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## **Dispositional mindfulness influences the balance control in elderly**

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## ABSTRACT

Invest higher cognitive attention to movements seems to be an important strategy for balance control and reduce fall-risk, especially during a threatened posture in elderly. The ability of pay attention in a particular way, on purpose, in the present moment, and non-judgmentally, also known as to dispositional mindfulness, seems to be one strategy to invest cognitive attention on movements and improve the balance control. The aim of our study was identify the association between dispositional mindfulness and the balance control in elderly. We evaluated the dispositional mindfulness through the Brazilian version of the Mindful Attention Awareness Scale (MAAS) and the balance capability through the balance Berg scale (BBS) in 48 elderly (age  $66.3 \pm 4.6$ , 16 males, 37 females). There was significant correlation between MAAS and BBS ( $r= 0.32$ ,  $p=0.02$ ) and a between the semi-tandem stand balance of BBS, the most challenging test, and MAAS ( $r= 0.41$ ,  $p=0.004$ ). These findings evinced that the dispositional mindfulness may be one new strategy to improve the balance control and, consequently, reduce the risk of fall in elderly.

**Keywords:** Aging. Postural balance. Accidental falls. Mindfulness. Exercise.

## 1. INTRODUCTION

Since elderly population still growing and getting older in worldwide, the concerns about healthy aging are also increasing<sup>1</sup>. The falls or the fall-related injuries became a huge global problem among elderly due to its consequences such their functional and physiological limitations which in turns lead to reduced quality of life and increased functional dependence and mortality<sup>2</sup>. Despite the etiology of falls in elderly are known as multifactorial, the balance control, a complex ability derived from the interaction of several sensorimotor and attentional processes, have an important contribution<sup>3</sup>. The balance control has two main functional biomechanical goals: **i)** postural orientation and **ii)** postural equilibrium; and their performance depends on biomechanical task, movement strategies, sensibility of the environment, postural orientation, dynamics of balance control, cognitive resources, experience and practice, and finally perception of goal and context<sup>4</sup>. It is known individuals focus more attention in their movements when they are in a threatened posture and studies have demonstrated cognitive strategies are crucial in response to a threatened posture and to reduce fall-risk<sup>5</sup>. In fact, recent evidence revealed changes in attention contribute to changes in static and anticipatory balance control, suggesting the investigation of these relationships is necessary to improve interventions to reduce the risk of falls<sup>6</sup>.

In the other hand, one of the several benefits of mindfulness meditation is the improvement of the dispositional mindfulness, defined by Kabat-Zinn as the ability of pay attention in a particular way: on purpose, in the present moment, and non-judgmentally<sup>7</sup>. Its benefits were recently demonstrated in children and adolescents with chronic illness<sup>8</sup>, in adults<sup>9</sup> and in the elderly population<sup>10</sup>. Moreover, despite its own set of practical challenges, mindfulness practice could be beneficial for several others issue in the elderly<sup>10</sup>. Therefore, to invest higher cognitive attention to movements to increase the dispositional mindfulness, seems to be an important strategy for balance control and reduce fall-risk, especially in elderly people.

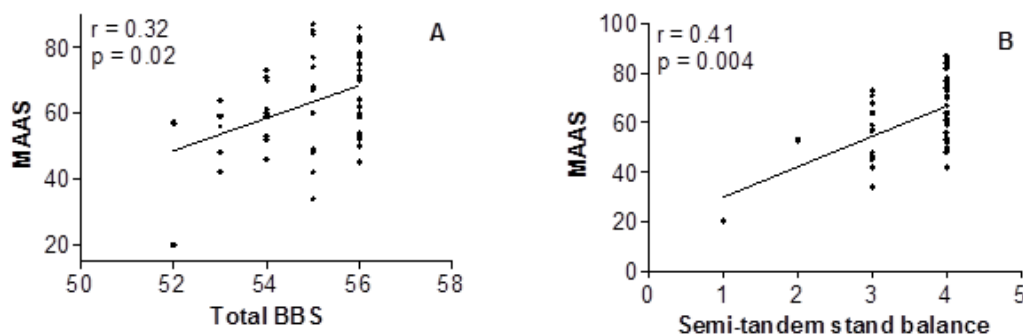
Although these recent interventions with mindfulness meditation showed diverse cognitive and mindful improvement, one of the most important challenges in the mindfulness field was to evaluate and differentiate the dispositional mindfulness between the individuals and in each individual along lifespan. Nevertheless, since<sup>11</sup> validated the Mindful Attention Awareness Scale (MAAS), a psychometric questionnaire composed by a 15-item to assess the dispositional mindfulness magnitude), it has been the most currently evaluation used in mindfulness and meditation field. By MAAS researchers could assess empirically the individual dispositional mindfulness and thus assign the improvements promoted by the meditation practices and other interventions. In this sense, we hypothesize the higher dispositional mindfulness is associated with the improvement of the balance control in elderly.

## 2. MATERIAL AND METHODS

This study was part of a randomized clinical trial (ClinicalTrials.gov U1111-1181-4455)<sup>12</sup>. We evaluated the dispositional mindfulness through the Brazilian version of the Mindful Attention Awareness Scale (MAAS)<sup>13</sup> and the balance capability through the balance Berg scale (BBS)<sup>14</sup> in 48 elderly (age  $66.3 \pm 4.6$ , 16 males, 37 females). The BBS was applied by the same evaluator along 4 days. While the participants waited for the balance tests they were instructed to fill the MAAS by themselves.

## 3. RESULTS

Despite most elderly had good scores on BBS leading to a very homogeneous sample, there was a significant association (Spearman correlation) between dispositional mindfulness and balance control (Figure A). We notice the 13<sup>o</sup> test of the BBS, which evaluate semi-tandem stand balance, was the most challenging test. In this test, there was stronger Spearman correlation between semi-tandem stand balance and MAAS (Figure B).



**Figure 1.** A: Spearman correlation between MAAS (Mindful Attention Awareness Scale) and BBS (balance berg scale). B: Spearman correlation between MAAS and semi-tandem stand balance of BBS.

## 4. DISCUSSION

Kee et al. already suggested that higher momentary mindful attention could benefit balance performance through better attentional focus during movement control, especially when this balance challenge came from changes in anticipatory postural control of the mediolateral movements<sup>15</sup>. In addition to their study in adult

population, now we showed this association can also be seen in elderly, whom could benefit from a better balance control since they lose it by aging. Moreover, corroborating with these findings, a recent review of Kerr et al. suggested that be mindful involves an enhances of somatosensory attention and top-down modulation from cortical areas, and this is one of the reasons by which to be mindful may be correlated with balance control<sup>16</sup>. Indeed, the increased fall risk is associated to balance reduction<sup>17</sup> and the age-related weakness is an important predictor of falls<sup>18</sup>. Therefore, a combination of strength training and specific balance training have been substantially recommended for elderly population<sup>19,20</sup>. A meta-analysis showed physical active adults aged  $\geq 60$  years had decreased rate of falls and risk of falling by 22% and 17%, respectively<sup>21</sup>. Furthermore, when considering only Tai chi practitioners, the study showed a 37% reduction in fall rate and 35% reduction in the risk of falling, leading us to believe there are some special features in Tai chi compared to physical activity in general<sup>21</sup>. Thus, likely, the attention on the movements developed in Tai chi, similar to other mindful exercises, can be determinant to increase dispositional mindfulness and improve the control of balance, as this modality of exercise is also able to improve attention, concentration and mental tracking<sup>22,23</sup>.

Despite the importance of exercise-induced strength in balance capability has been widely consolidated, our correlation data showed the exercise-induced attention can be also important to the balance capability in elderly. Therefore, new studies should be performed involving the effect of mindfulness training or other practices that improve dispositional mindfulness to improve the balance control. Such example, was recently showed by Mothes et al.<sup>24</sup>, with aerobic exercise promoting increase of dispositional mindfulness in men.

Moreover, a recent review has addressed how mindful meditation can promote changes on attention resources and which neural mechanisms are involved in this attention improvement<sup>16</sup>. The self-regulation of attention, emotion, and self-awareness are modulated in structures such as anterior cingulate cortex, multiple prefrontal cortex regions, amygdala, and insula and thus, balance performance could be modulated in some of these same neural structures<sup>25</sup>.

## 5. CONCLUSIONS

Although the present data shed some lights in the links between mindfulness and balance control, its direct relation and physiological mechanisms surrounding this phenomenon are not completely elucidated. However, at least, this study evinced the importance of new strategies to be included (*i.e.* dispositional mindfulness training), in interventions aiming to improve the balance control and reduce the risk of fall in elderly. Additionally, we suggest that improve dispositional mindfulness through

exercise interventions, and combinations of exercise and mindful practices, besides others meditative practices may be a good choice to reduce the risk of falls in elderly.

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