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Canadian Journal of Diabetes

journal homepage:  
[www.canadianjournalofdiabetes.com](http://www.canadianjournalofdiabetes.com)



Original Research

## The Short Version of the Activities-Specific Balance Confidence Scale for Older Adults with Diabetes—Convergent, Discriminant and Concurrent Validity: A Pilot Study

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### ARTICLE INFO

#### Article history:

Received 23 June 2016  
Received in revised form  
7 October 2016  
Accepted 13 October 2016

#### Keywords:

aging  
balance  
balance confidence  
falls  
type 2 diabetes mellitus

#### Mots clés :

vieillesse  
équilibre  
confiance en son équilibre  
chutes  
diabète sucré de type 2

### ABSTRACT

**Objectives:** The short version of the Activities-Specific Balance Confidence Scale (ABC-6) is advantageous in busy clinical or research settings because it can be administered in less time than the original 16-item Activities-Specific Balance Confidence Scale (ABC-16). This pilot study examined the convergent, discriminant and concurrent validity of the ABC-6 in older adults with diabetes mellitus with and without diagnosed diabetic peripheral neuropathy (DPN).

**Methods:** Thirty older adults (aged  $\geq 65$ ) were age- and sex-matched in 3 groups: 10 with diabetes (DM group), 10 with diagnosed DPN (DPN group) and 10 without diabetes (no-DM group). Balance confidence was quantified by the ABC-16, which includes the ABC-6. Potential correlates were evaluated in physical and psychological domains.

**Results:** The ABC-6 and ABC-16 balance confidence scores were strongly correlated ( $r=0.969$ ;  $p<0.001$ ; convergent validity). The ABC-6 revealed significant differences in balance confidence between the no-DM and the DM groups ( $p<0.001$ ; discriminant validity), whereas the ABC-16 did not ( $p>0.05$ ). The ABC-6 was moderately, but significantly, correlated with physical activity level ( $r=0.528$ ;  $p=0.017$ ), mobility ( $r=-0.520$ ;  $p=0.027$ ), balance ( $r=0.633$ ;  $p=0.003$ ), and depressive symptoms ( $r=-0.515$ ;  $p=0.020$ ) in the DM study groups (concurrent validity).

**Conclusions:** The ABC-6 and ABC-16 had excellent convergent validity, and both ABC scales had similar concurrent validity. However, the ABC-6 was more sensitive in detecting subtle differences in balance confidence in older adults with diabetes without diagnosed DPN than the ABC-16. Overall, this pilot study provided evidence of the validity of the ABC-6 in older adults with diabetes. Further exploration involving a larger sample size is recommended to confirm these findings.

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### R É S U M É

**Objectifs :** La version simplifiée (ABC-6) de l'échelle ABC-S (Activities-specific Balance Confidence Scale) est avantageuse dans les milieux cliniques ou de recherche qui sont débordés puisqu'il est possible de la faire passer en moins de temps que la version originale de l'échelle ABC-S qui comprend 16 items (ABC-16). La présente étude pilote a examiné les validités convergente, discriminante et concurrente de la version simplifiée de l'échelle ABC-6 chez les personnes âgées atteintes du diabète sucré et ayant reçu ou non un diagnostic de neuropathie diabétique périphérique (NDP).

**Méthodes :** Trente personnes âgées ( $\geq 65$  ans) ont été appariées selon l'âge et le sexe et réparties en 3 groupes : 10 personnes âgées diabétiques (groupe DS), 10 personnes âgées ayant reçu un diagnostic de NDP (groupe NDP) et 10 personnes âgées non diabétiques (groupe non DS). Le degré de confiance de la personne en son équilibre a été évalué par l'échelle ABC-16, qui comprend les 6 items de l'ABC-6. Les corrélats potentiels ont été évalués dans les sphères physique et psychologique.

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<http://dx.doi.org/10.1016/j.jcjd.2016.10.007>

**Résultats :** Les scores de confiance de la personne en son équilibre à l'échelle ABC-6 et à l'échelle ABC-16 ont montré une corrélation très étroite ( $r=0,969$ ;  $p<0,001$ ; validité convergente). L'échelle ABC-6 a révélé des différences significatives dans la confiance de la personne en son équilibre entre le groupe non DS et le groupe DS ( $p<0,001$ ; validité discriminante), alors que l'échelle ABC-16 n'en a pas révélé ( $p>0,05$ ). L'échelle ABC-6 a été corrélée de façon modérée, mais significative, avec le niveau d'activité physique ( $r=0,528$ ;  $p=0,017$ ); la mobilité ( $r=-0,520$ ;  $p=0,027$ ); l'équilibre ( $r=0,633$ ;  $p=0,003$ ); les symptômes de dépression ( $r=-0,515$ ;  $p=0,020$ ) dans les groupes DS à l'étude (validité concurrente).

**Conclusions :** L'échelle ABC-6 et l'échelle ABC-16 ont montré une excellente validité convergente, alors que les deux échelles ABC ont montré une validité concurrente similaire. Toutefois, l'échelle ABC-6 était plus sensible à la détection des différences subtiles dans la confiance de la personne en son équilibre chez les personnes âgées diabétiques n'ayant pas reçu de diagnostic de NDP que l'échelle ABC-16. Dans l'ensemble, cette étude pilote a fourni la preuve de la validité de l'échelle ABC-6 chez les personnes âgées diabétiques. Une analyse plus approfondie portant sur un échantillon de plus grande taille est recommandée pour confirmer ces résultats.

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## Introduction

Balance confidence is defined as individuals' beliefs in their ability to maintain balance while performing the activities of daily living (1). Low balance confidence is associated with activity avoidance, physical deconditioning, declines in mobility and balance, clinical depression and falls (2–4). The most commonly used measure of balance confidence is the Activities-Specific Balance Confidence Scale (ABC-16). However, to reduce the time to administer the ABC-16 in busy clinical or research settings from approximately 5 minutes to 2.5 minutes, the short Activities-Specific Balance Confidence Scale (ABC-6) was derived from the identification of 6 items with the lowest balance confidence on the ABC-16 in older adults with Parkinson disease and high-level gait disorders (5). The psychometric properties of the ABC-6 were similar to those of the ABC-16 when assessed in community-dwelling older adults (5,6) as well as in individuals with Parkinson's disease and high-level gait disorders (5,7). However, the psychometric properties of neither ABC version have been evaluated in older adults with diabetes mellitus.

Of the limited evidence available, balance confidence (ABC-16) has been reported to be 11% lower in older adults with diabetes who were fallers than in non-fallers (8) and indicative of a moderate level of physical functioning (9) in older adults with diabetic peripheral neuropathy (DPN); (ABC-16: 71.42%) (10). However, balance confidence (ABC-16) has also been reported to be similar between older adults with and without diabetes despite subtle but clear diabetes-related degradation of sensory functions (visual, vestibular and somatosensory) and worse balance performance (8). Emerging evidence suggests that the ABC-6, with its narrower continuum of activity difficulty, is more sensitive in detecting subtle differences in balance confidence than the ABC-16 (6). Therefore, it is possible the ABC-6 may detect subtle differences in balance confidence in older adults with and without diabetes that are undetected by the ABC-16. However, it is unknown whether the ABC-6 is a valid assessment tool in older adults with diabetes. Therefore, this study builds upon previous psychometric testing of the ABC-6 and assesses its validity in older adults with diabetes with and without diagnosed DPN. The specific study objectives were: 1) to evaluate the convergent validity of the ABC-6 to assess balance confidence, compared to the ABC-16, in older adults with diabetes with and without diagnosed DPN; 2) to compare the discriminant validity of the ABC-6 and ABC-16 in their abilities to discriminate between older adults with diabetes, with and without DPN, compared to older adults without diabetes and 3) to explore the concurrent validity of the ABC-6 by means of physical and psychological clinical assessments in older adults with diabetes and with and without diagnosed DPN.

It was hypothesized that the ABC-6 would have excellent convergent validity with the ABC-16, and that the ABC-6 would be more

sensitive in detecting subtle differences in balance confidence in older adults with diabetes without diagnosed DPN when compared to the ABC-16. Last, we hypothesized that balance confidence as shown by the ABC-6 would be significantly correlated with both physical and psychological clinical assessments in older adults with diabetes both with and without diagnosed DPN.

## Methods

### Participants

A sample-size calculation was conducted using the program G\*Power (Heinrich-Heine University of Dusseldorf, Dusseldorf, Germany) to determine a sufficient sample size with an alpha of 0.05 and a power of 0.80. Based on these assumptions and previous findings (6,11), a sample size of 10 older adults per group was concluded to be sufficient for this secondary data analysis. Thirty community-dwelling older adults (aged  $\geq 65$ ) were age- and sex-matched in 3 groups: 10 with diabetes (DM group; age  $72.00\pm 5.44$  years; 7 males); 10 with DPN (DPN group; age  $71.70\pm 5.14$  years; 7 males) and 10 without diabetes (no-DM group; age  $74.50\pm 3.54$  years; 7 males). Inclusion criteria were having diabetes for 5 years or longer. Exclusion criteria included 1) open sores or ulcers on feet; 2) other neurologic conditions (e.g. Parkinson disease, stroke, multiple sclerosis, etc.); 3) painful lower-limb arthritis; 4) use of a mobility device; 5) self-reported mobility disability (defined as the inability to walk a quarter mile without resting or to climb a flight of stairs unsupported) and 6) cognitive impairment (Montreal Cognitive Assessment score  $< 26$ ) (12). Participants provided written informed consent, and the protocol was approved by the Institutional Ethics Review Board.

### Outcome measures

#### Participants' characteristics

Ages, sex, heights and weights were recorded. Body mass indexes (BMIs;  $\text{kg}/\text{m}^2$ ) were calculated and used to classify obesity ( $\text{BMI} \geq 30$ ). Glycated hemoglobin (A1C) values were obtained at a local hospital from blood samples taken within 1 week of the testing session. Diabetes duration (years), possible comorbidities (e.g. diabetic retinopathy, cataracts, glaucoma) and current medications were recorded. Number of falls in the past year were self-reported (0 falls = non-faller;  $\geq 1$  fall = faller). Lower-limb somatosensory function was assessed by a 5.07 Semmes-Weinstein Monofilament (North Coast Medical, Gilroy, California, United States) on the plantar surface of the first metatarsal head of each foot. The 5.07 monofilament provides 10 g of force, and the inability to sense 10 g on either foot was recorded as loss of protective sensation (13).

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