balance and force control tests [Singh, 2012]. Falls were monitored during the following 12 month period to allow further differentiation into repeated fallers (RF) and a group that were previously NF, but who experienced a fall during the follow-up period (NEW). Principal component analysis (PCA) was performed on the 105 functional parameters, with the resulting principal components used as dependent variables in a binary regression analysis (BRA) to predict F and NF groups.

Results

PCA revealed 7 components, which represented 89% of the total variance in the functional data set. These components contained information on: balance, cadence, mean spatial parameters of gait, temporal metrics of gait variability, spatial metrics of gait variability, and rhythmicity of gait. In the BRA, only parameters of temporal variability and mean spatial parameters of gait improved the model significantly.

Due to the low numbers of NEW (n=6) and RF (n=7) over the follow-up period, no statistical prediction could be performed on these subjects, but a visual comparison showed that new fallers displayed function deficit trends towards the faller group, and that repeated fallers possessed the lowest functional capacity of all groups (Figure 1).

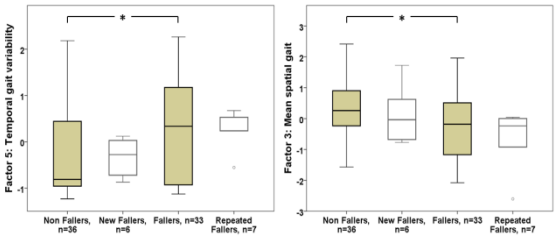

Figure 1: Component scores for temporal variability of gait (left panel) and mean spatial gait (right panel) for all

Discussion

The results suggest that fallers walk with shorter steps that include lower foot clearance. Moreover, fallers walk in a more irregular manner, shown by high levels of temporal variability. As a previous fall is thought to be the best predictor for future falls, established clinical screening tools are challenged in identifying first time fallers. The results of this study indicate that the accurate assessment of functional parameters may complement current clinical tools, but also specifically that the assessment of mean stride length and height, as well as variability of stride time, might be capable of providing vital information for the early identification of first time fallers.

References

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