Balance Confidence Is Related to Features of Balance and Gait in Individuals with Chronic Stroke

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Background: Reduced balance confidence is associated with impairments in features of balance and gait in individuals with subacute stroke. However, an understanding of these relationships in individuals at the chronic stage of stroke recovery is lacking. This study aimed to quantify the relationships between balance confidence and specific features of balance and gait in individuals with chronic stroke. *Methods:* Participants completed a balance confidence questionnaire and clinical balance assessment (quiet standing, walking, and reactive stepping) at 6 months postdischarge from inpatient stroke rehabilitation. Regression analyses were performed using balance confidence as a predictor variable, and quiet standing, walking, and reactive stepping outcome measures as the dependent variables. *Results:* Walking velocity was positively correlated with balance confidence, whereas mediolateral center of pressure excursion (quiet standing) and double support time, step width variability, and step time variability (walking) were negatively correlated with balance confidence. *Conclusions:* This study provides insight into the relationships between balance confidence and balance and gait measures in individuals with chronic stroke, suggesting that individuals with low balance confidence exhibited impaired control of quiet standing as well as walking characteristics associated with cautious gait strategies. Future work should identify the direction of these relationships to inform community-based stroke rehabilitation programs for individuals with chronic stroke, and determine the potential utility of incorporating interventions to improve balance confidence into these programs. **Key Words:** Chronic stroke—balance confidence—balance control—quiet standing—walking—reactive balance.

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Introduction

Falls are among the most common complications for individuals recovering from stroke. Of community-dwelling individuals recovering from stroke, up to three-quarters may fall within 6 months after discharge from hospital.[1] Furthermore, falls risk for individuals with stroke is doubled relative to healthy older adults.[2] Balance confidence, or an individual's confidence in his or her ability to maintain balance and remain steady,[3] has been related to falls risk in community-dwelling individuals with stroke,[4] as has falls-related self-efficacy.[5,6] Therefore, it is important to establish the nature of the relationships between balance confidence and falls risk in this population.

Balance confidence has also been associated with quiet standing and walking performance in older adults and individuals with stroke. In community-dwelling older adults, participants with greater balance confidence exhibited less center of pressure (COP) excursion during quiet standing and faster walking scores than participants with lower balance confidence.[7] Similarly, lower falls self-efficacy (a construct related to balance confidence[8]) in community-dwelling older adults has been associated with slower gait speed, shorter stride length, increased stride width, and prolonged double support time.[9] In individuals with stroke, falls self-efficacy has been positively related to clinical balance and gait outcomes.[10] Recently, the relationships between balance confidence and specific features of balance and gait were assessed in individuals with subacute stroke.[11] Balance confidence was positively related to walking velocity and negatively related to anteroposterior COP excursion during quiet standing and double support time and step time variability during walking.[11] These results suggest that in individuals with subacute stroke, low balance confidence was associated with impaired control of quiet standing balance and cautious behavior during gait.[11]

Specific measures of balance and gait have also been related to falls risk in several populations, including individuals with stroke. Between-limb synchronization during quiet standing, variability during walking, and reactive stepping measures have been related to falls in individuals with stroke.[6,12] Measures such as COP excursion during eyes-open quiet standing, walking velocity, and double support time are related to falls in older adults,[13-15] as is postural sway during eyes-closed quiet standing in individuals with multiple sclerosis.[16] Given the relationships between falls risk and balance confidence,[4] and between falls risk and features of balance and gait, it is warranted to explore balance confidence and these balance and gait features to better understand the strength of these relationships.

Although balance confidence and features of gait and balance have been related in individuals with subacute stroke,[11] one limitation of this study was that the assessments were administered soon after stroke (when participants were admitted to inpatient rehabilitation). The Activities-Specific Balance Confidence (ABC) Scale asks participants to assess confidence in completing activities that individuals in inpatient rehabilitation may not have attempted since their strokes (e.g., walking in a crowded environment or on icy surfaces).[11] Therefore, it may have been challenging for participants to quantify their levels of balance confidence at that time point in their stroke recovery. The assessment of balance confidence at a later stage in the recovery process (i.e., chronic stroke) may provide a higher level of ecological validity and potentially further insight into the relationships between balance confidence and features of balance and gait. To our knowledge, no study has determined whether the associations between balance confidence and specific features of balance and gait remain as individuals reach the chronic stage of stroke (6 months poststroke). This study aimed to quantify the relationships between balance confidence and specific features of balance and gait in community-dwelling individuals with chronic stroke. It was hypothesized that balance confidence would be positively associated with between-limb synchronization of anteroposterior COP (eyes-open quiet standing) and walking velocity, and negatively associated with COP excursion (eyes-open quiet standing), reliance on vision (quiet standing), double support time and variability measures (walking), and the number of steps taken, occurrence of reach-to-grasp reactions, and need for assistance (reactive stepping).

Materials and Methods

Participants

This study involved a cross-sectional, retrospective review of data from individuals with stroke who underwent inpatient stroke rehabilitation at a rehabilitation hospital between September 2010 and March 2013.[12,17] As part of a larger study, the participants were invited to complete a clinical assessment of balance and gait at 6 months postdischarge from inpatient rehabilitation if they had completed the same assessment at discharge from inpatient rehabilitation, had been discharged home from inpatient rehabilitation, and were capable of independent ambulation at discharge.[12] Individuals were included in the current analysis if they completed the ABC Scale[3] and at least one of the following tasks in the 6-month assessment: quiet standing, self-paced walking without a walking aid across a pressure-sensitive mat, or an unconstrained lean-and-release reactive stepping trial (assessment details below).[11,12] Initially, 100 individuals were recruited, with 69 of those individuals returning for a follow-up assessment. Of those 69 individuals, 66 (95.7%) were included in the present analysis; the remaining three individuals were excluded due to missing data (two) or because they presented with bilaterally affected limbs (one).