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Abstract

Balance confidence, measured using the Activity-Specific Balance Confidence Scale (ABC-16), can affect quality of life in individuals with Parkinson's disease (PD). Two abbreviated 6-item versions of the ABC-16 have been previously derived to measure balance confidence in an expedited fashion. This study aimed to validate these abbreviated versions and to determine their correlations with measures of balance and functional capacity. Eighty-nine individuals with PD participated in the study. Using the 25th percentile, 5 items were identified as the lowest scoring items (i.e., lowest balance confidence), and thus a 5-item version of the questionnaire was created. Internal consistency and the relationship with the ABC-16 were good for all abbreviated versions (Cronbach $\alpha > 0.93$; ICC > 0.91). All versions correlated significantly with most measures of balance and function, with no differences between versions. An abbreviation of the ABC-16, using only 5 items, may prove useful in busy clinical and research settings.

Keywords: Parkinson's disease, Balance, Functional Capacity

INTRODUCTION

The progression of Parkinson's disease (PD) is associated with a fear of falling (FOF) which may independently exacerbate functional decline.[1] The Activities-Specific Balance Confidence scale (ABC-16)[2] is often used to asses balance confidence, a construct similar to fear of falling. Respondents are asked to estimate their confidence in performing 16 everyday activities that range broadly in difficulty. Scores range from 0-100%, with higher scores indicating higher confidence. The ABC-16 has been used as both an outcome measure[3] and to assess the association between balance confidence and fall risk,[4, 5] and has been validated in several populations.[3, 6, 7] Up to 20 minutes may be required to properly complete the 16-item questionnaire. Due to time constraints in clinical and research settings, a more time-efficient version of the questionnaire would be advantageous. Peretz et al.[8] developed a 6-item version (ABC-6) of the ABC-16 based on a sample of individuals with PD (n=19) and higher level gait disorder (n=70). Those items scoring lowest (i.e., items on which respondents reported the lowest confidence) were chosen for the short version (Figure 1A). The ABC-16 was also translated to Dutch and validated in a larger sample of 50 outpatients with PD.[9] Item reduction based on lowest score criteria resulted in a 6-item version that differed slightly from that of Peretz et al.[8] (Table 1). These shortened versions have yet to be validated in separate samples, and although the full ABC-16 has been shown to correlate highly with other measures of balance,[1, 10] the abbreviated versions have yet to be tested in this regard. Therefore, the purpose of this study was to apply these two versions of the 6-item questionnaires to a larger sample with PD in order to assess the reliability and internal consistency of the measures as well as the correlation with other measures of balance and functional capacity.

SUBJECTS AND METHODS

Subjects diagnosed with idiopathic PD using diagnostic criteria for clinically defined "definite PD" [11] were recruited from the Movement Disorders Center at Washington University School of Medicine to participate in this study. All subjects gave informed consent to perform experimental procedures approved by the Human Studies Committee at Washington University School of Medicine.

Subjects were administered the ABC-16 questionnaire, the Unified Parkinson's Disease Rating Scale Motor Subscale III (UPDRS III), the Freezing of Gait (FOG) questionnaire, and completed a series of functional tests assessing balance and functional capacity. All testing occurred in the *on* state of their anti-Parkinson medication. Balance was assessed using the Berg balance scale (BBS)[12], timed-up-and-go test (TUG),[13] functional reach (FR),[14] one leg stance (1LS), tandem stance (TS) and postural instability and gait difficulty score (PIGD) of the UPDRS III (computed as the sum of the items 27-30). Functional capacity was assessed using the six minute walk test (6MW).[15]

Using scores from the completed ABC-16 questionnaire, two separate 6-item ABC scores were established for each subject using items specific to the Peretz[8] and Oude Nijhuis[9] versions, respectively (Figure 1A). Additionally, we used the 25th percentile score of each item to identify our lowest scoring ABC-16 items. This was the same method used to develop the previous two 6-item versions.[8, 9]

Data were analyzed using SPSS version 17.0. A general linear model with repeated measures was used to compare mean scores between all versions of the ABC questionnaire. The relationship between each of the condensed versions with the ABC-16 was assessed using intraclass correlation (ICC). Internal consistency of each version was assessed using Cronbach's alpha. The correlation of each version of the questionnaire with the balance and functional capacity measures was determined using Pearson's correlation coefficient and Spearman's rank order correlation.

RESULTS

Eighty-nine people with idiopathic PD (64 males, 25 females; mean age = 66.5 ± 9.8) were included in the study. Subjects were in Hoehn and Yahr Stage 1-4 (mean ± SD = 2.3 ± 0.5) with a mean disease duration of 8.2 ± 5.2 years. Based on our sample, five of the ABC-16 items received 25th percentile values of 50 or below (Figure 1B) while nine items received 25th percentile values of 60 or below. Therefore, we combined the 5 lowest scoring items (lowest confidence) into an ABC-5 score. The mean score on the ABC-5 (60.92% ± 2.96) was lower than both the Peretz[8] and Oude Nijhuis[9] versions (63.17% ± 2.86, 63.18% ± 2.87 respectively, $p<.001$). All three shortened versions produced lower scores than the ABC-16 (74.12% ± 2.16, $p<.001$). Internal consistency was high for all versions based on Cronbach's alpha (ABC-16, 0.96; ABC-6 Peretz, 0.93, ABC-6 Nihjuis, 0.94; ABC-5, 0.93). The relationships (ICC) between the ABC-16 and the ABC-6 Peretz (0.93), ABC-6 Oude Nijhuis (0.93) and the ABC-5 (0.91) were all good. Correlations between each version of the ABC and balance measures are shown in Table 1. All versions were significantly correlated with BBS, TUG, 6MW, 1LS, TS, UPDRS III and PIGD. None of the ABC scales were correlated significantly with FR. Correlation coefficients were similar across versions for each balance measure.

DISCUSSION

This study validates the use of two condensed 6-item versions of the ABC-16 in a large sample of patients with PD. Additionally, we have shown that a condensed version containing only 5-items is as useful as either 6-item questionnaire. Internal consistency was high for all versions, as was the agreement between the short and long versions of the questionnaire. Our condensed version includes the 5 items common to both the Peretz et al.[8] and Oude Nijhuis et al.[9] 6-item questionnaires (items 5, 6, 13, 15, and 16). These five items are consistently found to be among the lowest scoring items in various populations, reflecting the most challenging situations. Powell and Myers[2] studied older adults and found these five items to be among the

seven lowest scoring items. Additionally, Adkin et al.[1] found these five items to be among the six lowest scoring items in their study of PD. Items included in previous abbreviated versions of the ABC-16 but excluded from our 5-item questionnaire include items 12 (walking in a crowded mall)[9] and 14 (escalator holding rail).[8] As item 13 (escalator not holding a rail) is already included in our version, some degree of redundancy provides rationale for exclusion of item 14. Oude Nijhuis et al.[9] suggest that the inclusion of item 12 may have a relevant pathophysiological explanation, in that walking in a crowded mall could be related to freezing of gait, as those subjects who reported freezing on the UPDRS-ADL section scored significantly lower on item 12. Therefore, we conducted a secondary analysis on our data using a linear regression model and found that "freezers" (score >1 on item 3 of the FOG questionnaire) scored significantly lower on all items except 4, 5, and 11, as well as on the composite score of each of the four versions of the ABC scale ($p<0.05$). This effect was seen when controlling for disease severity as measured by UPDRS score. Hence, the association between freezing and lower scores is not limited to item 12. Furthermore, logistic regression indicated that although specificity (proportion of predicted non-freezers to true non-freezers) of the ABC-16 and each of the short versions was good (>82.5%), the sensitivity (proportion of predicted freezers to true freezers) was poor for all versions (ABC-16 = 50%, short versions < 40.6%). Therefore, inclusion of item 12 likely does not add to the functionality of the abbreviated questionnaire.

This study is the first to correlate shortened versions of the ABC-16 with various measures of balance and functional capacity. These versions were significantly correlated with all measures of balance and functional capacity except for FR. Most importantly, these correlations did not differ between abbreviated versions, nor were the magnitudes of the correlations reduced by abbreviating the questionnaire. Therefore, association between balance measures and the ABC-16 observed in previous studies appear to hold true for abbreviated versions of the questionnaire as well. It is unclear why the ABC scales did not correlate with FR. It is possible that FR is a poor measure of dynamic balance[16] and may in fact measure a

separate construct. Alternatively, because individuals with PD experience greater instability in the posterior direction[17], it may be that the forward leaning task of the FR test does not challenge dynamic balance to the same extent as the tasks included in the ABC items, where individuals may feel more likely to lose balance in the posterior direction.

In summary, we demonstrate herein that the measurement properties of three shortened versions of the ABC-16 are similar to those of the full version in a relatively large sample of individuals with PD. Furthermore, all three abbreviated questionnaires were similarly correlated with other measures of balance and functional capacity. In addition to externally validating two previously derived 6-item versions, we propose the use of a 5-item version. An abbreviated version of the ABC-16 containing only five items may be the most time-efficient means of measuring balance confidence using the ABC in settings where time constraints exist.

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Figures

A

ABC Questionnaires

ABC-16	ABC-6 Peretz *et al.*	ABC-6 Oude Nijhuis *et al.*	ABC-5 This study
1. Walk Around house			
2. Up and down stairs			
3. Pick up slipper from floor			
4. Reach at eye level			
5. Reach on tiptoes	X	X	X
6. Stand on chair to reach	X	X	X
7. Sweep the floor			
8. Walk outside to a nearby car			
9. Get in/out of car			
10. Walk across parking lot			
11. Up and down ramp			
12. Walk in crowded mall		X	
13. Walk in crowd/bumped	X	X	X
14. Escalator holding rail	X		
15. Escalator not holding rail	X	X	X
16. Walk on icy sidewalks	X	X	X

* Items included in each shortened version of the ABC scale are indicated by the symbol *X*.

B

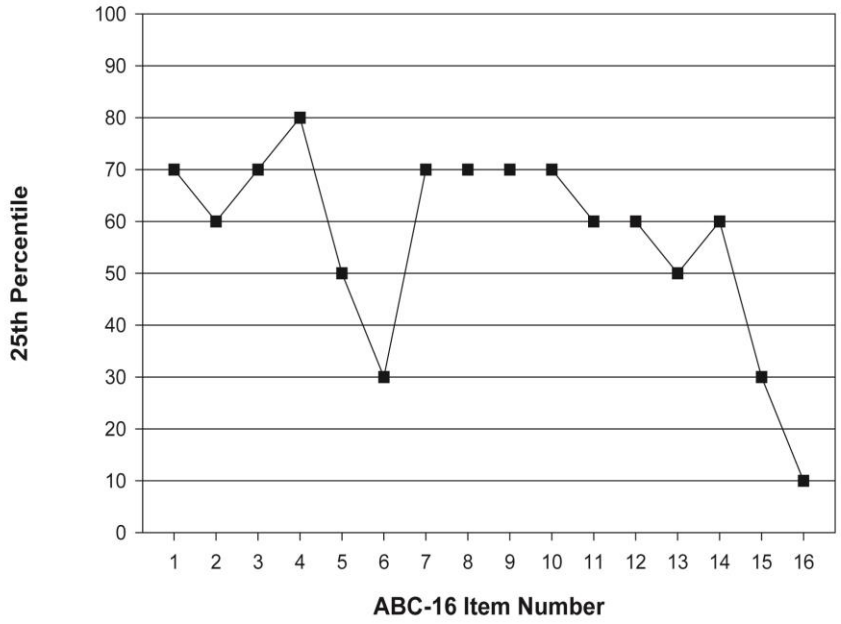

Figure 1a. Items included in each abbreviated version of the ABC-16.

Figure 1b. 25th percentile values for each of the 16 items included in the Activities-Specific Balance Confidence Scale.

Table 1. Correlation coefficients between ABC scales and balance measures.

	ABC-16[a]	ABC-6 Peretz[8,a]	ABC-6 Oude Nijhuis[9,a]	ABC-5[a]	Berg[b]	Func. Reach[a]	1-leg Stance[a]	Tandem Stance[a]	TUG[a]	6MW[a]	PIGD[b]	UPDRS III[b]
ABC-16	1	.963**	.970**	.956**	.505**	.184	.263*	.357**	-.372**	.458**	-.387**	-.221*
ABC-6 Peretz[8]		1	.991**	.994**	.520**	.192	.275**	.375**	-.418**	.473**	-.413**	-.236*
ABC-6 Oude Nijhuis[9]			1	.995**	.512**	.192	.281**	.376**	- .390**	.465**	-.419**	-.234*
ABC-5				1	.510**	.201	.288**	.393**	-.411**	.472**	-.421**	-.239*

[a] Pearson's Correlation Coefficient
[b] Spearman's Rank Order Correlation
* p<.05
** p<.01