VALIDITY OF THE YALE PHYSICAL ACTIVITY SURVEY FOR OLDER ADULTS

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DEDICATION

I would like to dedicate my thesis to my mother, Teresa Higgs Saegesser. The strength and perseverance she has shown in her own life inspired me to continue towards meeting my own academic and personal goals. I owe all of my personal bests to her. I hope that in all of my success, she sees her own.

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ABSTRACT

The purpose of this study is to determine the validity of the Yale Physical Activity Survey (YPAS) in a population of oldest-old adults residing in Southeastern Louisiana. Methods: Participants were older adults (n=273) in two distinct age groups; 60-81 years of age (YOUNG-OLD) AND 29-103 years of age (OLDEST-OLD). YPAS estimates of physical activity will be compared to physical function as measured by the continuous scale physical function performance test. Results: The OLDEST-OLD demonstrated lower physical function scores and reported less physical activity (and more time sitting) in comparison to the YOUNG-OLD. The correlation between Total Time Summary Index and function in the oldest-old group was very strong (0.30643, p = 0.0003). Bootstrapping resampling showed with 95% certainty that the estimate in the difference in correlation coefficients ranged between –0.49 and –0.01. A significant association was observed between Activity Dimensions Index and function in both the Young-Old and Oldest-old groups at 0.41 and 0.38, respectively. Conclusion: For a given value of function, the expected value of energy expenditure is lower for the 90+ group than for the 80-61 group. In the model for TTSI, both gender and nonagenarian are significant. For a given value of function, females tend to have higher time summary index scores than do the men. Participants in the 60-81 age group tend to have higher TTSI than do the nonagenarian participants. Regarding the ADSI, gender is significant, but oldest-old group is not significant. The analysis of covariance between TEEI and function were found to have a linear relationship. The results of the analysis indicate a main effect of gender such that the female participants of both age groups spend more time in physical activity than do their male counterparts. Males, regardless of age group, participate in a greater amount of intense physical activity than to females across both age groups.

CHAPTER 1. INTRODUCTION

1.1 Research Reasoning

Participating in regular physical activity provides numerous health benefits including a decreased risk of chronic disease, aid in the management of chronic disease, and an increase in functional lifespan (United States Department of Health and Human Services, 1996). Despite these known benefits of physical activity, most Americans do not currently obtain the required volume supported by both the Centers for Disease Control and Prevention or the Department of Health and Human Services (United States Department of Health and Human Services, 1996). Physical inactivity is now recognized as an epidemic largely due to the direct effect of increasing health care costs due to the increase in chronic disease and disability associated with inactivity. Consequently, promoting physical activity has become an important national policy issue.

More Americans are living for a longer period of time. Over the last 100 years, the percentage of the United States population that is over the age of 65 has increased steadily. In the year 2000, there were over 35 million individuals over the age of 65, or about 13%. However, it is estimated that this number will continue to grow and by the year 2030 approximately 20% or 70 million, and by the year 2050 to over 80 million people (US Census, 2000). In addition, the population of adults the age 85 years of age and older is the fastest growing sector of all age groups and is expected to increase by 500% in the next 40-50 years (US Census, 1996). With this increase in the aging population, and the consequential decrease in functionality, there will undoubtedly be a rise in the number of individuals affected by chronic disease and disability, which is costing billions of dollars (United States Department of Health and Human Services, 1996).

Participating in regular physical activity is a crucial component to a healthy lifestyle, which has been shown to extend one's years of independent life, reduce disability, and improve the quality of life. The benefits of physical activity for older adults can include reducing the risk of dying from coronary heart disease; decreasing the risk of developing high blood pressure, diabetes and colon cancer; reduce anxiety and depression; help those with chronic disabling conditions to improve stamina and strength; as well as help to maintain the ability to live independently (US Department of Health and Human Services, 1996). In spite of the evidence in support of the health benefits of regular physical activity, statistics indicate that less than 15% of older adults participate in the recommended amount of physical activity (US Department of Health and Human Services, 1996).

Age-related declines in physical activity are often associated with a decrease in strength and endurance and often result in an individual lacking the minimal level of physical ability to complete basic everyday activities. While there has been a modest decline in the percentage of older adults living with chronic disabilities over the last 15-20 years, it is not sufficient to overcome the projected growth in the older adult population.

Implementing effective community strategies to reduce the incidence of chronic disease and physical impairment in the later years of life require understanding of the stages of change that lead to frailty. Nagi, 1965 and 1991, suggested that the progression to disability includes four stages: 1) disease/pathology, 2) physical impairment, 3) functional limitation, and 4) disability. The Nagi model has been interpreted to suggest that pathology leads to a decline in basic physiology which leads to a functional limitation and then eventually disability. However, in recent years, evidence has indicated that lifestyle factors such as physical activity level can also lead to frailty and may be as affective as disease in the Nagi model.

In response to the need to increase physical activity levels in the older population, a coalition of national organizations has developed the National Blueprint: Increasing Physical Activity Among Adults aged 50 and over. The purpose of the National Blueprint on improving the longevity and functional existence of seniors, to expedite research striving is to improve the quality of physical activity programs implemented in communities (American College of Sports Medicine Active Aging Partnership. National Blueprint: Increasing Physical Activity among Adults 50 years of Age and Older, 2001).

Although the benefits of exercise extend to older adults, physical activity programs are not available to older adults of all fitness levels, abilities, and ages. In an attempt to service this population, older adults have been targeted for community-based physical activity interventions. Our understanding of measuring physical activity is somewhat limited, despite its importance for assessing the efficacy of physical activity interventions. Physical activity level is frequently quantified via self-report questionnaire instruments. While these instruments have been useful, they are subject to numerous biases including general demographics, and regional and secular influences. In order for such instruments to provide a valid and reliable measure of physical activity level, they must be specific to the population studied. One survey instrument that has been validated among older adults is the Yale Physical Activity Survey (YPAS).

1.2 Justification for Research

While data generally support the use of this instrument for older adults, the age range studied has not included strong representation from the oldest-old (85 years and older) it is important to include. Because the oldest-old are the most rapidly growing segment of our population, and because physical activity is important for people of all ages, it is important to further evaluate the YPAS in older adult groups that include the oldest-old.

1.3 Specific Aim

The current aim is to determine the criterion and construct validity of the Yale Physical Activity Survey (YPAS) in a population of older adults residing in Southeastern Louisiana. This study will also focus on determining the validity of the instrument in nonagenarians. The YPAS estimates of physical activity will be compared to physical function as measured by the continuous scale physical function performance test.

1.4 Research Hypothesis

We hypothesize that YPAS physical activity data scores will show a fair to good correlation with total energy expenditure and physical function performance in the general population of older adults. However, there is no basis for suggesting an hypothesis regarding the validity of the YPAS among nonagenarians.

CHAPTER 2. REVIEW OF LITERATURE

2.1 Physical Activity

Literature suggests that older adults engage in less physical activity compared to the general population. This decrease in physical activity may relate to the increase in chronic disease that often accompanies aging. However, this observed decrease in physical activity may be the result of measurement tools that are not appropriately validated nor shown to be reliable. Furthermore, many of the self report measures used to assess physical activity in older adults were developed for use with younger populations and therefore are not sensitive to the levels of physical activity seen in the older adult population. The process of validating self-report measures is a difficult task due to the lack of a gold standard. The lack of understanding regarding the relationship between the various dimensions of activity and their affect on performance measures may have resulted in inaccurate validation and low correlation coefficients.

2.2 Validation

Various criterion methods have been used to assess physical activity for the purpose of establishing validity within other techniques such as questionnaires, diaries, and activity monitors. Early methods of physical activity assessment included direct behavioral observation (Reynolds, 1982). Due to the inherent problems, such as time requirements and accuracy of recording, this method is best only in cases of studies with small sample sizes and should be used in combination with other instruments. (Reynolds, 1982; Schoeller et. al., 2000).

In an effort to improve upon the direct observation technique, motion sensor devices have been recently implemented for the purpose of providing a continuous digital recording of joint movement and velocities, and therefore, intensity of activity, while eliminating the need for

human observation. However, this method cannot account for increases in load associated with the carrying of objects, and is quite expensive, so also only appropriate for those studies with small sample sizes.

Currently, doubly labeled water is considered to be the most accurate measure of total energy expenditure in humans (Zhang et. al., 2004; Cress et. al., 1996). This method offers a highly validity across a variety of populations and is able to assess habitual physical activity (Wechsler, 1955; Reynolds, 1982). Unfortunately, this method is very expensive making it impractical for studies with large sample sizes (Zhang et. al., 2004; Reynolds, 1982).

Doubly labeled water has been considered to be the gold standard for measuring the energy expenditure of groups. However, due to the cost, time and staff education required to administer this type of test, and the quantity of Americans in need of this type of testing, it has become necessary to develop a validated tool that is more cost and staff effective.

Objective techniques, such as activity monitors, make the monitoring of frequency, intensity, and duration of physical activity possible (Reynolds, 1982). The most commonly used activity monitors include pedometers, accelerometers, and heart rate monitors. Pedometers are inexpensive and small, while allowing for estimation of habitual physical activity over a long period of time without interfering with the participants normal activity (Reynolds, 1982; Teng et. al., 1987). The immediate feedback provided can be a useful tool in behavior modification (Centers for Disease Control and Prevention and the Merck Institute of Aging and Health, 2004). However, pedometers do not provide temporal information about activity because they do not store data over specified time interval, are not sensitive to activities that do not involve locomotion, isometric exercise, or upper body movements (Teng et. al., 1987; Scholler et. al.,

1990). Furthermore, the accuracy of the pedometer data is influenced by the speed of locomotion (Starling et. al., 1999, Dishman et. al., 2001).

Accelerometers have been used in research in a variety of populations (Teng et. al., 1987). There are two types of accelerometers: uniaxial and triaxial. The uniaxial accelerometer is small, has a large memory capability and can measure amount and intensity of exercise (Teng et. al., 1987). However, activities such as bicycling, weight lifting, and swimming cannot be assessed by the uniaxial method (Reynolds, 1982). The triaxial accelerometer provides counts in each plane, a vector magnitude over a specified time interval, and total and activity energy expenditure in kilocalories using an equation that includes age, stature, body mass, and gender (Teng et. al., 1987). Accelerometers are small, but more expensive than pedometers. Both types of accelerometers provide information about the frequency and duration of activity, but the triaxial may be superior because it can record more movement (Teng et. al., 1987). Finally accelerometers have been shown to underestimate daily energy expenditure and are best used as an estimate of activity counts (Teng et. al., 1987).

2.3 Self Report Questionnaires

Physical activity level is frequently quantified via self-report questionnaire instruments. While these instruments are certainly useful, they are subject to numerous biases including general demographics, and regional and secular influences. In order for such instruments to provide a valid and reliable measure of physical activity level, they must be specific to the population studied. Many self-report questionnaires are available to investigators for the purpose of measuring physical activity. The available instruments differ in the amount of time for administration and the depth of information about modes of physical activity. Therefore, when choosing a method for self-report several components should be considered including the

instrument's reliability and validity, ability to measure population to be studied, and the type of activity thought to be associated with the studies outcome. In oldest-old adult populations, few of the existing questionnaires have been validated.

Measurement in the older adult population has proven to be difficult. A difference in physical activity pattern and activities of lower intensity are seen in the older population as compared with the younger individuals typically studied. Valid assessments of this older adult population will allow for baseline and follow up measures. This will be important to community centers in providing greater exercise opportunities to older adults.

Several questionnaires have been developed and validated in the older adult population. The modified Baecke questionnaire was adapted from the Baecke questionnaire that was validated in young adults. The most significant was the change from a self-administered questionnaire to a personal interview. Also, additional questions in regards to household activities were included. The respondents are asked to recall habitual physical activity over the past year. Items are rated and assigned an intensity code. The questionnaire takes about 30 minutes to complete. The modified-Baecke has been validated against 24-hour recalls and pedometer measures; however, one limitation of the instrument is that is does not provide an estimate of energy expenditure.

Similarly, the Physical Activity Scale for the Elderly (PASE) was designed in response to the need for a questionnaire for a report that was focused on the uniqueness of the older adult population. Investigators included occupational, leisure and household activities, as well as items on living situation, sleep and restricted activity days. This questionnaire is administered and asks open ended questions to elicit a full feedback response. This questionnaire appears to be reliable

and easy to administer, however, it does not provide detailed information regarding energy expenditure.

2.4 Yale Physical Activity Survey

A relatively new survey instrument that is valid for use among older adults is the Yale Physical Activity Survey (YPAS). From October 1987 to October 1989, the Department of Epidemiology and Public Health from Yale University and the Centers for Disease Control investigated methods for assessing the physical activity patterns among healthy adults over the age of 60 years who lived in Connecticut. The project had a specific purpose of creating a survey that measured physical activity levels in older adults and then establish the surveys 2 week repeatability and validity. The resultant Yale Physical Activity Survey (YPAS) is a comprehensive survey that evaluates a broad range of activities across varying intensity levels, including household, recreational, and exercise settings. The survey provides three summary indices and five subscales. The three indices include the Total Time Summary Index (TTSI), the Energy Expenditure Summary Index (EESI), and the Activity Dimensions Summary Score (ADSS). The Total Time Summary Index, which calculates total time spent for each activity on the checklist, is expressed as hours per week. The Energy Expenditure Summary Index is the time spent on each activity multiplied by an intensity code and is summed over all activities. The EESI is expressed as kilocalories per week. The ADSS is calculated using the 5 specific activity subsection dimensions. The frequency score from each subsection is multiplied by the duration score from the vigorous activity dimension and from the leisurely walking dimension to create a total daily duration score. Each total daily duration index is multiplied by a weighting factor that is based upon the relative intensity of the activity dimension and is summed to create the ADSS. The YPAS has relatively good repeatability, with test-retest, the correlation

coefficients reported in the range of 0.42 to 0.65. In addition, in the original validation aspect of the validation study, the investigation of 25 subjects revealed that weekly energy expenditure and daily hours spent sitting correlated with resting diastolic blood pressure. Additionally, the YPAS activity dimensions summary index correlated positively with estimated VO2max and inversely with percent body fat. The vigorous activity index also correlated positively with estimated VO2max and the moving index was somewhat correlated with body mass index. DiPietro and colleagues concluded that the YPAS did demonstrate "adequate" repeatability, and some indirect validity. However, the group acknowledged that their results did not necessarily indicate that the YPAS was able to accurately assess low intensity activity in older adults.

The development of this type of survey is valuable due to its ability to evaluate the lower intensity level activities that are common among older adults but not typically included in other questionnaires. Lower intensity activities, such as walking, have the potential to provide health benefits among the elderly. Establishing the ability of the YPAS to assess the lower intensity activities would provides researchers with a method for measuring the lower intensity activities participated in by older adults, and therefore allows research to better determine if low-intensity level activities are associated with health benefits for older adults.

While the validity of the YPAS was somewhat established by DiPietro in 1993 as part of it's development, other investigators, including Deborah Young from Johns Hopkins University, called for additional evaluation. Questions as to the small sample size (n=25) and that DiPietro did not directly compare the YPAS with other validated self-report physical activity methods have resulted in additional investigations. Additional questions came from Petra Schuler of the University of West Florida regarding the need for additional information as to the YPAS's strengths, weaknesses, and areas that require improvement. S. De Abajo of the Institute of

Physical Education at the University of Leon, in Spain, has questioned the validity of the application of a Spanish language version. A table of the anthropometric measures from each of the above studies can be seen in table 2.1.

Table 2.1: Anthropometric Measures of Study Populations

Study	DiPietro, 1993	DeAbajo, 2001	Schuler, 2001	Young, 2001	Harada, 2001
Number	76	108	56	59	75
N=women	56	70	31		46
N=men	20	38	25		29
Mean Age/Age Range in years	Men = 70.7 Women = 68.0	Men = 69.8 Women = 67.7	Men = 68 Women = 68		65-89 yrs
Body Fat %	Men = 17.2 Women = 26.1	Men = 18.12 Women = 23.0			
Skin fold measurements (mm)			Men = 63.1 Women = 74.2		
Pred. VO2 max (ml/kg/min)	Men = 31.3 Women = 23.2		Men = 29.1 Women = 20.2		
Rest HR (beats/minute)	Men = 72.5 Women = 68.5		Men = 72 Women = 70		
Diastolic Pressure (mmHg)	Men = 75.7 Women = 72.9		Men = 82.6 Women = 82.4		
Systolic Pressure (mmHg)	Men = 133.0 Women = 124.8		Men = 137 Women = 132		
N=White					34
N=African American					5
N=Asian American					61
Average yrs of Education					13
BMI	Men = 26.1 Women = 25.3	Men = 27.4 Women = 27.7			
Caltrac motion sensor (counts/2.5 days)	Men = 748.2 Women = 673.0	Men = 479 Women = 528			

Consequently, the YPAS has been one of the more heavily scrutinized measures of physical activity for use in older populations. Young, et. al in 2001 compared the Yale Physical Activity Survey with various other physical activity measures including the Stanford seven day physical activity recall, and other physiologic measures such as maximal oxygen uptake, resting pulse rate and body mass index. Harada, et. al., 2001 compared the YPAS with other questionnaires including the Physical Activity Survey for the Elderly (PASE) and the CHAMPS Physical Activity Survey and other physiologic measures, such as Mini-Logger monitor, the Short Physical Performance Battery, Six-Minute walk, body mass index, and SF-36 measures. Furthermore, in 2001, Schuler, et. al., investigated the ability of the YPAS to reflect physical activity over both a week and a month. The Schuler group used YPAS data, total time of activity recall, total energy expenditure (derived from total time of activity recall), and a physical activity diary as methods to assess direct validity. To validate the YPAS against known physiologic indices the group used predicted maximal oxygen consumption, sum of three skin folds, resting heart rate, blood pressure, and body mass index.

Young, et. al., 2001, found that weekly energy expenditure, total time in activity and the summary index correlated well with baseline daily energy expenditure and moderate activity duration, as shown in table 2.3. The vigorous index correlated with time in light, moderate, hard/very hard activity as well as with daily energy expenditure. The investigators also described a significant correlation between changes in physical activity determined from the PAR as compared with the vigorous activity index as assessed by the YPAS.

The Schuler group found that the YPAS had a “moderate-to-good” repeatability (Table 2.2) and found that in the first administration of the test, total energy expenditure component of

the survey to be significantly associated with the information gathered from the physical activity diary.

Table 2.2: Reliability Studies of the Yale Physical Activity Survey

Reference	Methods	Sample	Summary Results
DiPietro, 1993	Relationship between initial test and 2-week retest (Pearson correlations and t-tests)	Men= 20, Women= 26; Age range=60-86 years; variable socioeconomic status	Mean values for the total time indice and the vigorous activity dimension were significantly higher at the initial administration (0.42* to 0.65*—p<0.05)
DeAbajo, 2001	Participants responded twice to the questionnaire with an interval of two weeks	108 (Men=38, Women=70) community dwelling healthy people aged 61-80 years	Test-retest correlations for total time and energy expenditure were significant
Schuler, 2001	Two-week repeatability was estimated by calculating an intraclass coefficient using an analysis of variance with repeated measures.	56 men and women, ages 56-86 years.	Moderate to good repeatability

On the second administration of the test, significant correlations were seen between the physical activity diary and the total energy expenditure index, the total activity summary index, and the total time index, as well as with VO2max and the Total Time Index and the Total Activity Summary index as seen in table 2.3.

Table 2.3: Test-Retest Results for the YPAS Survey Indices

Index	Study	MeanDifference	p*	r†	p‡
Total Time (hours/week)	DiPietro et. al., 1993	3.68	0.05	0.57	0.0001
	Schuler et. al., 2001			0.74	
	DeAbajo et. al., 2001			0.66	0.001
Energy Expenditure (kcal/week)	DiPietro et. al., 1993	873.42	0.06	0.58	0.0001
	Schuler et. al., 2001			0.72	
	DeAbajo et. al., 2001			0.65	0.001
Summary (total units)	DiPietro et. al., 1993	1.31	0.19	0.65	0.0001
	Schuler et. al., 2001			0.55	
	DeAbajo et. al., 2001			0.31	0.002

Table Continued

Vigorous (units/month)	DiPietro et. al., 1993	4.66	0.02	0.61	0.0001
	Schuler et. al., 2001			0.48	
	DeAbajo et. al., 2001			0.20	0.042
Leisurely walk (units/month)	DiPietro et. al., 1993	-1.60	0.28	0.48	0.0001
	Schuler et. al., 2001			0.41	
	DeAbajo et. al., 2001			0.33	0.001
Moving (hours/day)	DiPietro et. al., 1993	-0.12	0.40	0.49	0.0001
	Schuler et. al., 2001			0.60	
	DeAbajo et. al., 2001			0.19	0.015
Standing (hours/day)	DiPietro et. al., 1993	0.51	0.08	0.48	0.0001
	Schuler et. al., 2001			0.22	
	DeAbajo et. al., 2001			0.12	0.224
Sitting (hours/day)	DiPietro et. al., 1993	-0.05	0.58	0.48	0.0002
	Schuler et. al., 2001			0.13	
	DeAbajo et. al., 2001			0.29	0.003

p*= p-value based on paired t-tests
r† = Pearson product moment correlation coefficient (DiPietro and DeAbajo); Spearman Correlation Coefficients (Schuler)
p‡ = p-value based on the correlation coefficient

Harada, et. al. 2001, indicated that their findings showed correlations of physical activity measures with performance-based measures ranging from 0.44 to 0.68. Body mass index was not shown to correlate with any of the physical activity measures. Correlations with the Mini-logger counts ranged from 0.36 to 0.59 (ankle) and 0.42 to 0.61 (waist). Correlations among the measures of the three self-report instruments ranged from 0.58 to 0.68.

DeAbajo, et. al., 2001, showed significant test-retest correlations for the total time and energy expenditure. Also, significant association was found between the different summary indices, all of the checklist activities and mean differences between first and second administration. This group also indicated that their results showed that total time and energy expenditure correlated positively with Caltrac activity units and negatively with body weight. The activity dimension summary index and the individual index of vigorous activity correlated

significantly with the body mass index and the moving index of the Caltrac units as seen as follows in table 2.4.

Table 2.4: Test-Retest Reliability for the YPAS Activities Checklist

Activity	Study	Mean Difference	p*	r†	P‡
Shopping	DiPietro et. al., 1993	0.06	0.8	0.52	0.001
	DeAbajo et. al., 2001			0.29	0.003
Stairs/load	DiPietro et. al., 1993	0.15	0.5	0.29	0.01
	DeAbajo et. al., 2001			0.32	0.001
Laundry	DiPietro et. al., 1993	-0.21	0.2	0.51	0.001
	DeAbajo et. al., 2001			0.27	0.004
Light Housework	DiPietro et. al., 1993	0.55	0.2	0.38	0.001
	DeAbajo et. al., 2001			0.67	0.001
Heavy Housework	DiPietro et. al., 1993	0.18	0.6	0.20	0.09
	DeAbajo et. al., 2001			0.30	0.002
Preparing Food	DiPietro et. al., 1993	0.36	0.4	0.43	0.001
	DeAbajo et. al., 2001			0.55	0.001
Serving Food	DiPietro et. al., 1993	0.12	0.7	0.34	0.003
	DeAbajo et. al., 2001			0.39	0.001
Dishwashing	DiPietro et. al., 1993	-0.24	0.2	0.60	0.001
	DeAbajo et. al., 2001			0.58	0.001
Light repair	DiPietro et. al., 1993	0.18	0.5	0.30	0.01
	DeAbajo et. al., 2001			0.25	0.009
Heavy Repair	DiPietro et. al., 1993	0.03	0.8	0.98	0.001
	DeAbajo et. al., 2001			0.29	0.003
Gardening	DiPietro et. al., 1993	0.24	0.4	0.48	0.001
	DeAbajo et. al., 2001			0.32	0.001
Lawn Mowing	DiPietro et. al., 1993	0.00	0.9	0.62	0.001
	DeAbajo et. al., 2001			0.27	0.004
Raking/Sweep	DiPietro et. al., 1993	0.13	0.2	0.55	0.001
	DeAbajo et. al., 2001			0.66	0.001
Adult Care	DiPietro et. al., 1993	-0.08	0.7	0.18	0.12
	DeAbajo et. al., 2001			0.65	0.001
Child Care	DiPietro et. al., 1993	-0.06	0.9	0.29	0.01
	DeAbajo et. al., 2001			0.35	0.001
Brisk Walking	DiPietro et. al., 1993	0.10	0.6	0.53	0.001
	DeAbajo et. al., 2001			0.35	0.001
Stretch/Yoga	DiPietro et. al., 1993	0.17	0.5	0.26	0.02
	DeAbajo et. al., 2001			0.32	0.001
Calisthenics	DiPietro et. al., 1993	0.08	0.4	0.84	0.001
	DeAbajo et. al., 2001				
Cycling	DiPietro et. al., 1993	0.02	0.4	0.90	0.001
	DeAbajo et. al., 2003			0.75	0.001

Table Continued

Swimming	DiPietro et. al., 1993	0.12	0.2	0.86	0.001
	DeAbajo et. al., 2001			0.28	0.004
Leisure Walk	DiPietro et. al., 1993	-0.03	0.9	0.24	0.03
	DeAbajo et. al., 2001			0.21	0.032
Needlework	DiPietro et. al., 1993	0.34	0.2	0.91	0.001
	DeAbajo et. al., 2001			0.56	0.001
Dancing	DiPietro et. al., 1993	0.14	0.3	0.92	0.001
	DeAbajo et. al., 2001			0.52	0.001
Bowling	DiPietro et. al., 1993	0.08	0.3	0.75	0.001
	DeAbajo et. al., 2001			0.76	0.001
Golf	DiPietro et. al., 1993	0.03	0.8	0.96	0.001
	DeAbajo et. al., 2001				
Racquet Sports	DiPietro et. al., 1993				
	DeAbajo et. al., 2001				
Billiards	DiPietro et. al., 1993	0.06	0.4	0.97	0.001
	DeAbajo et. al., 2001				

p*= p-value based on paired t-tests
r† = Pearson product moment correlation coefficient
p‡ = p-value based on the correlation coefficient

Additionally, a positive association was found between body mass and sitting index.

The results of these studies suggest that there is a general agreement that the YPAS is a valid and reliable measure of physical activity in relatively active and healthy older adults. The notable commentary from the Harada group suggests that perhaps the survey may perform better at assessing certain segments of the older adult population, and with others still raising some doubts as to whether the YPAS can assess light-intensity activities.

CHAPTER 3. METHODS

3.1 Study Participants

Volunteers were recruited from local community centers. Research volunteers included older adults (n=273) over the age of 60, who were assigned to one of two groups based on their ages. Adults between 60 and 81 years of age assigned to the YOUNG-OLD (n=110), and adults ages 89 years of age and older (range 89-103) were assigned to the OLDEST-OLD age group (n=145). Inclusion criteria were that participants must be at least 60 years of age, and reside with-in a 40 miles radius of Baton Rouge, Louisiana. Exclusion criteria included cognitive impairment (as defined as a score of < 24 on the mini-mental status exam), and American Heart Association Class C unstable or Class D.

3.2 Experimental Measurements

There were three contact days with the participant. A home visit was performed wherein the study was explained in detail, and basic demographic information was obtained. The participant was asked to visit the testing facility for a day-long testing session. The testing included administration of the YPAS and Continuous Scale Physical Function Performance Test (PFP-10).

3.2.1 Home Visit One

During the first session, the candidate was asked to provide an informed consent, after which they were interviewed for demographic information, social history, and health and medical history, as well as investigators administered the mini-mental status exam (Howley, 2003). This session lasted for duration of approximately 60-90 minutes.

3.2.2 Testing Visit

This session took place approximately one week following the initial home visit. Upon arriving to the facility the participant was asked to lie supine for approximately 10 minutes while the investigator applied a ventilation hood, which is used to collect breath gases that will be analyzed by a sensormedics breath gas analysis system. Once the hood was in place, breath gases were collected for 30 minutes to determine resting metabolic rate (RMR). Following the collection of breath gases, the sample of doubly labeled water was introduced, and study participants were asked to void for the collection of serial urine samples throughout the day. Once doubly labeled water was administered, participants were asked to complete the YPAS and the PFP10 Physical function test battery.

3.3 Yale Physical Activity Survey

The survey provides three summary indices and five subscales. The three indices include the Total Time Summary Index (TTSI), the Energy Expenditure Summary Index (EESI), and the Activity Dimensions Summary Score (ADSS). The Total Time Summary Index, which calculates total time spent for each activity on the checklist, is expressed as hours per week. The Energy Expenditure Summary Index is the time spent on each activity multiplied by an intensity code and is summed over all activities. The EESI is expressed as kilocalories per week. The ADSS is calculated using the 5 specific activity subsection dimensions. The frequency score from each subsection is multiplied by the duration score from the vigorous activity dimension and from the leisurely walking dimension to create a total daily duration score. Each total daily duration index is multiplied by a weighting factor that is based upon the relative intensity of the activity dimension and is summed to create the ADSS.

3.4 Continuous Scale Physical Functional Preformance-10 (PFP10)

This test is either time to completion scores, and/or weight carried, height reached, etc. The test battery provided 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. For greater detail regarding the test administration procedures, please see Cress et al (Cress, 1996). During the performance of the CS-PFP, the investigators collected physiologic data such as heart rate (Polar monitor or palpation), blood pressure (auscultation method), and rating of perceived exertion to ensure the safety of the test. This test allowed for the investigator to evaluate the subject's ability quantitatively through the use of various sub-scales. These sub-scales include upper body strength, upper body flexibility, lower body strength, balance and coordination, and endurance.

3.5 Statistical Analyses

T-tests were used to compare age groups on descriptive characteristics, YPAS activity indices, and PFP-10 total function scores. Pearson correlation was used to examine the strength of association between the questionnaire estimates of physical activity level and the PFP-10 scores. The physical function scores acted as the dependent variables with the YPAS indices acting as the independent variables. Using a bootstrapping approach, the strength of the correlation coefficients for the 60-81 ear olds was compared to those for the participants 89 years of age and older.

Linear regression with Analysis of Covariance was used to examine main effects of age group and gender, and age group by gender interaction on the relationship between YPAS outcomes and total physical function according to the PFP-10. In each of the models will initially

determine if the explanatory variable of PFP-10 total score is linearly related to the response variables TEEI, TSSI, and ADSI. If the relationships between the response and explanatory variables are not found to be significant by age group, then the models will be run without the interaction terms and the resulting estimated models will be used to construct plots. Alpha was set at $p<0.05$ for all associations.

CHAPTER 4. RESULTS

4.1 Participant Characteristics

The participant characteristics are presented in table 4.1. Of the 273 participants in the study, there were n=110 between the ages of 60-81 who were assigned to the YOUNG-OLD group, and there were n=145 who were 89 years of age and older (range = 89-103) at the time of testing t-tests revealed that the age groups were different with respect to body weight, with the OLDEST-OLD being significantly lighter than their younger counterparts.

Table 4.1: Participant Characteristics

	All Participants; n=273		YOUNG-OLD; n=110		OLDEST-OLD; n=145	
	Mean	SD	Mean	SD	Mean	SD
AGE	83.3	10.6	71.4	5.7	91.9*	2.4
Hgt (cm)	164.9	11.4	166.8	12.9	162.6	9.3
Wgt (kg)	75.6	18.3	84.6	18.6	66.3*	13.3
Waist (cm)	96.4	14.4	100.8	15.2	91.6	12.4
Hip (cm)	104.7	11.1	108.4	11.5	100.9	9.6

* different from YOUNG-OLD, $p < 0.05$

Table 4.2 presents the number of medications taken by the study participants and the prevalence of chronic diseases. Cardiovascular diseases include atherosclerosis, cerebro-vascular accident, hypertension, peripheral vascular disease etc. Orthopedic conditions include arthritis, osteoporosis, degenerative disc problems, etc. Neurological conditions include Parkinsonism, Alzheimer's, Vertigo, vision problems, etc. Other diseases include Diabetes, Cancers, and Thyroid problems.

Table 4.2: Medications and chronic diseases

	All Participants; n=273	YOUNG-OLD; n=110	OLDEST-OLD; n=145
# of prescritions	3	4	3
CV disease	4%	5%	3%
Orthopedic	3%	8%	3%
Neurological	7%	3%	0%
Other	40%	35%	59%
Male	109	52	57

Table Continued

Female	146	58	88

*Numbers do not add up to 273 due to gap in age ranges

4.2 Participant Scores

Tables 4.3 and 4.4 present the Physical Function Scores and the Yale Physical Activity Survey Scores for the entire group as well as for the two age groups. Independent samples t-tests revealed significant group differences in all functional and all physical activity survey scores. In every case the OLDEST-OLD demonstrated lower physical function scores and reported less physical activity (and more time sitting) in comparison to the YOUNG-OLD.

Table 4.3 Physical Function Scores

	All Participants; n=273		YOUNG-OLD; n=110		OLDEST-OLD; n=145	
	Mean	SD	Mean	SD	Mean	SD
UBS	32.7	23.1	47.6	20.3	21.7*	17.8
UBF	53.9	21.4	67.9	16.1	43.6*	19.3
LSB	31.9	21.9	46.9	19.7	20.8*	15.8
BALCOR	35.9	22.7	51.3	18.3	24.3*	18.1
ENDUR	38.4	23.1	54.9	18.9	26.3*	17.5
PFP-TOTAL	37.3	21.3	52.5	17.4	26.1*	16.0

* = different from YOUNG-OLD, $p < 0.01$

Table 4.4 Yale Physical Activity Survey Scores

	All Participants; n=273		YOUNG-OLD; n=110		OLDEST-OLD; n=145	
	Mean	SD	Mean	SD	Mean	SD
Vigorous Freq	1.44	1.49	2.02	1.45	1.03*	1.41
Vigorous Dur	0.97	1.04	1.44	1.06	0.60*	0.87
Walking Freq	1.84	1.49	2.13	1.31	1.66*	1.57
Walking Dur	0.93	0.78	1.15	0.75	0.81*	0.78
Moving	2.67	1.16	2.94	1.21	2.48*	1.04
Standing	1.82	1.11	2.34	1.13	1.46*	0.90
Sitting	2.25	0.84	1.98	0.74	2.43*	0.85
ESI	5044.5	3832.3	6977.5	4457.9	3728.3*	2729.7
TTSI	26.0	18.9	32.8	21.5	21.6*	15.8
ADSS	36.5	22.3	46.6	23.2	29.3*	18.2

* = different from YOUNG-OLD, $p < 0.01$

4.3 Correlation Coefficients and Bootstrap Resampling

Table 4.5 presents the correlation coefficients. No correlation is seen between Total Time Summary Index and function in the YOUNG-OLD group (0.05662, p = 0.5569). However, the correlation between Total Time Summary Index and function in the oldest-old group was very strong (0.30643, p = 0.0003). The Bootstrapping resampling showed with 95% certainty that the estimate in the difference in correlation coefficients ranged between –0.49 and –0.01. Therefore, we are at least 95% certain that the strength of association is different for the YOUNG-OLD and OLDEST-OLD groups.

A fairly strong, but not significant correlation is seen between Total Energy Expenditure Index and function in the Young-Old group. However, the relationship was almost twice as strong in the oldest-old group, with a correlation of r=0.40, p < 0.0001. Again, using the bootstrapping resampling, the difference in the correlations is estimated at lying between -0.44 and 0.01. Thus, there is nearly 95% certainty that the correlation coefficients are different. It is seen then that while the difference could be zero, it is most likely different.

A significant association was observed between Activity Dimensions Index and function in both the Young-Old and Oldest-old groups at 0.41 and 0.38, respectively. With an approximate 95% confidence interval estimate of the difference in correlation coefficients, the range of differences was estimated at being between –0.20 and 0.26.

Table 4.5: Correlation Coefficients and Bootstrapping Effect between YPAS Indices and PFP10

	Total PFP		
Indices vs. PFP total	Pearson Correlation Coefficient		Bootstrapping Effect: Difference in Correlation by confidence interval
	YOUNG-OLD; n=110	OLDEST-OLD; n=145	
Total Energy Expenditure	0.182; p <0.0561	0.398; p <0.0001	90%= [-0.41, -0.26] 95%= [-0.44, 0.01] 99%= [-0.51, 0.08]

Table Continued

Total Time Summary	0.056; p <0.0556	0.306; p <0.0003	90%= [-0.45, -0.05] 95%= [-0.48, -0.01] 99%= [-0.56, 0.06]
Activity Index	0.412; p <0.0001	0.381; p <0.0001	90%= [-0.16, 0.22] 95%= [-0.19, 0.25] 99%= [-0.27, 0.33]

4.4 Analysis of Covariance

Table 4.6 represents the results of the Analysis of Covariance between YPAS indices and PFP-10.

Table 4.6: Analysis of Covariance between YPAS Indices and Function

	Parameter	Estimate	Standard Error	T value	Pr > t
Total Time Summary Index	Intercept	20.1	6.08	3.30	0.0011
	Gender-Female	8.15	2.44	3.30	0.0011
	Gender-Male	0.00	.	.	.
	PFPTotal	0.161	0.102	1.57	0.1173
	Nonagenarian	-13.94	6.23	-2.24	0.026
	PFPTotal*Nonagenarian	0.21	0.13	1.54	0.12
Total Energy Expenditure Index	Intercept	3890.27	1194.47	3.26	0.0013
	Gender-Female	567.51	479.60	1.18	0.23
	Gender-Male	0.00	.	.	.
	PFPTotal	53.1	20.1	2.65	0.0087
	Nonagenarian	-2552.00	1222.26	-2.09	0.038
	PFPTotal*Nonagenarian	21.4	27.14	0.79	0.43
Activity Dimensions Index	Intercept	23.9	6.47	3.70	0.0003
	Gender-Female	-5.58	2.59	-2.15	0.0328
	Gender-Male	0.00	.	.	.
	PFPTotal	0.487	0.108	4.49	<0.0001
	Nonagenarian	-1.29	6.62	-0.20	0.845
	PFPTotal*Nonagenarian	-0.092	0.147	-0.63	0.53

For the analysis of covariance, in each of the models relating function to the response variables EESI, TTSI, and ADSI, the explanatory variable PFPTOT appears to be linearly related

to the response. However, in none of the models is the interaction between nonagenarian and function significant at the 10% level. Therefore, for each response variable, the slope of the linear relationship between that response and function does not appear to depend on age group. As seen in Figure 4.1 for the total energy expenditure index, the explanatory variable gender is not significant.

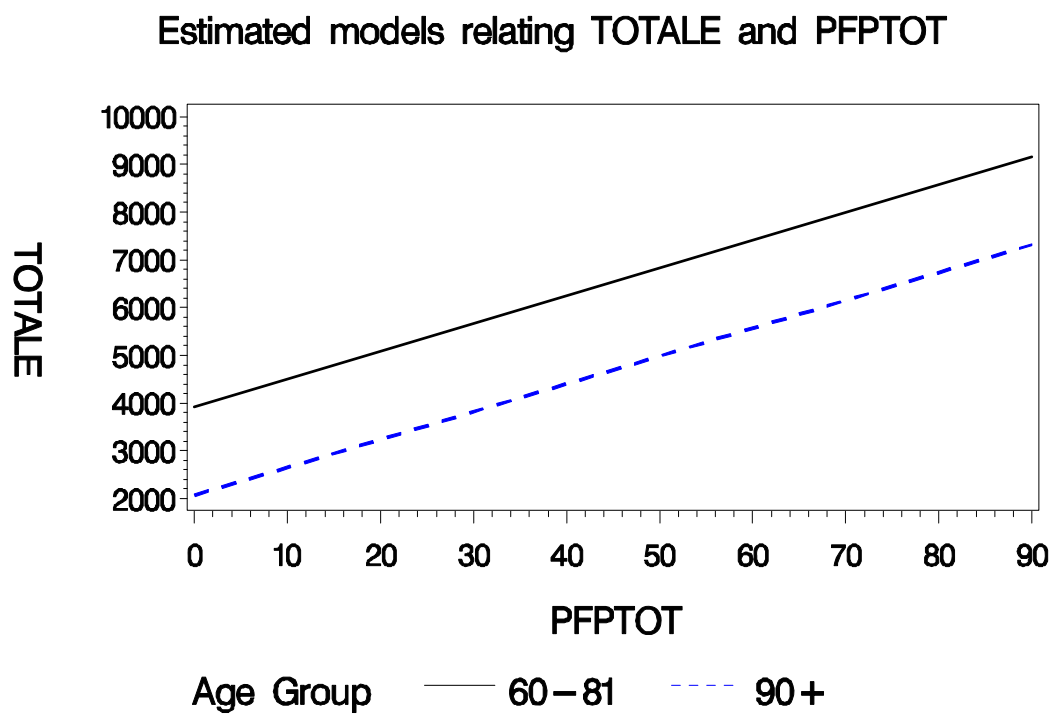

Figure 4.1: ANCOVA for YPAS Total Energy Expenditure Index and PFP Total

However, nonagenarian is significant, so we can conclude that the lines do not coincide. For a given value of function, the expected value of energy expenditure is lower for the 90+ group than for the 80-61 group. In the model for TTSI, both gender and nonagenarian are significant. For a given value of function, females tend to have higher time summary index scores than do the men. Participants in the 60-81 age group tend to have higher TTSI than do the nonagenarian participants. This relationship is illustrated in Figure 4.2.

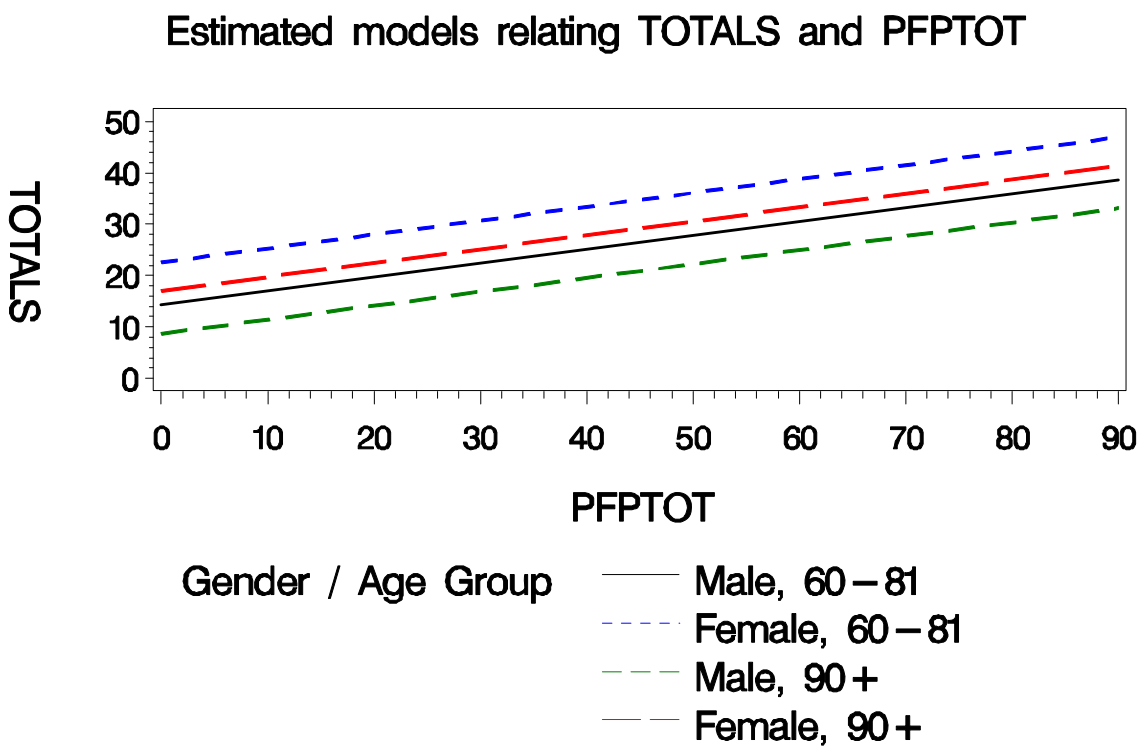

Figure 4.2 ANCOVA for YPAS Total Time Summary Index and PFP Total

In Figure 4.3, it shows that regarding the ADSI, gender is significant, but oldest-old group is not significant.

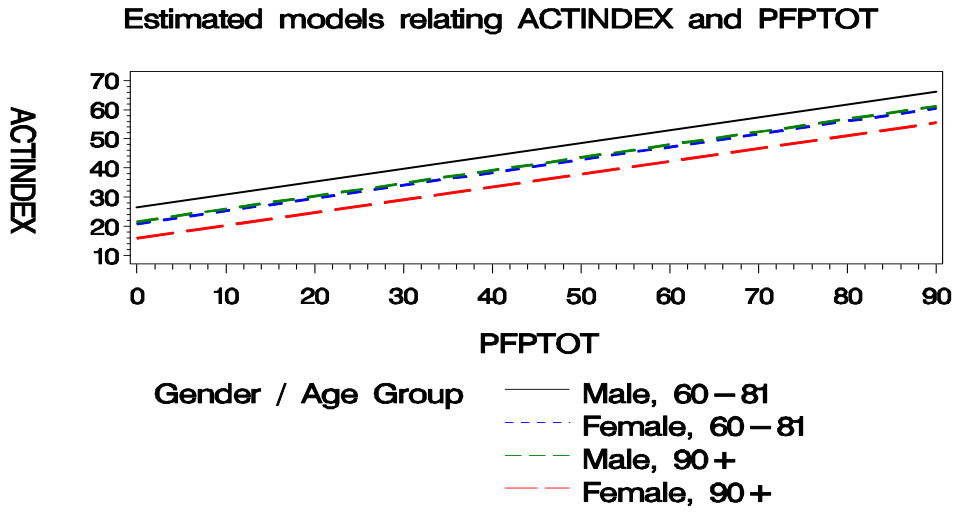

Figure 4.3: ANCOVA for YPAS Activity Index and PFP Total

Additionally, it is seen that regardless if both young-old and oldest-old are at the same functional level, the young-old group appears to be expending more calories per week. Gender did not appear to play a role in this relationship. The analysis of covariance between TTSI and function is illustrated in figure 4.2. The results of the analysis indicate a main effect of gender such that the female participants of both age groups spend more time in physical activity than do their male counterparts.

The results of the analysis indicate that males, regardless of age group, participate in a greater amount of intense physical activity than to females across both age groups. This is expanded upon in Figure 4.3. Figure 4.4 illustrates the main effect of gender on ADSI. This graph shows that young-old males are physically active at a higher intensity level than are oldest-old males and young-old females. The oldest-old females had the lowest ADSI for a given function as compared with the other groups.

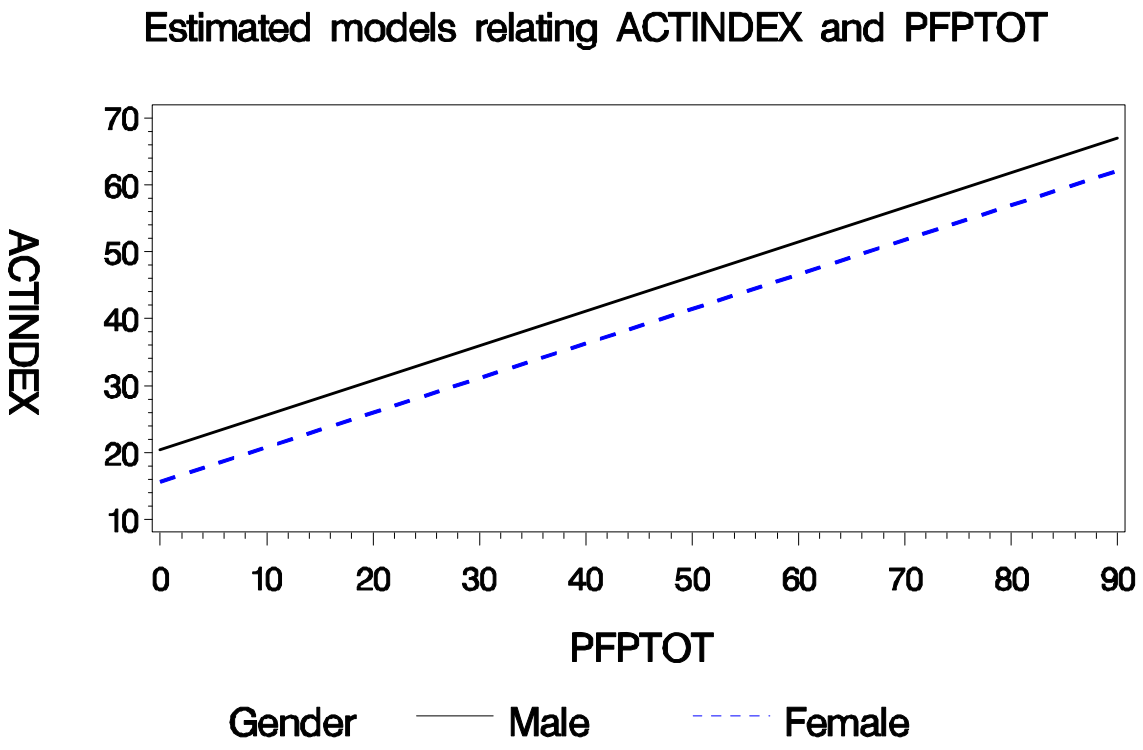

Figure 4.4: ANCOVA for YPAS Activity Index and PFP Total with Gender Differences

CHAPTER 5. DISCUSSION

5.1: Primary Purpose

The YPAS was developed at Yale University to measure current physical activity in older adults. Although the instrument has been found valid and reliable, it remains to be clearly established within the subgroups of the "older adult" population. The primary purpose of this investigation was to examine if differences in the relationship between the YPAS indices and function could be measured between the YOUNG-OLD group and the OLDEST-OLD group. Additionally, the YPAS was tested for differences in validity against the CSPFP10 in the OLDEST-OLD population. Upon data analysis, the scope was expanded to include investigation into whether gender played a role in the relationship.

5.2 Summary of Current Findings

As in many of the previous activity recall questionnaire validation studies, there appears to be some variations in the magnitude of the correlations. The general relationships found in this study are summarized in Tables 5.1 and 5.2. The data appears to show that there are specific differences within the "older adult" population. First of all, it appears that while in the OLDEST-OLD group all three of the major indices were strongly correlated with function, only one was significantly correlated with YOUNG-OLD group. Additionally, there appears to be gender differences. The females of both age groups appeared to spend more time being physically active, while the males tended to participate in higher intensity activities. Only in TEEI did gender not play a role.

Table 5.1: Summary of Correlation Findings

Indices	YOUNG-OLD; n=110	OLDEST-OLD; n=145
TTSI	Not strong, not significant	Strong
TEEI	Strong, but not significant	Strong
ADSI	Strong	Strong

Table 5.2: Summary of Analysis of Covariance Findings by Age Group and Gender

Indices	Age Group	Gender
TTSI	No Role	Females showed increased time spent being physically active for given functional level
TEEI	Young-Old showed increased energy expenditure for given functional level	No Role
ADSI	Young-old showed increased intensity of activities for given functional level over oldest-old group.	Males of both age groups showed increased intensity of activities for given functional level over females of both age groups.

5.3: Comparison of Current Findings to Previous Findings:

The findings regarding all participants from the current study appear to be mostly concurrent with findings from the Cress, 1996 study as seen in Table 5.3. However, when the entire group is broken down into sub-groups one can see that in the current study YOUNG-OLD group has higher scores than the Cress study, and the OLDEST-OLD group has lower scores than the Cress study.

Table 5.3: Previous CS-PFP Findings as Compared with Current Findings

VALUES	CRESS, 1996	CURRENT FINDINGS		
		All Participants; n=273	YOUNG-OLD; n=110	OLDEST-OLD; n=145
UBS	41	33±23	48±20	22±18
UBF	47	54±21	68±16	44±19
LBS	33	32±22	47±20	21±16
BALCOR	40	36±23	51±18	24±18
ENDUR	41	38±23	55±19	26±17
PFP-TOTAL	CD: 54.2±11.0 LTC-I: 42.3±15.0 LTC-D: 23.6±8.7	37±21	53±17	26±16

Previous findings for the YPAS subsections and indices are seen in Table 5.4. The findings from Young, 2001 showed significantly lower numbers for all indices and subsections with the exception of the standing and sitting subsections. The numbers found in the current study for the OLDEST-OLD group were consistently lower than that found in other studies. In

particular, all indices and the moving and standing subsections were lower for the OLDEST-OLD group. Additionally, the Total Time Summary index for the YOUNG-OLD group was consistent with those found in the other studies, however the OLDEST-OLD group was much lower and therefore dropped the mean for the entire group to lower than that seen in the other groups. Previous findings comparing YPAS and CSPFP10 have not been published.

5.3.1: Age Roles

Our finding regarding the OLDEST-OLD group have been somewhat substantiated in other studies. It has been shown that certain subgroups such as men, "younger-older adults" (age 65-74 years) were better at reporting activity. In addition, this group may perform more regular exercise of a higher intensity than women and people of 75 years and older.

5.3.2: Gender Roles

As seen in DeAbajo, et al, 2003, men had lower scores than women on the TTSI and in TEEI. It has been indicated that this difference could be due to the differing social roles between older males and females. DeAbajo suggests that women engage in housework and caretaking, while men expended more time in higher intensity, shorter duration activities such as yard work, exercise, and recreational activities.

5.4: Explanation of Current Findings

Overall, the current findings indicate several insights into the physical activity intensities and patterns of the older adult. It has been widely established that aging results in substantial changes to physiology, function and basic lifestyle. Decreased body mass, increase fatigue, sarcopenia, decreased neural communication, as well as many other issues can be attributed to aging. Therefore, aging presents a unique situation where individual differences in race, gender and socioeconomic background play a large role in the expression of these decreases in function.

Additionally, measurement of physical activity in the older adult population is especially problematic due to the differing physical activity patterns from “younger” groups.

5.4.1: Age Roles

The TTSI of the YPAS had a strong but not significant relationship with function in the YOUNG-OLD, but was significantly correlated with function in the OLDEST-OLD group. This could indicate that when surveying nonagenarians, focusing questionnaire towards the total amount of time spent in activities could provide a better overall estimate of function. In looking at the information from the analysis of covariance, the differences in the duration of physical activity through out the week indicated that gender played a greater role than did age.

The YOUNG-OLD group showed an increased level of energy expenditure over the OLDEST-OLD group. This is most likely due to the difference in body weight between the two groups. The OLDEST-OLD group was much lighter than the YOUNG-OLD group indicating sarcopenia. The loss of muscle mass would decrease the resting metabolic rate and therefore energy expenditure.

The ADSI results indicated that the young-old group participated in more intense activities. This difference is most likely due to the OLDEST-OLD group’s physical activity consisting of predominately activities of daily living.

5.4.2: Gender Roles:

By looking at the relationship between the ADSI, a measure of intensity level, it is seen that when looking at the age groups combined there are gender differences. For a given functional level, the males participate in higher intensity activities. In looking at the information

Table 5.4: Comparison of Previous YPAS Findings with Current Findings

	DiPietro, 1993				Young, 2001			Schuler, 2001				Current Data, 2006		
STUDY TYPE	Validity		Re-Test		Validity			Re-Test		Retest		Validity		
Gender Info	Men	Women	Men	Women	81.3% Women	74.1% Women	78% Women	Men		Women		All	YOUNG-OLD	OLDEST-OLD
N=	14	11	20	56	27	32	59	25		31		273	110	145
AGE	70.7±6	68.0±5.6	71.0±6.8	71.1±6.3	65.8±5.4	69.1±5.9	66.5±5.2	68±6		68±8		83±11	71±6	92±2
GROUP	Men	Women	1st Trial	2nd Trial	AA*	NAA*	Entire Group	1st Trial	2nd Trial	1st Trial	2nd Trial	Entire Group	Young	Oldest
TOTAL TIME	32±21	33.9±15.4	34.3±18.4	30.6±16.7	19.2	20.7	20.5	33.95 ±20.8	34.32 ±26.4	34.96 ±31.2	47.11 ±19.8	26.0 ±18.8	32.8 ±21.5	21.5 ±15.8
ENG EXP	8325 ±6640	6936 ±3334	7613 ±4502	6740 ±4267	3285	3769	3675	7988 ±5730	7794 ±5592	9680 ±4060	10080 ±4440	5045 ±3832	6978 ±4458	3728 ±2730
ADIS			49±25	45±23	22	29	27	75±28	69±24	77±19	76±21	361±22	47±23	29±18
*AA=African-American; NAA=Non-African American														

from the TEEI, gender did not appear to play a role in the relationship between energy expenditure and function. It is seen that the females of both age groups participate in an increased duration of physical activity, as compared with the males of both age groups of the same functional level. This difference could be attributed to changes in muscle mass with age as well as due to selective attrition.

5.5: Study Limitations

The subjects in this study represent "relatively well" older adults. Therefore, these individuals may be among the more physically active within their demographic. Reliability of reporting more vigorous activities is higher than moderate and low intensity activities. While other measures were collected within this sample, data is not yet available. As the pursuit for the "gold" standard of physical activity questionnaires continues, it is imperative that more through investigations into the validity of physical activity measures and to correlate the questionnaires with new instruments.

5.6: Future Considerations

Further studies are needed to assess the validity of this questionnaire against additional construct and criterion measures in a wide variety of demographics. The findings that validity differed between age groups and gender suggest that further studies are necessary with larger sub-group sample sizes. These future studies should report validity coefficients for the total sample as well as for a variety of subgroups of older adults. Additionally, it will be important to include additional indices/scores from the instrument, to further divulge areas where differences may lie. Also, the need to modifying the item weight of the various YPAS activities to more accurately describe the different types of physical activity among older adults should be

investigated. The study is though a step towards understanding the exponentially growing “older adult” population.

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APPENDIX A
SUMMARY INDICES CALCULATIONS

TOTAL TIME SUMMAY INDEX:
Total time spent is summed across all components and expressed as hours per week for each subject.

Example: 13 hours/week (work) + 4 hours/week (yardwork) + 3 hours/week (recreational activities) = 20 hours/week

ENERGY EXPENDITURE SUMMARY INDEX:
Time spent is multiplied by an intensity code that is equivalent to kilocalories per minute and is then summed across all activities and expressed as kilocalories per week for each subject.

Example: 3500 kilocalories/week (work) + 500 kilocalories/week (exercise) + 300 (recreational activities) = 4300 kilocalories/week

ACTIVITY DIMENSIONS SUMMARY SCORE
Vigorous activity and leisurely walking dimension scores are derived from multiplying frequency score and duration score to create a total duration for the day socre. Each total daily duration score is multiplied by a weighing variable and is then summed to create the activity dimensions summary index. This index is expressed as total units for each subject.

Example:

Activity Dimension

Vigorous activity: 2(Q1) x 2 (Q2) x 5 (weight) = 20

Leisurely walking: 3(Q3) x 2(Q4) x 4 (weight) = 24

Moving: 5(Q5) x 3(weight) = 15

Standing: 3(Q6) x 2(weight) = 6

Sitting: 2(Q7) x 1 (weight) = 2

Total = 67

SEASONAL ADJUSTMENT SCORE = SUM OVER ALL SEASONS/4

APPENDIX B
WEEKLY PHYSCIAL ACTIVITY DESCRIPTIONS

Working:

- Shopping:
  - grocery, clothes
- Stairclimbing while carrying a load
- Laundry
- Light housework:
  - tidying, dusting, sweeping, collecting garbage in home, polishing, indoor gardening, ironing
- Heavy housework:
  - vacuuming, mopping, scrubbing floors and walls, moving furniture, moving boxes or garbage cans
- Food Preparation (10 minutes or more):
  - Chopping, stirring, moving around to get food items, pots or pans
- Food Service (10 minutes or more):
  - Setting table; carrying food, serving food
- Dishwashing (10 minutes or more):
  - Clearing table, washing and drying dishes, putting dishes away
- Light home repair:
  - Small appliance repair, light household maintenance and repair tasks
- Heavy home repair:
  - Painting, washing and polishing car, carpentry

Yardwork:

- Gardening:
  - Pruning, planting, weeding, hoeing, digging
- Lawn mowing (walking only):
- Clearing walks and driveway:
  - Raking, shoveling, sweeping

Caretaking:

- Older or disabled person:
  - Lifting, pushing wheelchair
- Childcare:
  - Lifting, pushing stroller

Exercise:

- Brisk walking for exercise (10 minutes or more)
  - Causes large increases in heart rate, breathing or leg fatigue
- Stretching exercises, yoga, pool exercise

- Vigorous calisthenics, aerobics:
  - Causes large increases in heart rate, breathing or leg fatigue
- Cycling, exercycle

Lap Swimming

Recreational Activities:

- Leisure walking (10 minutes or more)
- Hiking
- Needlework:
  - knitting, sewing, crocheting, needlepoint
- Dancing (moderate to fast):
  - Line dancing, ballroom, square, tap, etc
- Bowling, Bocci
- Golf (walking to each hole only)
- Racquet sports:
  - Tennis, racquetball
- Billiards

VITA

Angela Nickole "Nicki" Solomito Pugh was born in Bloomington, Indiana, on November 25th, 1978. After completing high school while living in Odon, Indiana, she moved to Evansville, Indiana, where she completed her Bachelor of Science degrees in both Sports Medicine and Exercise Science at the University of Evansville in 2001. Upon graduation, Nicki attended Louisiana State University and will graduate with a Master of Science degree in Kinesiology in December of 2006. After graduation, Nicki plans to continue her work supervising the community-based wellness programming for North Oaks Health System. She is planning on moving to the Hammond area with her husband and infant daughter.