

Increased time incongruence between imagined and actual walking in frail older adults

Mental chronometry is commonly used to evaluate motor imagery ability. Mental chronometry measures imagined time required for movement. Smaller differences between imagined and actual times suggest higher motor imagery. Imagined and actual times for movement tend to be similar and both elicit activation of brain regions related to motor imagery.

Previous studies reported that there is increased time incongruence between imagined and actual walking in healthy older adults. However, mental chronometry in frail older adults has not yet been clarified. As physical function decreases in frail older adults, mental chronometry, an index of motor imagery, may differ from that of healthy older adults. In this study, we aimed to clarify temporal characteristics of imagined and actual walking in frail older adults.

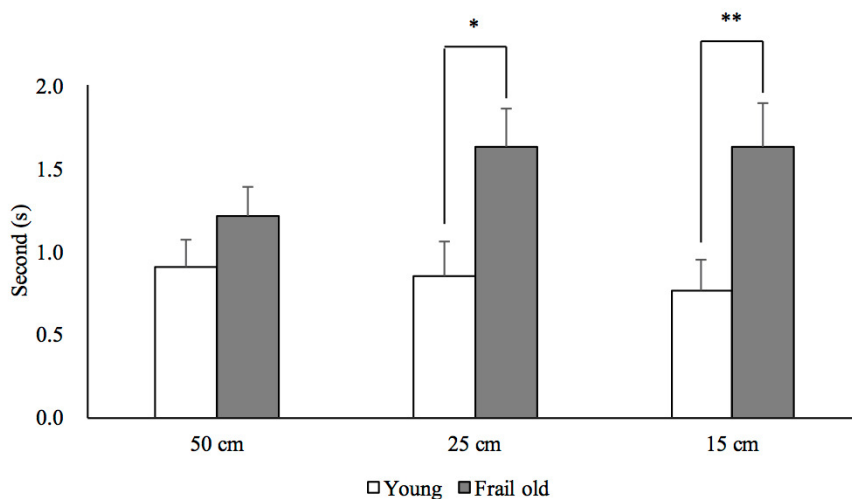


Fig. 1. Comparison of absolute error in frail older and young adults. Absolute error reflects the absolute value of the difference between the actual and imagined times. This score provides a measure that is independent of directional bias and reflects overall accuracy. * $p < 0.05$, ** $p < 0.01$

Our results suggest that temporal differences (absolute error) in frail older adults were significantly greater than in young adults for walkways of 25 and 15 cm width (Fig. 1). Previous studies reported that imagined and actual walking times and their temporal differences (absolute error) are significantly greater in older than in younger adults where the length and width of walkways, or the environment are altered. Deterioration of working memory function in older adults may affect motor imagery ability. Here, we included frail older adults, in whom physical frailty may be associated with deterioration of working memory function. Therefore, we hypothesized that imagined and actual walking times and their temporal differences (absolute error) would increase with narrower walkways in frail older adults.

We also observed significant differences in temporal differences (constant error) of imagined and actual walking times between frail older adults and young adults for 25- and 15-cm-wide walkways (Fig. 2). Young adults had values close to zero or negative (overestimation of actual walking time in imagined walking trials), whereas frail older adults showed positive values (underestimation of actual walking time in imagined walking trials). Previous study reported that older adults with fear of falling underestimate actual walking time during imagined walking trials. This may be because motor imagery ability is affected by activity avoidance/inactive lifestyle resulting in/from fear of falling. Our participants were frail older adults whose ability to perform ADL was declining. In older adults, declining ability to perform ADL is associated with fear of falling. Therefore, we suggest that frail older adults underestimated actual walking time in imagined walking trials, leading to significant differences between frail older adults and young adults in the temporal differences (constant error) between imagined and actual walking times.

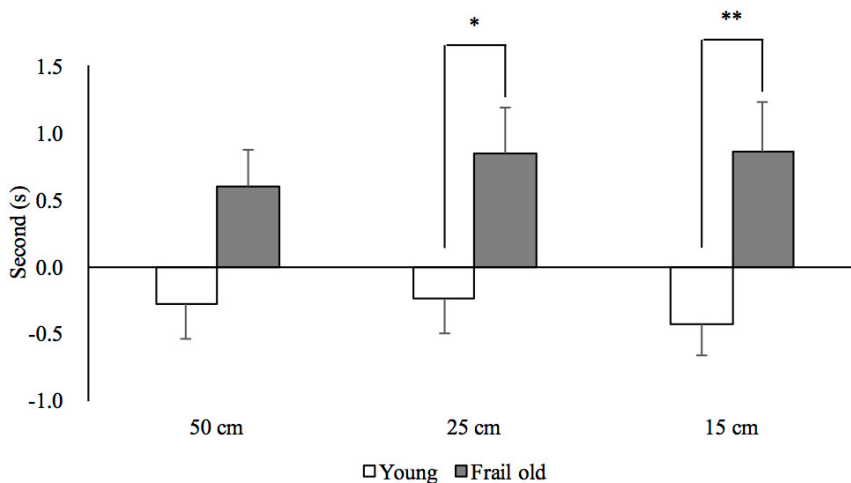


Fig.2. Comparison of constant error in frail older and young adults. Constant error reflects the constant value of the difference between the actual and imagined times. This score reflects the bias between both actual and imagined times. * $p < 0.05$, ** $p < 0.01$

In conclusion, our study suggests that walkways of differing widths may be useful to evaluate age-related changes in imagined and actual walking of frail older adults. Moreover, our results suggest the methods we used have broad clinical application to evaluate motor imagery ability related to walking in frail older adults, judging the effectiveness of training and preventing falls.

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