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Reliability and Validity of the Modified Vestibular Disorders Activities of Daily Living Scale in Older Adult Balance Examination

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Background

• 30-60% community dwelling older adults fall each year, which is the leading cause of injury, death, and traumatic hospital admissions in the elderly.[1] This costs the U.S. health care system $20-30 billion per year.[2]

• Currently used older adult self-report measures demonstrate poor responsiveness[3], thus failing to detect a decline in function early enough for preventative physical therapy intervention.

• The Vestibular Activities of Daily Living Scale (VADL) is a self-report measure developed to determine activity & participation restrictions in patients with vestibular dysfunction[4]. This scale clearly delineates important tasks and categories of independence, which would be applicable to the assessment of older adult fall risk and functional decline.

• The 10 independence rating categories of the VADL may enable physical therapists to detect functional changes on balance-related tasks and provide interventions to prevent falls and associated injuries in community-dwelling elders.

• Assessing some basic psychometric properties of a modified version of the VADL (m-VADL) to the examination of older adult balance is required before this tool can be used confidently in the clinic.

Purpose

The purpose of this study was to measure the test –retest reliability of the m-VADL and its construct validity with the Functional Gait Assessment (FGA), 10-Meter Walk Test (10MWT), Single Limb Stance (SLS), and Activities-Specific Balance Confidence scale (ABC).

Methods

Subjects
• Inclusion criteria:
   • ≥65 years old
   • able to independently ambulate ≥14 meters
   • able to provide informed consent
   • lives independently within the community
   • able to follow 3 step commands
• Recruitment: from local retirement community

Data Collection
• Subjects completed m-VADL, ABC, FGA, SLS, and 10MWT in a random order during a single data collection session.
• Subjects completed m-VADL for a second time 2 weeks later.

Statistical Analysis
• SPSS software – using intraclass correlation coefficient (ICC) for reliability
• Known group analysis for validity

Results

• 10 subjects completed testing
   • Baseline characteristics reported in Table 1.

• Test-retest reliability of the m-VADL
   • ICC = 0.92 (95% CI, 0.72-0.98)
   • Figure 1 shows the two week test-retest reliability for the m-VADL and the line of agreement.

• Construct validity
   • Within the subjects tested, 2 groups emerged based on the presence or absence of other health conditions.
   • m-VADL scores differentiated between the two groups, with balance and gait self report measures (ABC) and performance-based measures of 10 MWT comfortable walking speed (CWS), fast walking speed (FWS), FGA, single limb stance with eyes open (SLS-EO) and eyes closed (SLS-EC) consistently higher for the group reporting no major health conditions—see Table 2.

Table 1. Subject Characteristics

Variable	Mean (±SD)
Age (years)	81 (± 7)
BMI	22 (± 3)
	N
Gender	9 female; 1 male
# of falls within the past year	0 Falls = 7 subjects; 1 Fall = 2 subjects; 2 Falls = 1 subject
Reported general health status	5 Excellent; 5 Good
Reported health conditions	9 subjects report none; 1 subject reports paralysis due to brain aneurism
Frequency of community walking	Daily = 4 subjects; 3-4 days/wk = 3 subjects; 1-2 days/wk = 2 subjects; Never = 1 subject

Table 2. Construct Validity: Known Group Analysis

	Group 1 (n=9)	Group 2 (n=1)
Total m-VADL 1 score	1	3
FGA score	27	16
SLS-EO Left/Right (s)	10/9	0/0
SLS-EC Left/Right (s)	2/2	0/0
10MWT – CWS (m/s)	1.30	0.89
10MWT – FWS (m/s)	1.70	0.90
ABC (%)	92	53

Figure 1. Test-Retest Reliability of the m-VADL
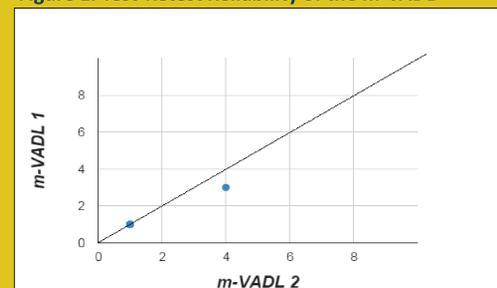
Discussion

• m-VADL demonstrated strong test-retest reliability for a high functioning population of community dwelling older adults (ICC = 0.92).

• Construct validity established using known group analysis
   • m-VADL scores distinguished expected group differences in balance and gait using self-report measures and performance-based measures.
   • m-VADL accurately identified independent community dwelling older adults.

• High level of independence displayed by subjects:
   • All subjects were regular participants in a group balance class, resulting in a homogeneous sample.
   • A normative score for the FGA is 20.8 among 80-89 year olds[5]. The subjects in this study had a combined average of 25.5.
   • Group 1 had an average CWS of 1.30 m/s, which is faster than the average for 80 year olds of 0.80 m/s for females and 0.88 m/s for males[6].

• Strengths of this study
   • Tests were administered in a random order to reduce test order bias.
   • Self-report questionnaire follow-up was 100%.

• Limitations to this study
   • Homogenous sample, skewed to higher functioning older adults.
   • Small sample size.

Conclusion

• Within the small sample size of this study, the test-retest reliability is strong.
• m-VADL distinguished expected group differences in balance and gait measures in community dwelling older adults.

Further Research

• Extend validity assessment of the m-VADL with a larger sample size and recruitment of community-dwelling older adults representative of a wider range of functional levels.
• Assess responsiveness of the m-VADL to change in functional status.
• Assess the prospective predictive validity of the m-VADL with regards to future falls.

References

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