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Construct Validation of Physical Activity Surveys in Culturally Diverse Older Adults: A Comparison of Four Commonly Used Questionnaires

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The purpose of this study was to establish validity evidence of four physical activity (PA) questionnaires in culturally diverse older adults by comparing self-report PA with performance-based physical function. Participants were 54 older adults who completed the Continuous Scale Physical Functional Performance 10-item Test (CS-PFP10), Physical Activity Scale for the Elderly (PASE), CHAMPS Physical Activity Questionnaire for Older Adults, Yale Physical Activity Survey (YPAS), and modified Baecke questionnaire. The total PASE score, three outcome scores for the CHAMPS, and three summary indices for the YPAS were significantly correlated with total CS-PFP10 score. The modified Baecke exhibited no correlations with CS-PFP10 scores. The PASE, CHAMPS, and YPAS appear to be the most valid PA self-report questionnaires for culturally diverse older adults.

Key words: aging, exercise, measurement

Regular physical activity (PA) is associated with numerous health benefits, yet many older adults are not physically active (U.S. Department of Health & Human Services [USDHHS], 1996). Consequently, increasing PA in the older adult population has become an important public health concern (Merck Institute of Aging & Health, Centers for Disease Control and Prevention, Gerontological Society of America, 2004).

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Moreover, certain groups appear to be particularly at risk for sedentary lifestyles, including racially and ethnically diverse, less educated, and socioeconomically challenged older adults (USDHHS, 1996). Data indicate that these older adults demonstrate the highest rates of disablement, and they are less likely to be involved in PA programs (USDHHS, 2000).

Although culturally diverse older adults have been targeted for community-based PA interventions, little data exist to substantiate the appropriateness of existing PA measurement techniques in this population. In addition, participation in PA may be socially constructed with cultural variability related to activity type. For example, African Americans are more likely than Caucasians to provide care to families in the community versus institutions (Young & Kahana, 1995), and, therefore, caretaking activities may be a more important component of their daily PA than Caucasians. However, questions about caretaking activities are not consistently included across PA questionnaires. In large samples or other situations, when ease of administration is important, subjective measures (e.g., questionnaires) are used to record PA levels. Among the most popular PA question-

naires for older adults are the Physical Activity Scale for the Elderly (PASE; Washburn, Smith, Jette, & Janney, 1993), the CHAMPS Physical Activity Questionnaire for Older Adults (Stewart et al., 2001), the Yale Physical Activity Survey (YPAS; DiPietro, Caspersen, Ostfeld, & Nadel, 1993), and the modified Baecke Questionnaire for Older Adults (Baecke, Burema, & Brijters, 1982). These questionnaires are valid and reliable measures of PA among older adults (Harada, Chiu, King, & Stewart, 2001; Voorrips, Ravelli, Dongelmans, Deurenberg, & Van Staveren, 1991).

Direct evidence of the validity of these questionnaires has been established through the use of criterion measures of doubly labeled water (YPAS, PASE) and indirect calorimetry (YPAS; Washburn, 2000). Motion sensors such as accelerometers (PASE; $r = .49$), pedometers (modified Baecke; $r = .72$), and the Mini-Logger Series 2000 activity monitor (CHAMPS; $r = .42$–$.61$ activity counts detected by a waist sensor; $r = .36$–$.59$ activity counts detected by an ankle sensor) have also been used (Harada et al., 2001; Washburn, 2000). Regardless of the approach, however, reliability and validation studies for PA questionnaires have been limited to samples of generally healthy, well educated, Caucasian participants (Washburn, 2000). Consequently, little is known about the reliability and validity of these measures for racially and ethnically diverse, less affluent, and less educated older adults.

Therefore, the purpose of this study was to provide validity evidence of the PASE, CHAMPS, YPAS, and modified Baecke PA questionnaires in culturally diverse older adults participating in community-based programs by comparing self-report PA estimates with measures of physical function. In so doing, we hoped to make recommendations based on our findings as to which, if any, of the instruments may provide investigators with the most culturally sensitive self-report PA measure. We chose to examine the validity evidence against indirect measures of physical activity (i.e., physical function) as an initial step in validating these instruments. This approach was selected because it is somewhat more feasible and less costly than doubly labeled water, and, moreover, there has been a call for using functional outcomes as indirect PA measures for validating PA questionnaires among older adults (Rikli, 2000).

While we hypothesized that these instruments would have at least moderate associations with physical function scores, we had no basis for suggesting which instrument would show the greatest evidence of validity. To that end, this study was exploratory rather than confirmatory. To demonstrate which instrument possesses the best evidence of validity, differences in correlations were evaluated with confidence intervals (CI) and *t* tests using methods outlined by Cohen and Cohen (1983, p. 57; Fisher, 1921).

Method

The procedures described herein were approved by the institutional review board of Louisiana State University.

Participants and Procedures

Participants were eligible for inclusion in the study if they (a) were at least 50 years of age, (b) were involved in activities at an urban community center or resided at an independent living retirement facility for seniors with fixed incomes, and (c) consented to participate in a PA and nutrition intervention. Participants with contraindications to exercise as defined by the American College of Sports Medicine Guidelines (ACSM, 2000) were excluded from the study.

Data were collected as part of the preliminary assessments conducted between February 2004 and February 2006 for a PA and nutrition intervention study of culturally diverse older adults. Specifically, the researchers collected data used in this study during three 60-min interview sessions. Interviews followed a standardized protocol and were conducted by trained research technicians at either the local community center or the independent living retirement facility. During the first interview session, participants completed an informed consent form approved by the University's Institutional Review Board, and they responded to the demographic items, the health status questionnaire, and the Mini Mental Status Examination MMSE). During the second session, the Continuous Scale Physical Functional Performance 10-item Test (CS-PFP10) was administered. In the third interview session, the participants responded to the PA questionnaires. All four questionnaires were administered verbally in a face-to-face interview.

Descriptive Measures

Demographic Questionnaire. A demographic information questionnaire was designed for this study to obtain information regarding participants' age, sex, race, marital status, education level, annual income, and employment status.

Health Status Questionnaire. This 25-item questionnaire (Howley & Franks, 2003) assesses participants' medical history (i.e., examinations, operations, medical conditions, medications), health-related behavior (i.e., smoking, exercise, weight), and health-related attitudes. It was used to obtain information about participants' smoking status, medical conditions, and prescription medications.

MMSE. The MMSE (Folstein, Folstein, & McHugh, 1975) is a measure of cognitive status routinely used with

older adults in the cognitive aging literature (Crum, Anthony, Bassett, & Folstein, 1993). The MMSE is composed of seven subscales that include orientation, registration, attention and calculation, recall, language, repetition, and comprehension. It was useful for screening for cognitive impairment and has demonstrated validity and reliability in a variety of populations (Tombaugh & McIntyre, 1992). Scores can range from 0 to 30, with lower scores indicating greater cognitive impairment.

Outcome Measures

PASE. The PASE (Washburn et al., 1993) is a physical activity recall instrument that provides activity scores over a 1-week period. Individual items for the PASE include strength and endurance activities, sport activities ranging from light to vigorous, occupational activity, family care and household activities, and yard work and gardening. The overall PA outcome variable, or total PASE score, is recorded as a unitless activity score. The PASE was designed for use in either an interviewer or self-administered format and it can yield scores that range from 0 to 400 or more. Washburn and colleagues (1993) developed and validated the scale using health status and indirect measures of physical activity (e.g., heart rate, body mass index). Further validation of the PASE has been demonstrated using doubly labeled water (Schuit, Schouten, Westerterp, & Saris, 1997), portable accelerometer (Washburn & Ficker, 1999), young-old individuals (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999), and older adults with chronic knee pain (Martin et al., 1999).

CHAMPS. The CHAMPS questionnaire (Stewart et al., 2001) provides a comprehensive list of light, moderate, and vigorous physical activities. Participants report the frequency and duration of participation in these activities during a typical week during the previous 4 weeks. Four total scores are calculated including frequency and energy expenditure for activities with metabolic equivalent (MET) values above 3.0 (i.e., moderate and vigorous activities) and frequency and energy expenditure for all activities (i.e., light, moderate, and vigorous activities). This instrument has demonstrated adequate reliability and validity evidence, and it is sensitive to changes in activities in older adults (Harada et al., 2001; Stewart et al., 2001; Stewart et al., 1997). Validation of the CHAMPS has been demonstrated using performance-based measures (i.e., 6-min walk and the Short Physical Performance Battery from the Established Populations for Epidemiologic Studies of the Elderly), activity monitoring and self-reported health-related quality of life (Harada et al., 2001). Most recently, the CHAMPS showed adequate measurement properties for use among older Australian adults by tests of physical ability and measures of physical and mental health (Cyarto, Marshall, Dickinson, & Brown, 2006).

YPAS. The YPAS (DiPietro et al., 1993) is an interviewer-administered, 36-item questionnaire that provides estimates of caloric expenditure from work, yard work, exercise, recreational activities, and an overall energy expenditure summary score (kcal/week). The Yale survey also provides a summary index for total activity time (hrs/week) and activity dimensions (i.e., vigorous activity, leisurely walking, moving, standing, and sitting) during a typical week in the past month. Evidence of validity for the YPAS has been demonstrated in healthy older adults using predicted maximal oxygen consumption, percent body fat, and resting diastolic blood pressure (DiPietro et al., 1993), physical activity diary (Schuler, Richardson, Ochoa, & Wang, 2001), doubly labeled water and indirect calorimetry (Starling, Matthews, Ades, & Poehlman, 1999), and measures of cognitive function (DiPietro, Seeman, Merrill, & Berkman, 1996). Additionally, the YPAS has been validated in a sample of older women (Campbell, Cyr-Campbell, Weaver, & Evans, 1997) and against doubly labeled water and measures of physical function (Wood et al., 2005).

Modified Baecke Questionnaire for Older Adults. This questionnaire (Baecke et al., 1982) is a 12-item PA recall survey that provides activity scores for the past year. Scores are calculated for household activities, sport participation, leisure-time activities, and overall PA. The overall PA score is unitless, and scores from the validation study ranged from 2.5 to 21.7 (Voorrips, Ravelli et al., 1991). Research has shown that modified Baecke scores are closely associated with pedometer scores (r= .74; Voorrips, Ravelli, et al., 1991), age, socioeconomic status, measures of subjective health, disability, chronic diseases, living close to shopping areas, and living in a house with stairs (van den Hombergh, Schouten, van Staveren, Van Amelsvoort, & Kok, 1995). Voorrips and colleagues demonstrated that high modified Baecke scores in older Dutch women are correlated with low body weight and body mass index (Voorips, Lemmink, Van Heuvelen, Bult, & Van Staveren, 1993; Voorrips, Meijers, Sol, Seidell, & Van Staveren, 1992; Voorrips, Van Staveren, & Hautvast, 1991), better flexibility of the hip and spine and better endurance (Voorips et al., 1993). Further, the modified Baecke demonstrates very good test-retest reliability over a 20-day interval (r= .89; Voorips et al., 1993).

CS-PFP10. The original CS-PFP test battery was first validated in 1996 (Cress et al., 1996). It included 17 tasks that required the participant to perform activities of daily living (e.g., carrying a pot from the sink to a stove, emptying a washer, walking a flight of stairs, sweeping a floor, etc.) in a standardized fashion. The tests are either time to completion scores, and/or weight carried, height reached, etc. For greater detail, see Cress et al. (1996). Since its introduction, the CS-PFP has gone through several iterations and most recently was

reduced to a 10-item scale (CS-PFP10; Cress, Petrella, Moore, & Schenkman, 2005). The test battery provides functional fitness scores for upper body strength, upper body flexibility, lower body strength, balance and coordination, and endurance, as well as an overall functional fitness score. CS-PFP10 scores range from 0 to 100, with higher scores reflecting better physical functioning.

Analyses

Demographic variables were analyzed using frequencies, means, and standard deviations. Multivariate analyses of variance and *t* tests were used to determine group differences in age, self-reported PA, or CS-PFP10 scores based on race, education level, and income. A Pearson product-moment correlations were calculated between self-report estimates of PA and CS-PFP10 for all four PA questionnaires, and 90% confidence intervals and *t* tests for a significant difference between correlations were calculated using methods outlined by Cohen and Cohen (1983, p. 57; Fisher, 1921). Correlations between .10–.29 were classified as small, correlations between .30–.49 were classified as moderate, and correlations ≥ .50 were considered large (Cohen, 1988). Statistical calculations were considered significant at alpha level of $p < .05$. All data analyses were performed using SPSS version 11.0 (SPSS, Inc., 2001).

Results

During the 24-month recruitment period, 83 older adults consented to participate. Of those 83, 6 relocated and 16 voluntarily withdrew from the study, leaving 61 available. Of these 61 remaining participants, 1 was missing data from the CHAMPS PA questionnaire, and 3 were physically disabled and could not complete the CS-PFP10 test battery, which left a total of 57 participants with complete data. Three of the 57 were identified as univariate and multivariate outliers and were excluded from the analyses. Thus, the final sample included 54 participants. Tests of normality on the final 54 participants indicated a normal distribution of data for all outcome measures. Therefore, linear models were used for statistical analyses.

These 54 adults were between the ages of 50 and 93 years (M age = 66.94 years, SD = 9.79) and were from an urban community center (n = 27) and an independent living retirement facility for seniors with fixed incomes (n = 27). Most were female (79.6%) and African American (70.4%). On average, the participants took approximately three prescription medications (SD = 2.07) and exhibited a mean cognitive status of 25.19 (SD = 3.56). Approximately 32% scored ≤ 23 on the MMSE, indicating the presence of cognitive impairment. Additional participant characteristics are included in Table 1.

Group differences on the physical function and self-reported PA measures by race, education level, and income are displayed in Table 2. Of interest, significant group differences were found for the physical function scores by race, Wilks' Lambda = .67, $F(6, 47) = 3.8$, $p <$

Table 1. Frequencies of participant characteristics

Characteristic	*n*	%
Gender		
Male	11	20.4
Female	43	79.6
Marital status		
Single, never married	5	9.3
Married	10	18.5
Widowed	19	35.2
Divorced/ separated	20	37.0
Education		
≤ High school	27	50.0
> High school	27	50.0
Race		
Black, African American, non-Hispanic	38	70.4
Caucasian, non-Hispanic	16	29.6
Employment		
Retired	37	68.5
Other	17	31.5
Annual income		
≤ $20,000	34	63.0
> $20,000	14	25.9
Did not answer	6	11.1
Smoking status		
Smoker	7	113.0
Nonsmoker	47	87.0
Medical conditions[a]		
Cardiorespiratory	45	83.3
Neurological	24	44.4
Orthopedic	20	37.0
Other condition	25	46.3
MMSE score		
≤ 23	17	31.5
> 23	37	68.5

Note. Cardiorespiratory conditions are categories from the Health Status Questionnaire (HSQ) that include anemia, asthma, chronic bronchitis, emphysema, heart problems, high blood pressure, phlebitis, and stroke. Neurological conditions are categories from the HSQ that include epilepsy, eye problems, and hearing loss. Orthopedic conditions are categories from the HSQ that include back strain, neck strain, and rheumatoid arthritis. Other conditions are categories from the HSQ that include cancer, diabetes and thyroid conditions; MMSE = Mini Mental State Examination.
[a]Percentages may not add up to 100%, because some participants reported multiple conditions.

.01. Univariate analyses revealed that African Americans scored significantly higher than Caucasians on lower body strength ($p < .01$), endurance ($p < .05$), and total physical function ($p < .05$). Significant group differences were also found for the physical function scores by income, Wilks' Lambda = .54, $F(12, 92) = 2.8$, $p < .01$. Univariate analyses revealed that participants with an annual income ≤ $20,000 scored significantly lower on lower body strength ($p < .01$), balance and coordination ($p < .05$), endurance ($p < .01$), and total physical function ($p < .01$). Group differences on the PASE score were observed for race ($p < .01$), education level ($p < .05$), and annual income ($p < .05$). African Americans, participants with a high school education or higher, and those with annual incomes > $20,000 had higher PASE scores than their counterparts. There were also annual income group differences on the YPAS energy expenditure summary index ($p < .01$), with participants having annual incomes > $20,000 scoring higher than those with annual incomes of ≤ $20,000. No race, education, or income group differences were observed for the other self-reported PA questionnaires.

Correlations between the PASE, CHAMPS, YPAS, and modified Baecke PA questionnaires and CS-PFP10 scores are presented in Table 3. Most notably, a large significant correlation emerged for the CHAMPS energy expenditure in MET values above 3.0 with the CS-PFP10 total score ($r = .50$, 90% CI = .31 -.65, $p < .01$). The CHAMPS frequency for MET values above 3.0 ($r = .36$, 90% CI = .15 -.54, $p < .01$), total PASE score ($r = .45$, 90% CI = .25 -.61, $p < .01$), and YPAS energy expenditure summary index ($r = .40$, 90% CI = .19 -.57, $p < .01$) also demonstrated moderate correlations with the CS-PFP10 total score. Additionally, the YPAS demonstrated two small, significant correlations for time summary index with the CS-PFP10 total score ($r = .28$, 90% CI = .06 -.48, $p < .05$) and activity dimensions summary score with the CS-PFP10 total score ($r = .27$, 90% CI = .05 -.47, $p < .05$), and the CHAMPS frequency for all activities also exhibited a small correlation with the CS-PFP10 total score ($r = .29$, 90% CI = .07 -.48, $p < .05$). The modified Baecke was not significantly correlated with any functional measures.

The correlation coefficients in Table 3 generally suggest that the PASE scores, the CHAMPS energy expenditure in MET values > 3.0 scores, the CHAMPS frequency for MET values > 3.0 scores, and the YPAS energy expenditure summary scores are the strongest predictors of CS-PFP10 scores. Thus, it is apparent that the correlation coefficients for the above-mentioned variables for the PASE, CHAMPS, and YPAS fall within the confidence intervals of one another. Tests for a

Table 2. Mean and standard deviation scores for physical activity questionnaires and physical function by race, education, and income

	Race				Education level				Annual income			
	AA		C		≤ HS		> HS		≤ $20,000		> $20,000	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age[a]	67.2	9.9	66.3	9.8	64.3*	7.9	69.6	10.9	66.7	9.5	66.7	9.0
UBS[b]	44.0	16.4	36.2	18.2	41.7	15.3	41.7	19.1	37.6	16.0	49.3	15.6
UBF	63.8	14.8	60.1	19.3	61.6	16.2	63.7	16.4	61.3	17.1	66.3	13.1
LBS	53.6*	15.0	40.0	19.1	48.0	17.8	51.2	16.9	44.0*	15.8	60.0	15.7
BALCOR	49.5	19.3	40.9	15.4	44.3	16.1	49.6	20.7	41.5*	14.6	55.5	22.5
ENDUR	58.1*	17.0	46.3	17.0	52.2	17.1	56.9	18.3	48.7*	14.8	64.2	18.6
PFPTOT	53.3*	15.6	42.6	16.6	48.3	15.9	52.0	17.3	44.7*	14.1	59.4	16.9
Baecke[c]	4.1	3.0	4.7	4.4	4.4	3.7	4.2	3.1	4.7	3.7	4.0	2.8
YPAS	7,709.9	4,183.9	7,526.3	5,737.9	6,920.2	4,798.0	8,390.7	4,447.1	6,480.8*	3,824.0	8,257.7	4,227.8
PASE	110.2*	46.0	72.8	47.6	84.8*	47.4	113.4	47.4	85.8*	44.8	125.1	52.8
CHAMPS	3,752.8	2,242.5	4,049.4	2,331.5	3,604.2	2,073.1	4,077.2	2,432.3	3,691.3	2,366.4	4,463.3	2,080.8

Note. AA = African American ($n = 38$); C = Caucasian ($n = 16$); HS = high school; *M* = mean; *SD* = standard deviation; UBS = upper body strength; UBF = upper body flexibility; LBS = lower body strength; BALCOR = balance and coordination; ENDUR = endurance; PFPTOT = total Physical Functional Performance score; YPAS = Yale Physical Activity Survey; PASE = Physical Activity Scale for the Elderly; CHAMPS = CHAMPS Physical Activity Questionnaire for Older Adults.

[a] *t* test.

[b] Multivariate analysis of variance (MANOVA) on physical function measures.

[c] MANOVA on self-reported PA measures; scores for UBS, UBF, LBS, BALCOR, ENDUR, and PFPTOT reflect Continuous Scale Physical Functional Performance 10-item Test scores and range from 0 to 100, with higher scores reflecting better physical function; scores for the Baecke and PASE are recorded as a unitless activity score; YPAS scores reflect the energy expenditure summary index score (kcal/week); CHAMPS scores reflect energy expenditure for all activities (kcal/week).

*$p < .05$.

significant difference in correlations between each questionnaire and/or each of its subscales with the CS-PFP10 total score revealed no statistically significant differences between any of the questionnaires, with p values ranging from $p = .06$ (i.e., Baecke with CHAMPS EE/week in MET values > 3.0) to $p = .96$ (i.e., CHAMPS total frequency/week with YPAS time).

Discussion

The objectives of this study were to test four PA questionnaires within a sample of culturally diverse older adults for evidence of validity against measures of actual physical function. The demographics of our study sample ($N = 54$, age range = 50–93 years) indicate that 70.4% of our participants were African American, 50.0% achieved no greater than a high school education, and 63.0% reported an annual income of < $20,000, which is approximately poverty level in Louisiana. By comparison, the population of adults 50 years and older in the United States is approximately 10% African American (U.S. Census Bureau, 2002), with 45% having attained no more than a high school education (U.S. Census Bureau, 2004), and approximately 10% living at or below poverty levels (Wu, 2003). Thus, it appears that the community-based programs in the present study reach a large proportion of minorities and older adults living at or below poverty with varied educational experiences. The characteristics of our study sample, therefore, justify our purpose of examining the validity evidence of PA surveys in community-based settings that target underserved older adults. It is also important to note that these programs frequently enroll people under 65 years of age. Therefore, another unique contribution of this investigation is the inclusion of adults 50 years of age and older.

Three of the four PA questionnaires, the PASE, CHAMPS, and YPAS, supported the hypothesis that PA data obtained by questionnaire would show at least moderate correlations with physical function performance. Interestingly, the modified Baecke total score was not significantly associated with any of the physical function measures. In contrast, the PASE, CHAMPS, and YPAS each demonstrated some significant associations with physical function scores. Moreover, comparison of the 90% confidence intervals of the Pearson r values, as well as t tests for a significant difference in correlations for the PASE, CHAMPS, YPAS, and Baecke, did not reveal one instrument to be statistically superior. However, the results suggest that the PASE, CHAMPS, and YPAS appear to be more appropriate than the Baecke for capturing PA patterns of this population.

Other studies have reported sex and/or age differences for self-report PA instruments (Harada et al., 2001; Martin et al., 1999; Schuit, et al., 1997; Starling et al., 1999; Stewart et al., 2001; Washburn, et al., 1999; Washburn et al., 1993), and our findings, although not significant, suggest an age-related trend for the YPAS energy expenditure summary score, $F(1, 52) = 3.60$, $p = .06$, with participants 50–64 years of age ($M = 8{,}964.21$

Table 3. Correlations and 90% confidence intervals for PASE, YPAS, CHAMPS, and modified Baecke questionnaires with CS-PFP10 scores

Survey	Variable	UBS		UBF		LBS		BALCOR		ENDUR		PFPTOT	
		r	90% CI	*r*	90% CI	*r*	90%CI	*r*	90% CI	*r*	90% CI	*r*	90% CI
PASE	T score	.32*	.10–.51	.39**	.18–.57	.47**	.27–.63	.40**	.19–.57	.45**	.25–.61	.45**	.25–.61
CHAMPS	T EE/week	.32*	.10–.51	.23	.00–.43	.26	.04–.46	.20	-.03–.41	.22	-.01–.43	.26	.04–.46
	EE/week (METs > 3.0)	.49**	.30–.64	.38**	.17–.56	.49**	.30–.64	.43**	.23–.60	.47**	.27–.63	.50**	.31–.65
	T Freq/week	.20	-.03–.41	.23	.00–.43	.25	.03–.45	.30*	.08–.49	.29*	.07–.48	.29*	.07–.48
	Freq/week (METs > 3.0)	.29*	.07–.48	.22	-.01–.43	.32*	.10–.51	.35*	.13–.53	.35**	.13–.53	.36**	.15–.54
YPAS	TSI	.28*	.06–.48	.11	-.12–.33	.30*	.08–.49	.23	.00–.43	.27	.05–.47	.28*	.06–.48
	EE SI	.39**	.18–.57	.23	.00–.43	.42**	.21–.59	.34*	.12–.53	.38**	.17–.56	.40**	.19–.57
	AD SS	.17	-.06–.38	.08	-.15–.30	.27*	.05–.47	.31*	.09–.50	.27*	.05–.47	.27*	.05–.47
Baecke	T score	.18	-.05–.39	.14	-.09–.36	.20	-.03–.41	.17	-.06–.38	.14	-.09–.36	.17	-.06–.38

Note. UBS = upper body strength; UBF = upper body flexibility; LBS = lower body strength; BALCOR = balance and coordination; ENDUR = endurance; PFPTOT = total Physical Functional Performance score; CI = confidence interval; PASE = Physical Activity Scale for the Elderly; T = total; CHAMPS = CHAMPS Physical Activity Questionnaire for Older Adults; EE = energy expenditure; MET = metabolic equivalent; Freq/week = frequency per week; YPAS = Yale Physical Activity Survey; TSI = time summary index; SI = summary index; AD = activity dimensions; SS = summary score.

*$p < .05$.

**$p < .01$.

kcal/week, $SD = 5,448.5$) expending more energy than participants 65 years and older ($M = 6608.5$ kcal/week, $SD = 3,644.3$), and the YPAS time summary index, $F(1, 52) = 2.50$, $p = .12$, with those 50–64 years of age ($M = 40.3$ hr/week, $SD = 24.9$) spending more time in PA than participants 65 years and older ($M = 31.3$ hr/week, $SD = 16.5$). The mean PASE score ($M = 99.1$, $SD = 49.1$), mean YPAS time summary index ($M = 35.3$ hr/week, $SD = 21.0$), mean YPAS energy expenditure summary index ($M = 7,655.5$ kcal/week, $SD = 4,641.7$), and mean YPAS activity dimensions summary score ($M = 51.6$, $SD = 31.9$) are consistent with results from previous research (Chad et al., 2005; Harada et al., 2001; Schuler et al., 2001; Washburn et al., 1993), although the mean CHAMPS score for caloric expenditure in all listed physical activities ($M = 3,840.7$ kcal/week, $SD = 2,251.1$) appears higher than results from Stewart et al. (2001). One important distinction between the results of our study and previous studies is our inclusion of predominantly African American older adults over the age of 50 years. Similar studies using the same measurement instruments have typically included participants age 65 and over who were mostly non-African American (Harada et al., 2001; Stewart et al., 2001) or with an ethnicity not reported by the investigator (Voorrips et al., 1991; Washburn et al., 1999; Washburn et al., 1993).

Our results for the modified Baecke ($M = 4.3$, $SD = 3.4$) appear much lower than those observed by Voorrips et al. (1991) in a validation study of the instrument. Based on results from Voorrips et al. (1991), with scores testing both the reliability (Test 1 $M = 11.0$, $SD = 4.6$; Test 2 $M = 11.4$, $SD = 4.6$) and the relative validity of the modified Baecke ($M = 13.6$, $SD = 6.8$), our participants would be classified in the "low" PA category. Therefore, in light of the results of the other questionnaires, it can be hypothesized that the modified Baecke PA questionnaire may not have captured a significant portion of this sample's PA and, therefore, may not be a culturally sensitive instrument. Furthermore, based on these data, it is also possible that the modified Baecke is not an age-sensitive instrument, because our sample included younger participants than the Voorrips et al. study. Further investigation may be necessary to determine why this instrument fails to capture the PA behavior of this sample.

When comparing measures of physical function from our sample of culturally diverse older adults with a primarily Caucasian sample from a validation study of the CS-PFP10 (Cress et al., 2005), our participants scored slightly higher on five of the six measures including total physical function ($M = 50.1$, $SD = 16.5$), upper body strength ($M = 41.7$, $SD = 17.1$), upper body flexibility ($M = 62.7$, $SD = 16.2$), lower body strength ($M = 49.6$, $SD = 17.3$), and endurance ($M = 54.6$, $SD = 17.7$). The higher scores from our study could also be attributed to slight age differences, as the Cress et al. (2005) study used participants who were 60 years of age or older, and we included participants 50 years and older.

Based on comparisons with the existing literature on subjective measures of PA and functional performance for older adults, our participants appeared to be slightly more functional and more physically active than older adults previously studied; however, as previously stated, this may be an artifact of including adults aged 50 years and older. It may also be the result of selection bias, with those more active/healthy more likely to be in a study of healthy aging, but perhaps it shows the promise of diverse community-dwelling older persons enjoying a more productive aging process, despite potential limitations. It may also indicate that culturally diverse older adults are not adequately represented in the literature, and their functional activity may likewise be misrepresented. Further study is merited to use measures and account for cultural variability among older citizens. In addition, our sample is also unique because of its culturally diverse composition. Keeping this in mind, it is necessary to be aware of demographic differences when comparing PA measures and physical function so that differences within participant samples can be examined more closely.

Despite several of its strengths, this study was not without its limitations. Some of these limitations are due in part to the difficulty of working with a culturally diverse population. Specifically, the ability to administer all of the PA questionnaires during one session proved to be an unforeseen challenge. Of the 54 participants involved in the study, 47 completed all PA questionnaires during one interview session. Although data for the remaining 7 participants were eventually obtained, it took weeks and in some cases up to several months to secure. Although this time delay disrupted the standardization of our protocol, we felt the data should be included in our analysis, because the addition of these participants accurately reflect the difficulty in measuring this population. In making this decision, we could not turn down the opportunity to add to the research base and draw attention to the PA characteristics of a population traditionally characterized as "hard to reach."

Beyond this limitation, the lack of a true counterbalanced design for the order of PA questionnaire administration limited the generalizability of our results. Consequently, because all PA questionnaires were not uniformly administered in a random order, a potential order effect exists. Although we attempted to standardize our procedures as much as possible, we felt that given the population being tested, it was important to have participants complete all four surveys. Another limitation was that we did not have the opportunity to include interrater reliability. Although the same interviewer administered all instruments to each participant, we were not interested in determining the reliability of the

self-report PA measures. Because the primary intent of this investigation was to determine the validity evidence of the instruments in a clinical setting, we felt that administering questionnaires to the same participant on multiple occasions would be too cumbersome.

Additional limitations of this study include a small sample size and a relatively small number of men compared to women. With additional participants, we could have more confidence in our observed correlations and a smaller likely range of values for each correlation. Although we sampled from a culturally diverse population, it was a homogenous group of older adults, and, therefore, the validity of the questionnaires need to be investigated in a more gender-diverse sample. Another limitation is the inclusion of participants 50 years of age and older. Because most of the previous research on older adults focused on those 65 and older (Harada et al., 2001; Stewart et al., 2001; Washburn et al., 1993), it may be difficult to compare our results with those from other studies. However, we consider this limitation to be a strength of our study, in that we included a wider age range of older adults than previous research in this area. Similarly, we consider the inclusion of participants with MMSE scores ≤ 23 a strength of the study. We felt that including these participants provided a more representative population sample, because education levels influence MMSE scores (Crum et al., 1993). Because our results were based on indirect measures of PA, there is still room for future research to further validate these instruments against a combination of functional and physical measures that can more accurately discriminate PA levels of older adults.

Based on these results, we would recommend the CHAMPS, PASE, or YPAS questionnaires to measure PA in culturally diverse older adult participants. The PASE may be a viable alternative to the CHAMPS or the YPAS; the PASE has fewer items, and, if brevity of the interview is important, the PASE may provide some advantage. Finally, based on our findings use of the modified Baecke questionnaire would not be recommended for culturally diverse older adults.

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