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Physical function and quality of life in the very- and oldest-old: gender differences

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PHYSICAL FUNCTION AND QUALITY OF LIFE IN THE VERY- AND OLDEST-OLD: GENDER DIFFERENCES

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ABSTRACT

Age is associated with deterioration in physical function (PF) and health-related quality of life (HRQL). Recent investigations suggest that a decrease in function may have a greater impact on perceived activities of daily living (ADL) competency in women than in men. The purpose of this investigation was to test the hypothesis that the association between PF and HRQL among older adults is influenced by gender. We examined 108 older adults aged 60 years or older, for PF (Continuous Scale-Physical Function Performance test (CS-PFP10) and Functional Status Index (FSI)) and HRQL (SF-36). In order to address this question we assigned subjects to fitness categories according to FSI and CS-PFP10 scores and tested for gender by fitness category interactions on HRQL. Moreover, we examined the relationship between total CS-PFP10 scores and the PCS-component of the SF-36 as well as total FSI scores and the PCS-component using linear, logarithmic, and power curves. Furthermore, we examined the correlation between total FSI and total CS-PFP10 in men and women. There were main effects of gender on physical self-reported and performance-based measures of PF indicating lower function in women as compared to men. The results indicate that self-reported and performance-based PF scores were positively associated with HRQL in men and women; however, the strength of the association was greater in men (R^2 ranging from 0.57-0.61) than in women (R^2 ranging from 0.17-0.44). Furthermore, the association between CS-PFP10 scores and FSI scores was stronger in men (R^2= 0.64) than in women (R^2= 0.47). These data suggest that PF explains more of the variance in physical constructs of HRQL in older men as compared to older women, and that a woman's HRQL is more tightly matched to her perceived functional ability than to her actual performance of ADL-based tasks. These findings underscore the complexity of the

manner in which gender and PF interact with HRQL, and suggest the need for further research to clarify the most appropriate modeling techniques for understanding gender, function, and HRQL in later life.

CHAPTER 1. INTRODUCTION

Over the last century, the proportion of the population aged 65 and older has progressively increased. According to the United States Census, about 12.8% of the population was 65 and older in the year 2000. This percentage is expected to increase to approximately 20.1% in the year 2030 (U.S. Census, 2000). Consequently, it is becoming increasingly important to understand the impact of age-related changes in function as greater numbers of seniors are living with chronic disabling conditions.

Of particular relevance here is the impact of physical functional decline on quality of life (QOL), and whether or not this association is different in older women as compared to older men. In general, it is quite clear that physical function (PF) is associated with quality of life in older adults. Numerous studies, including those conducted in our laboratory (Wood, Reyes-Alvarez, Maraj, Metoyer, & Welsch, 1999) and unpublished data from Dunbar et al., support the plethora of studies suggesting a direct association between function and health-related quality of life (HRQL). Interestingly, however, available data, while scarce, suggest that functional decline may be associated with a greater rate of decline in HRQL among older women as compared to men (Kaplan, Anderson, & Wingard, 1991; Deck, Kohlmann, & Jordan, 2000). In 1991, Kaplan et al. found that Quality of Well Being deteriorates faster in women than in men, and that after adjusting life expectancy for years of Well-living, the gap between women and men is cut by more than 50%. More recently, Deck et al. (2000) confirmed these earlier findings, reporting that men tend to assess their HRQL more positively than women in a number of different dimensions. The apparent gender disparity in HRQL may reflect the observation that despite the greater life expectancy of females, women tend to live with more chronic illnesses and not surprisingly report greater problems with PF and have a higher incidence of disablement as compared to men (Deck et al., 2002; Kaplan et al., 1991).

While HRQL may decline faster in older women, this may not entirely reflect a differential change in PF and disparate rates of disablement. Rather, it has been suggested that women tend to report a greater impact of functional limitation on HRQL (Dibble, Padilla, Dodd, & Miaskowski, 1998) and perceived difficulty in performing ADLs (Rahman & Liu, 2000). Rahman and Liu (2000) found significant differences between men and women. Their findings include: older women consistently report significantly more limitations than their male counterparts, older women consistently perform significantly worse than men on individual items, summary scales, and the overall physical-performance index (Rahman & Liu, 2000). Moreover, at the same level of physical-performance and age, older women in this study population were much more likely to report that they had difficulty with or were unable to do ADLs in comparison to their male counterparts (Rahman & Liu, 2000). Such a finding however is not universal. Merrill, Seeman, Kasl, and Berkman (1997) reported a high accuracy of perceived abilities among a sample of elderly men and women. However, the authors also indicated that among those who reported inaccurately, more men than women underreported disability and more women than men over-reported disability (Merrill et al., 1997).

While there is, at present, no consensus on the nature of gender differences in the relationships among function, perceived function, and quality of life among the elderly, Dibble et al. (1998) and Rahman & Liu (2000) assert that measurement of QOL requires gender-specific questions to accurately address the dimensions of the concept of QOL in women and men. Consequently, the approach to validation of instruments used to assess PF in older adults should address the question as to whether the instrument possesses some degree of gender bias.

Due to the problems with under- and over-reporting function according to questionnaires (i.e., perceived function), there has been interest in developing objective tools for assessing function in older adults. One such instrument is the relatively newly proposed Continuous-Scale Physical Functional Performance test (CS-PFP10) (Cress, Buchner, Questad, Esselman, deLateur, & Schwartz, 1996). In our laboratory, we have implemented the CS-PFP10. The CS-PFP10 is designed to provide a comprehensive, in-depth measure of PF that reflects abilities in several separate physical domains (Cress et al., 1996). This instrument offers valid and reliable quantification of whole-body physical functional performance, as well as, assessment of five physical domains: upper and lower body strength, upper body flexibility, balance and coordination, and endurance (Cress, 1997). Cress has validated this study against self-reported quality of life and need for dependent-care services (Cress et al., 1996; Cress & Meyer, 2003).

While the measurement of function using the CS-PFP10 has clearly shown strong associations with quality of life, the instrument has not been used to examine gender differences in these associations. Therefore, with respect to previous research, the purpose of this study was to examine whether the relationship between function as defined by the CS-PFP10 and HRQL is also gender-specific. Previous literature suggests that we will find that men will score higher on QOL as compared to women with similar PF scores. However, preliminary data from our laboratory suggest that the nature of the relationship between PF and QOL will be different in men and women such that the relationship in women is linear, whereas the relationship in men will be better described by power curve.

CHAPTER 2. METHODS

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

2.1 Participants

One hundred-eight independent older adults (ages 60 and older) were invited to participate in this study. Thirty-seven participants (13 men, 24 women) were residents of St. James Place continuing care retirement community who responded to a solicitation, and the remaining 71 participants (35 men, 36 women) were from the population-based HEF study. Each participant was screened for disease and/or chronic conditions that are recognized as contraindications for physical activity (ACSM, 1995), and physician as well as client consents for participation were obtained. Participants were also questioned regarding their previous health history, including incidence of disabling diseases and conditions as well as current medication use. The exclusion criteria include those categorized by the American Heart Association as Class C and Class D unstable or otherwise symptomatic of cardiovascular disease at rest.

2.2 Instrumentation

The SF-36 (Kaplan et al., 1982) has been validated for assessing QOL in persons over 65 years of age, and was used for this purpose in the present study. Self-reported ADL competency was assessed using the functional status index (Jette, 1980). The functional status index provides a continuous scale measure of self-reported need for assistance, pain, and difficulty with the performance of basic and instrumental ADLs. Lastly, the reduced continuous scale physical function performance test (CS-PFP10) was used to measure performance-based physical function. The CS-PFP10 is designed to provide a comprehensive, in-depth measure of physical function that reflects abilities in several separate physical domains. The battery of test that make up the CS-PFP10 include low, medium, and high effort tasks described below. Cress et al. (1996) report very good reproducibility of the CS-PFP10, and unpublished data from our laboratory reveal very high test/retest reliability (ICC in the range of r= 0.91- 0.99), as well as very high inter-tester reliability (ICC in the range of r= 0.91- 0.99). The CS-PFP10 involves the following tasks:

- **Low-effort:**
    - Weight Carry In this task the subject carried a pan of weights from one counter to another counter approximately 63 inches behind them. The subject was instructed to add sandbags to the pan until they have reached the *maximal* amount of weight they feel they can carry safely to the counter (maximal weight is 65 lbs). Starting with their hands by their side, at the word 'go' of the command "ready, set go" the subject picked up the pan and carried it to the counter behind them, then set it down and put their hands by their side. The time was stopped as the pan hit fully on the counter. Time and weight was recorded.
    - Jacket In this task the subject was instructed to put on a light "windbreaker" type jacket and pull the jacket together without zipping it up. Once the jacket was pulled together, the subject took it off and set it on the table. The subject began at the command, "ready, set, go", and was timed from the word 'go' to the moment the subject's second hand emerged from the second sleeve. Time was recorded.
    - Scarves In this task the subject was asked to pick up four scarves from the floor. The subject was instructed to start facing the scarves with their hands at their side, at the word 'go' they were to pick up each scarf separately until all four scarves were picked up, then return to standing position at the place where the last scarf

was picked up. The time started at the word 'go' and stopped when the subject returned to a standing position. Time was recorded.

- Reach This is not a timed test. In this test the subject was asked to reach as high as to possible (maximum height is 234 cm). The subject was instructed to push a shelf up as high as possible with their feet flat on the floor, place the sponge on the shelf and let go, then reach up and remove the sponge. The subject was allowed to lean on the wall or go up on their toes to remove the sponge. Distance was recorded.

▪ **Medium-effort:**

- Floor Sweep In this task the subject was instructed to sweep up a ½ cup of kitty litter in a 4' x 3' block square rectangle. At the command, "ready, set, go", the subject swept the kitty litter into a dustpan as quickly as possible and to their satisfaction, and then placed the dustpan onto a shelf. Their time started at the word 'go' and ended when the dustpan was placed on the counter. Time was recorded.
- Laundry 1 In this task the subject emptied a top-loading washer into a side loading dryer. The subject unloaded and loaded three 2 lb and one 3 lb bags of sand and 4 lbs of dry clothes. The washer began closed, but the dryer began open. Time started at the word 'go', and once all items were put into the dryer, the subject closed the dryer door and their time was stopped. Time was recorded.
- Laundry 2 In this task the subject was asked to unload the dryer. The dryer door began closed. At the command "ready, set, go", the subject was instructed to open the dryer door, and put only the 4 lbs of dry clothes into a laundry basket. The subject then picked up the basket and placed it on top of the dryer and closed

the dryer door. The time started at the word 'go' and stopped when the clothes were on top the dryer or the dryer door was closed (whichever comes last). Time was recorded.

- Floor Down/Up Test In this task the subject was asked to start in a standing position and on the command, "ready, set, go", they sat down on the floor, stretched their legs straight out in front of them and then immediately stood up and put their hands by their side. There were two chairs on each side of the subject for support, and the examiner held onto the subject's safety belt to guard the subject from falling the last few inches of the sit-down. Time started at the word 'go' and was stopped as soon as they returned to standing position. Time was recorded.

- **High-effort:**
  - Grocery In this task the subject was instructed to carry groceries from the store onto the bus platform, open the door and set the groceries on the counter, 42.3 total yards. Knowing this distance, the subject was asked to place the maximal amount of weight they could safely carry into one or more grocery bags (maximal weight they could choose was 65 lbs). They could carry the bags any way they like. The subject was instructed at the command "ready, set, go" to carry the bag(s) to the bus stop (16.3 yards), climb the steps, descend the steps, carry the groceries to the door (26 yards), open the door and set them on the counter. Time started at the word 'go' and stopped when all bags are placed on the counter. Time and weight was recorded.
  - Stair Climb Test This task required the subject to climb one flight of stairs, 11 steps, 12 inches in depth, 6.5 inches high. They could use the handrail, but could

not pull themselves up the steps. This task only required the subject to climb up the stairs. Once the task was completed, they could take as much time as needed to walk down the stairs. Time started at the word 'go' and stopped once they stepped on the eleventh step. Time was recorded.

- Endurance Walk In this task the subject walked up and down a hallway marked at 150 feet as many times as possible, at a pace that allowed them to cover the greatest distance they could in 6 minutes. The subject was allowed to rest any time they needed and time would continue to run. The subject was asked to stop where they were at the end of the 6 minutes. Distance was recorded.

Participants were given specific directions for each task, and were instructed for each task to perform it safely but to work at maximal effort. It was important for participants to pace their performance in order to complete as many tasks as possible (Cress, 1997).

The tasks of the CS-PFP10 are categorized into five physical domains: upper body strength, lower body strength, upper body flexibility, balance and coordination, and endurance (Cress et al, 1996). According to Cress et al (1996), weight-carried data provided information about skeletal muscle strength; time to complete the task was regarded as a reflection of balance and coordination, although time was sometimes used as a measure of strength; distance measured provided information about flexibility and endurance; and the cumulative time of the timed tasks was regarded as one measure of endurance. The total CS-PFP10 score is derived from the average of the individual scores of each domain.

2.3 Procedure

Participants reported to the laboratory on two occasions. The first session included an informed consent, a review of medical history, the SF-36 and functional status index questionnaires. The second session involved the CS-PFP10.

2.4 Statistical Analysis

All data were analyzed using SPSS 11.0 system for Windows.

2.4.1 Descriptive Analysis

Medical history information was coded so as to identify whether participants had a history of cardiovascular diseases, orthopedic diseases or problems, neurological diseases or conditions, and or "other" conditions known to influence physical function. Gender differences in prevalence of cardiovascular, neurological, orthopedic, and other diseases were analyzed using Pearson's Chi Square test for homogeneity. Linear models (one-way ANOVA) were employed to examine gender differences in age, height, weight, waist-hip ratio, total number of disease categories, number of medications, CS-PFP10 items, total score, and subscales, and all SF-36 indices. Mann-Whitney U tests were employed to test for gender differences in mean ranks of FSI subscales (FSA, FSP, FSD). For all statistical tests alpha was set a-priori at $p<0.05$.

2.4.2 Group Differences in QOL According to Gender and Physical Function

The CS-PFP10 total physical function scores were categorized according to one of three categories, low, moderate, and high. The criteria for determining the cutoffs for these categories were the level of care associated with the score as published by Cress and Meyer (2003). Cress and Meyer (2003) suggest that CS-PFP10 total scores below 48 are associated with increased dependent-care needs (LOW); scores between 48 and 58 are associated with intermediate risk of dependent-care needs (MOD), and scores > 58 are associated with independent living (HIGH). We used a 2x3 ANOVA (gender vs. functional category) to examine gender differences in HRQL main component scores (PCS, MCS).

Similarly, self-reported function (FSI) subscales were summed to provide a total FSI score. The FSI total scores were then divided into tertiles. The tertile of participants with the best FSI scores and the poorest FSI scores were then used in a 2x2 ANOVA to examine main effects of self-reported function and gender, and gender x function interactions on HRQL main component scores (PCS, MCS).

2.4.3 Association between Function and Quality of Life

Several regression models were employed to assess the nature of the association between physical function and HRQL. The data for the men and women were compared separately on using linear, exponential, logarithmic, and power curve models. An alpha level of $p<0.05$ was required for statistical significance.

CHAPTER 3. RESULTS

3.1 Descriptive Statistics

One-hundred-eight of the 109 participants completed all aspects of the investigation. One participant chose not to complete the CS-PFP10. Three of the 108 had incomplete medical records. Figures 3.1-3.6 show the frequency distributions for gender, physical function categories (PFCAT), and the presence of cardiovascular diseases (CV), orthopedic diseases or conditions (ORTHO), neurological diseases or conditions (NEURO) (including loss of vision and hearing), and/or "other" diseases, in which most of the cases of “other” diseases involved hypothyroidism or cancer.

The gender distribution of the study participants is illustrated in Figure 3.1. Forty-three percent of the participants were male, and 57% female. Participants were assigned to one of three functional fitness categories (PFCAT) according to their CS-PFP10 scores (LOW, MOD, and HIGH). The frequency distributions for the PFCAT categories are presented in the Figure 3.2.

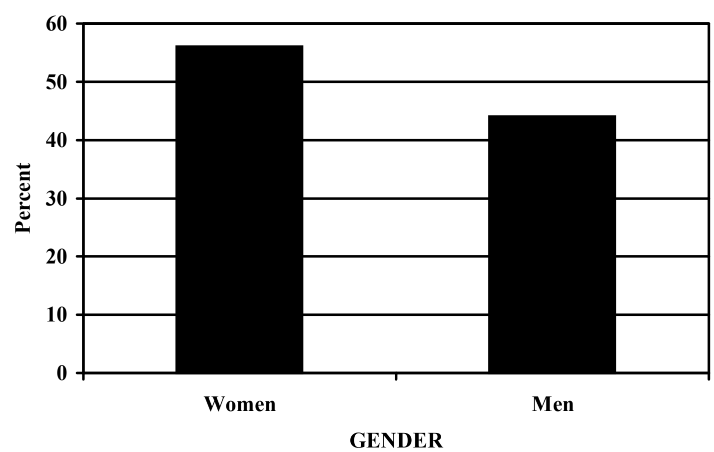

Figure 3.1-Gender Frequency

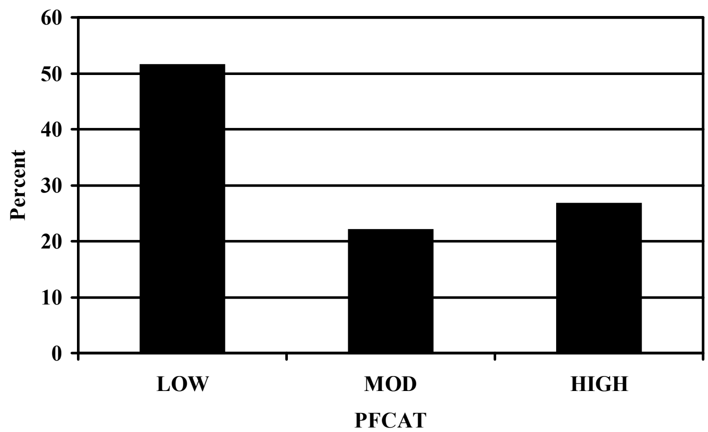

Figure 3.2-Physical Function Category

The participant's medical records were reviewed for the presence of diseases. The following figures report the distribution of CV diseases (Figure 3.3), orthopedic diseases (Figure 3.4), neurological diseases (Figure 3.5), and/or "other" diseases (Figure 3.6) in the total subject sample.

Pearson’s Chi Square for homogeneity revealed no gender differences in the frequency in CV diseases, orthopedic diseases or conditions, neurological diseases or conditions, or "other" diseases or conditions. However, there were gender differences with respect to distribution in PFCAT. Table 3.1 presents the PFCAT by gender. The distribution was such that a greater percentage of women were of LOW functional fitness as compared to men, with fewer women in both the MOD and HIGH fit categories.

Additional participant descriptives are shown in Tables 3.2-3.4 according to gender. Simple ANOVA revealed gender differences in weight, height, and waist-to-hip ratio ($F=17.402$, $p<0.001$; $F=15.392$, $p<0.001$; $F=42.213$, $p<0.001$; respectively).

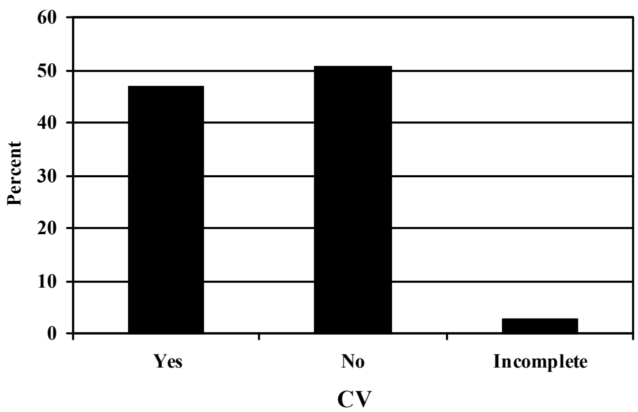

Figure 3.3-Cardiovascular Disease

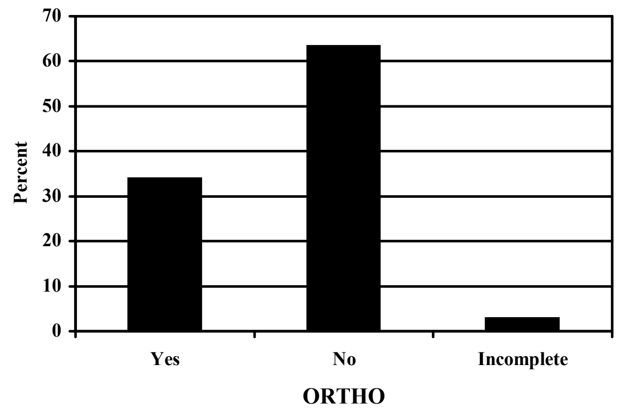

Figure 3.4-Orthopedic Disease

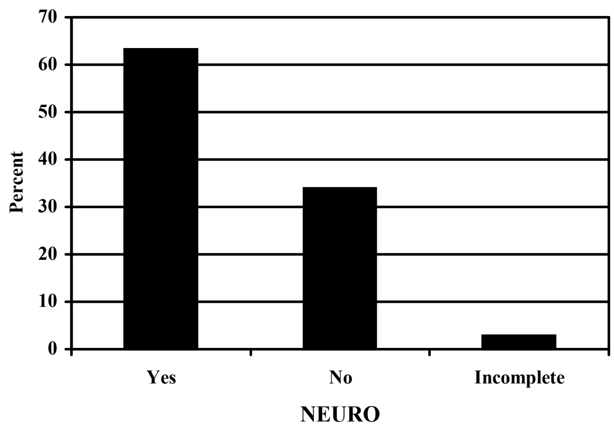

Figure 3.5-Neurological Disease

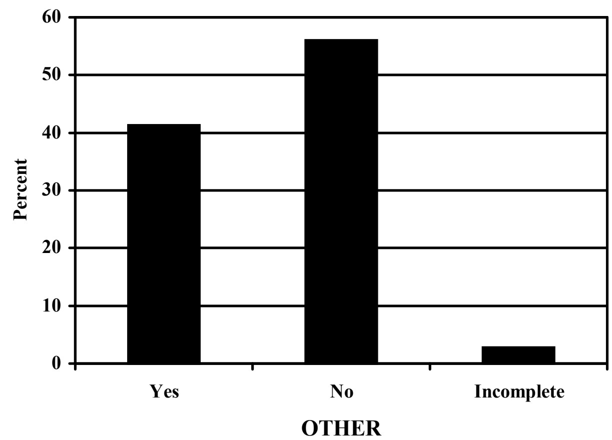

Figure 3.6-Other Disease

Table 3.1 Frequency of PFCAT by Gender

	Women	Men
LOW	64%*	35%
MOD	17%*	30%
HIGH	19%*	35%

*p<0.05

Table 3.2 Participant Characteristics

	Women	Men	F value	*p* value
Age	77.9 ± 8.3	76.6 ± 7.7	0.65	0.42
Weight	63.4 ± 11.4	80.54 ± 10.6	17.402	0.000**
Height	163.5 ± 7.6	175.1 ± 8.9	15.392	0.000**
BMI	23.7 ± 4.0	26.3 ± 2.9	3.459	0.072*
WHR	0.79 ± 0.05	0.92 ± 0.07	42.213	0.000**
# Disease	1.93 ± 0.97	1.84 ± 1.26	0.167	0.684
# Meds	4.47 ± 2.89	2.98 ± 2.61	7.414	0.008**

*p<0.10
**p<0.05

Gender differences also appeared in performance-based physical function (reported by the CS-PFP10) and self-reported function (reported by the Functional Status Index (FSI) scores), as reported in Table 3.4. ANOVA revealed main effect of gender on several CS-PFP test items (Table 3.3), upper body strength, lower body strength, and total CS-PFP10 score (F=16.757, p=0.000; F=8.915, p=0.004; F=5.404, p=0.022; respectively) (Table 3.4).

Table 3.3 Gender and CS-PFP10 Item Scores

Task	Men	Women	*t* value	*p* value
Weight carry (time)	3.8 ± 2.3	4.2 ± 2.4	-0.82	0.43
Weight carry (weight)	34.6 ±17.5	18.0 ± 7.1	6.75	<0.001
Jacket	17.3 ± 10.0	17.3 ± 9.3	0.24	0.98

Table con't

Scarves	7.5 ± 6.9	8.5 ± 6.7	-0.81	0.42
Reach	223.2 ± 22.3	206.2 ± 13.3	4.94	<0.001
Floor sweep	35.1 ± 14.1	40.8 ± 24.5	-1.44	0.15
Laundry 1	35.9 ± 21.0	40.5 ± 22.9	-1.01	0.29
Laundry 2	19.9 ± 8.1	23.7 ± 17.4	-1.40	0.16
Floor down/up	10.9 ± 8.4	13.2 ± 13.4	-1.05	0.30
Grocery (time)	63.2 ± 50.2	57.6 ± 26.0	0.74	0.46
Grocery (weight)	25.1 ± 12.6	16.0 ± 8.3	4.48	<0.001
Stairs	8.4 ± 12.4	6.2 ± 3.5	1.29	0.20
6min walk	191.4 ± 78.7	212.8 ± 90.2	-1.29	0.20

Table 3.4 Gender and Physical Function

	Women	Men	F value	p value
Upper strength	31.3 ± 16.5	46.5 ± 21.7	16.8	<0.001**
Upper Flexibility	59.8 ± 19.7	56.5 ± 19.7	0.7	0.410
Lower Strength	33.3 ± 17.8	44.7 ± 21.3	8.9	0.004**
Balance & Coord.	42.4 ± 18.3	49.9 ± 21.6	3.7	0.057*
Endurance	43.7 ± 18.8	51.3 ± 22.4	3.5	0.063*
Total CS-PFP	40.5 ± 17.3	49.3 ± 21.1	5.4	0.022**
FSIA	22.7 ± 7.6	21.0 ± 7.1	1.4	0.007†
FSIP	21.2 ± 5.7	19.9 ± 4.2	1.6	0.148
FSID	22.7 ± 6.1	21.9 ± 7.9	0.3	0.014†

*p<0.10 using General Linear Model
**p<0.05 using General Linear Model
† p<0.05 using MannWhitney-U

The effects were such that men had better scores than women. After including body weight as a covariate, the gender differences in CS-PFP score were still present. Mann-Whitney U tests revealed that women reported greater need for assistance (FSA) and greater difficulty (FSD) in performing ADLs. ANOVA revealed no significant gender differences in the subscales of the SF-36 or the total SF-36 score (Table 3.5).

Table 3.5-QOL

	Females	Males	F =	p=
SF36PF	66.9 ± 27.4	76.4 ± 23.3	3.395	0.068*
SF36RP	73.7 ± 33.9	77.8 ± 32.9	0.382	0.538
SF36BP	70.2 ± 25.1	77.5 ± 20.2	2.503	0.117
SF36GH	74.2 ± 16.1	75.5 ± 15.4	0.151	0.698
SF36VT	66.8 ± 17.1	65.9 ± 18.0	0.066	0.797
SF36SF	91.4 ± 15.7	90.6 ± 16.0	0.057	0.812
SF36RE	92.0 ± 21.0	87.9 ± 25.0	0.799	0.374
SF36MH	85.0 ± 12.7	84.9 ± 10.8	0.003	0.958
SF36PCS	43.7 ± 10.3	47.1 ± 8.5	3.233	0.075*
SF36MCS	57.8 ± 6.6	56.0 ± 5.1	2.170	0.144

*p=<0.10

3.2 Results of ANOVA of Gender x Physical Function on Health-Related Quality of Life

The results of the mixed model ANOVA revealed a main effect of PFCAT on the physical component scale (PCS) of the SF-36 ($F= 14.8$, $p<0.001$). However, there was no main effect of gender or gender by PFCAT interaction. Post-hoc testing (LSD) on the main effect of PFCAT indicated MOD and HIGH function groups had higher PCS than LOW function ($p < 0.05$), but MOD and HIGH fit groups did not differ from each other (Table 3.6).

Table 3.6-HRQL Components by PFCAT and Gender

CS-PFP Category	MCS		PCS	
	Women	Men	Women	Men
LOW	58.2 ± 6.8	54.9 ± 5.7	40.3 ± 10.4	41.1 ± 9.1
MOD	55.5 ± 7.6	57.0 ± 4.3	48.1 ± 7.8*	47.8 ± 7.4*
HIGH	58.4 ± 5.7	56.4 ± 5.2	50.5 ± 7.0*	52.5 ± 3.7*

MCS = mental component of the SF-36, PCS = physical component of the SF-36
*$p < 0.05$ compared to LOW

3.3 Associations between Physical Function and HRQL According to Gender

Associations among total CS-PFP10 scores and SF-36 PCS component were examined using Pearson correlation. Regression curves for these variables were estimated using linear, logarithmic, and power function approaches. For women and men, all regression methods provided statistically significant models. The data are illustrated in figures 3.7 & 3.8, respectively. According to the R-square values (Table 3.7), the linear model was the best fit for women, and the power function model was the best fit for the men.

Table 3.7 CS-PFP vs. HRQL Component Regression Models by Gender

	Women		Men	
Model	R^2	p <	R^2	p <
Linear	0.17	0.001	0.57	0.001
Log	0.14	0.005	0.56	0.001
Power	0.10	0.015	0.60	0.001

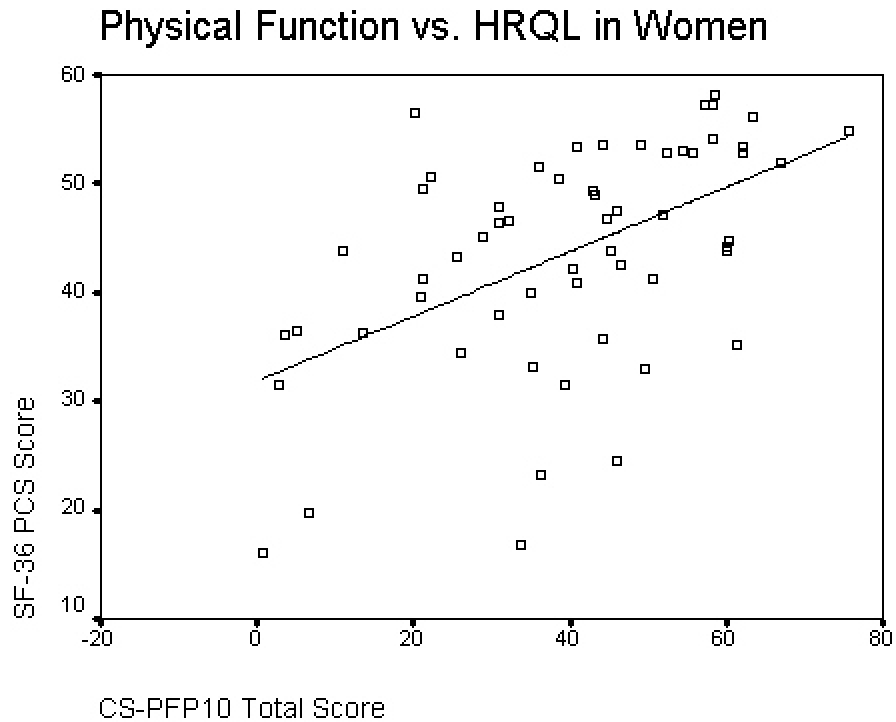

Figure 3.7-Physical Function vs. HRQL in Women

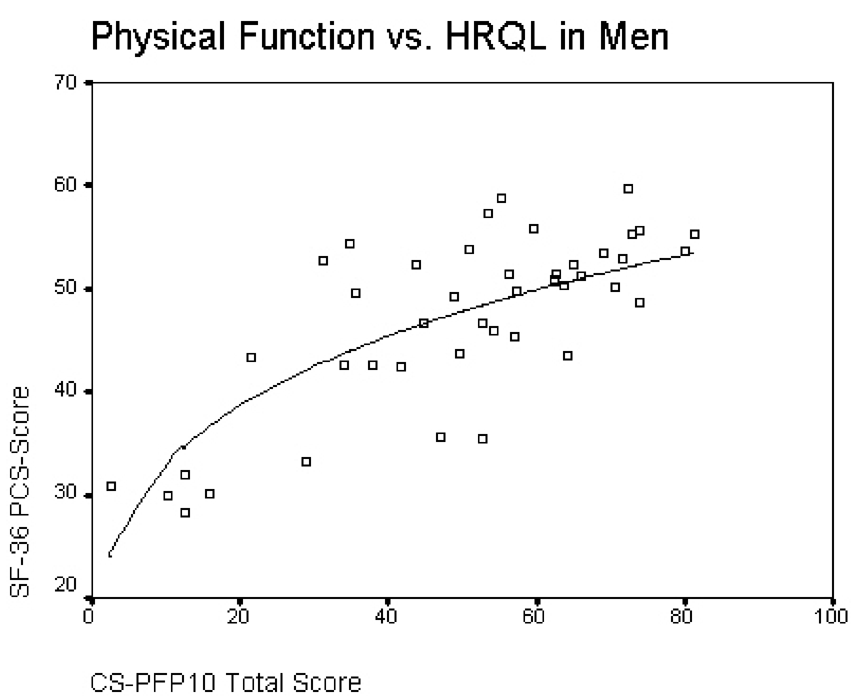

Figure 3.8-Physical Function vs. HRQL in Men

Furthermore, inspection of the R-squares for the regression curves reveals that physical function scores account for as much as 60% of the variation in HRQL among men, but less than 20% of the variability in HRQL for the women. When employing self-reported physical function (total FSI) as the independent variable the results were quite similar, however the R-square for women (0.48) was much higher in comparison that observed when the performance-based (CS-PFP10) was used as the independent variable.

Lastly, we examined the association between performance-based physical function and self-reported physical function according to gender (see figures 3.9 & 3.10). In each case, significant associations were revealed that were well described by a logarithmic model; however, the regression for the men was such that the R-square was higher than that observed for women (R^2 = 0.64 vs. 0.47, respectively).

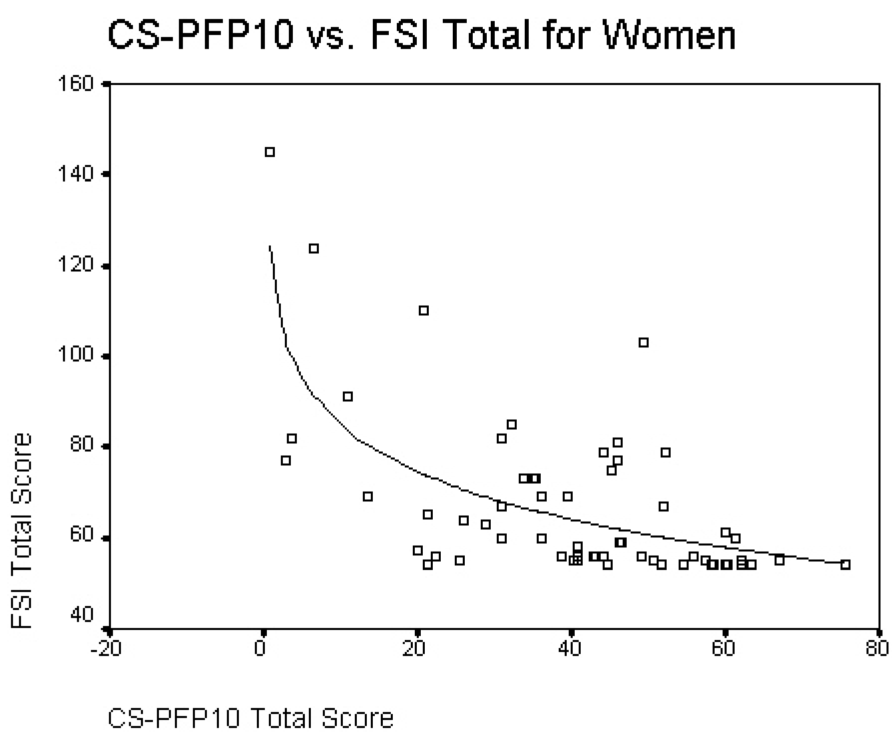

Figure 3.9-CS-PFP10 vs. FSI Total for Women

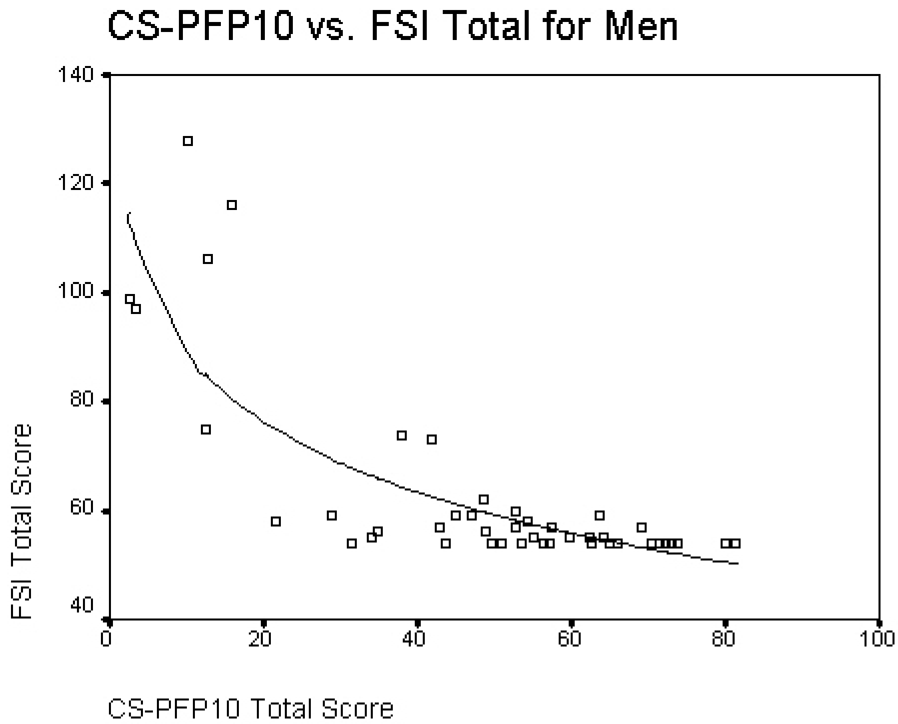

Figure 3.10 CS-PFP10 vs. FSI Total for Men

CHAPTER 4. DISCUSSION

The purpose of this investigation was to test the hypothesis that the association between physical function and quality of life among older adults is influenced by gender. In order to address this question we examined quality of life among older men and women across a wide array of physical function capabilities and, by assigning subjects to fitness categories, we looked for gender by fitness category interactions on health-related quality of life, with a particular interest in the physical component score (PCS) of the SF-36 health-related quality of life inventory. Moreover, we examined the characteristics of the regression curves, plotting physical function scores (CS-PFP10 total score) against SF-36 PCS scores, with a particular interest in the linearity of the regression and the variance accounted for by the models.

4.1 Participant Characteristics

The study population was comprised of 108 elders, 47% men and 53% women. The distribution of men and women is consistent with what would be expected in a random sample of senior adults according to the 2000 United States Census. However, inferences from the present study sample may be limited to the population of Caucasian elders inasmuch as 106 participants were Caucasian and two were African-American.

For the purpose of this particular study it was important to investigate the appearance of any gender differences in the presence of serious diseases, and number of prescribed medications taken. On average, by age 75, adults have between two to three chronic medical conditions (The AGS Foundation for Health in Aging (FHA), 1999-2002). Typically, disability among older Americans results from specific age-related diseases and conditions including dementia, stroke, heart and lung disease, and muscular/skeletal disorders such as arthritis and osteoporosis (FHA). In the present investigation, the health history of the entire study sample revealed 46.8% had a history of CV diseases, 33.9% had the presence orthopedic diseases or conditions, 63.3% had the presences of neurological diseases or conditions (including vision and hearing loss), and 41.3% had the presence of other diseases or conditions, most of which were either cancer or hypothyroidism. Closer inspection the study sample revealed there were no gender differences in the prevalence of disease categories or total number of diseases. Therefore, it is not likely that the appearance of gender differences in other variables can be explained by the health characteristics of the women and men in this study.

Despite the lack of gender differences in these broad health categories, there were differences in the number of medications taken, with women reporting greater medication number as compared to men (4.5 ± 2.9 vs. 3.0 ± 2.6, respectively) ($p = 0.008$). This finding is consistent with recent data from Deck et al. (2002). Importantly, the data also indicate no significant association between number of medications and HRQL constructs, although significance was narrowly missed for the general health component of the SF-36 ($p=0.07$). Again, these data confirm the findings of Deck et al. who reported no association between medications and the subscales or the total score of the VITA Questionnaire used by Deck et al. (2002).

4.2 Gender, Physical Function, and Quality of Life

The present study revealed no significant gender difference in the SF-36 subscales, however, the p-values for the main effect of gender with respect to the PF subscale, and PCS component were somewhat marginal ($p<0.10$). Thus, it is difficult to rule out the possibility that women report lower physical aspects of quality of life as compared to age-matched males with a similar health history. This possible trend notwithstanding, the general finding of no gender differences in older men and women with a similar health history is not entirely new. A fairly recent investigation of 222 men (60 ± 14 years of age) and 254 women (58 ± 11.3 years of age) diagnosed with cancer revealed no gender differences in quality of life as measured using the MQOLS-CA (Dibble et al., 1998). However, at least one study (Deck et al. 2000) has reported that middle-aged to older (50-85 years) healthy men report better levels of well-being on most dimensions of quality of life compared to age-matched healthy women. This is somewhat supported by data from the present investigation suggesting a trend towards lower scores of physical health quality of life constructs in women. The lack of statistical significance in the present investigation may be due to the older age of our participants (60-98). Regardless, the present findings make it difficult to draw conclusions about gender differences in self-reported quality of life in very-old adults with similar health profiles, and underscore the need for continued investigation of this issue.

In contrast to what is known about quality of life quality of life, gender differences in function have been consistently documented (Merrill et al., 1997; Rahman and Liu, 2000). For example, in perhaps the most similar investigation, Merrill et al. (1997) reported significant gender differences for several self-reported measures of physical function items such as, ADL items (bathing, dressing, etc.), gross mobility limitations items (do heavy housework, walk a half mile, walk up and down stairs, etc.), and range of motion limitation items (lifting, stooping, reaching over head, etc.); with women reporting more disability and functional limitations than men. The present data are consistent with these findings, confirming the existence of significant gender differences in both self-reported and performance-based tests of physical function. The self-reported needs for assistance and difficulty scales (FSA and FSI) revealed poorer function among females as did the performance based CS-PFP10 total score. Closer inspection of the CS-PFP10 subscales suggest that the lower functional performance can be attributed, to a large extent, to weaker lower body and upper body strength.

This then leads us to the main purpose of the investigation that being to test the hypothesis that a gender by Functional Fitness level interaction on HRQL would be found. This hypothesis is not supported by the results of the 3 x 2 ANOVA modeling HRQL with gender and functional fitness category. That is, men and women belonging to the same functional categories, whether based on self-report or performance-based tests, reported similar HRQL.

4.3 Associations between Function and Quality of Life

While the average scores for HRQL indicators were not subject to a gender by functional fitness interaction, the results of regressing health-related quality of life (PCS scores) against scores of physical function reveal evidence of some gender specific differences in the nature of the function vs. HRQL relationship. In general, for both men and women, significant associations between function and physical constructs of quality of life were seen using linear, logarithmic, and power function approaches. As expected, the power model appeared to be the best-fit model for men, with a very high R-square of 0.60, indicating that approximately 60% of the variance in men's physical constructs of HRQL was accounted for by physical function. In contrast, the linear model was the best-fit model for women but only accounting for 17% (R^2=0.17), of the variance in SF-36 PCS score.

Of additional importance was the observation that when employing self-reported function as the independent variable (total FSI score), the results for the men did not change (R^2= 0.61), but the results for the women revealed a much more impressive R-square, now accounting for nearly 50% of the variance in the PCS score of the SF-36. Therefore, one may infer that the women who participated in this study appeared to have a stronger link between their perceptions of function (FSI total) and physical constructs of quality of life, than between their actual functional performance (CS-PFP10 Total) and physical constructs of quality of life. In contrast, there appeared to be no difference in the values of using self-report vs. performance based measures for the purposes of describing HRQL in older men.

The gender specific associations between self-report measures and performance-based functional measures further underscore this apparent gender difference. In the present study, men appeared to more accurately describe self-reported function (total FSI score) in comparison to women. Regressions of FSI scores against total CS-PFP10 result in significant linear relationships for both men and women. However, the performance scores for men account for 64% of the variance in their self-reported function, as compared to women where the data reveal that only 47% of self-reported function can be accounted for by actual functional performance. Other studies have also suggested gender specific differences in the accuracy of reporting perceived-functional abilities. It has been suggested that inconsistencies in reporting can be related to the way each gender perceives "difficulty" (Merrill et al., 1997; Rahman & Liu, 2000), the way they react to gender-specific nature of certain activities (Rahman & Liu, 2000), and the fact that women are more likely to interpret physical discomforts as symptoms and report them as such (Merrill et al., 1997).

Moreover, it is important to explore the sources of variation discovered in the present investigation that could offer potential explanations to the gender differences that were revealed. Gender differences were seen in performance-based and self-reported physical function with men performing and reporting better than women. Factors that should be considered as a disadvantage for women are that women report physical discomforts as symptoms, they tend to over report their functional ability, and they may interpret the difficulty of an activity differently than men (Merrill et al, 1997 and Rahman and Liu, 2000). Although significant gender differences were not revealed in our HRQL data, the physical component subscale of the SF-36 was approaching significance ($p<0.10$) with men reporting a higher HRQL than women.

Nonetheless, it is important to consider factors that may place women at a disadvantage in regard to men. However, our data did reveal that women significantly take more medications than men. Previous investigations have revealed that medications have an affect on HRQL. We cannot determine whether the medications are causing the greater variation in HRQL scores in the present investigation, however, this can be offered as a possible explanation due to the gender differences reported.

4.4 Summary/Conclusion/Future Research

In summary, this investigation offers several conclusions. First, self-reported (FSI) and performance-based physical function, as defined by the CS-PFP10, reveal poorer physical function in older women as compared to men, and that these differences may be due to an older woman's tendency to have weaker upper body and lower body strength. Secondly, while the assessment of HRQL scores, as defined by the SF-36, revealed no statistically significant gender differences, the somewhat low p-value observed for physical components, makes it difficult to rule out the possibility that gender differences indeed exist. Most importantly, this investigation revealed that the physical constructs of HRQL are more closely linked to physical function in older men than in older women with a similar health history, and that perceived function is more closely linked to HRQL than actual functional performance in older women. The appearance of these gender differences is not clear and cannot be surmised from the present data; however, other sources of variation that may contribute to physical constructs of quality of life include the extent to which signs and symptoms of disease and functional limitations may contribute to one's overall assessment of physical constructs of HRQL.

The finding of different characteristics of the function vs. HRQL response curves for men and women points towards the complexity of the manner in which gender and function interact with HRQL, and suggest the need for further research to clarify the most appropriate modeling techniques for understanding gender, physical function, and quality of life in old age.

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APPENDIX

Literature Review

Introduction

According to the National Center for Health Statistics (2000), life expectancy for men is 74.1 years at birth and 16.3 years at age 65, and for women life expectancy is 79.5 years at birth and 19.2 years at age 65. In other words, women enjoy a 5.4 year advantage in life expectancy over men. Interestingly, however, the prospects for the oldest-old men (i.e., 85 years +) are brighter than those for their female counterparts. Barer et al. (1994) report that men who survive beyond the age of 85 are more likely than women to be in better health and to have more remaining years of independent life.

The cause of this disparity is not entirely understood; however, one plausible explanation may be that such differences are related to gender differences in prevalence of various diseases. Kaplan et al (1991) report that women tend to suffer from more reproduction-related morbidity, and are more subject to disabling chronic diseases such as rheumatoid arthritis, whereas men are more likely to die suddenly from conditions such as coronary artery disease or accidents and lifestyle choices. Moreover, gender differences exist in lifestyle choices that may also contribute to disparities in disabling conditions. For example, women are less likely to exercise than men (Kaplan et al, 1991).

Regardless of the specific reason, functional decline in older women is somewhat more steep than in men, and thus the gender gap in ***functional life-span*** is about half of that which is noted for ***expected lifespan***, indicating that women will have 2-3 years more of functional life span than men. These gender differences in longevity and functional decline underscore the complexity of human aging. Furthermore, while all older people face health-related declines, the particular aspect of decline to which one must adjust, and the expected duration and consequences of loss and impairment appear to differ for men and women. It is therefore not surprising that evidence also indicates that men and women employ different coping mechanisms to manage age-related physical and social losses (Barer, 1994).

Gender differences in rate of functional decline and functional-lifespan are presumed to be associated with gender differences in the nature and magnitude of pressure under which men and women adapt to "Aging." Therefore one can surmise that such disparities may also result in differences in health-related quality of life (HRQL). HRQL is known to interact with disease age, state, and physical function. Further, changes in HRQL are interesting in that it not only are they an important consequence of changes in health status and function, but moreover, HRQL may also influence functionality to the extent that it affects one's energy level and confidence for successfully performing tasks such as Activities of Daily Living (ADLs). Recognizing the need to further understand this complex issue, it is the purpose of this overview to examine age-related changes in function and quality of life, and further, to examine the studies that have addressed gender differences with respect to the aging process, physical functional decline, and associated changes in quality of life.

Age and Physical Function

There is little doubt that advancing age is associated with a decline in physical function, which is likely to be, at least in part, a consequence of decreasing physiological capacity. Arriving at a consensus as to how to be described or quantify age-related loss in physical function is difficult as there is no true standard measure. However, it would appear that in the average adult over 65 years of age, significant decrements in physical function could be noted over every 3 to 5 years of chronological age (Young et al., 1995). Young et al., reported 3-5 year longitudinal data revealing decrements in both performance-based measures of function as well as in self-reported responses to questionnaires. Despite such evidence, it is difficult to attribute the loss of function purely to age. Other factors that appear to interact with age include, lower educational level, lack of exercise, chronic disease, and impaired cognition (Aguero-Torres, 2001). Nonetheless, age is still considered to be among the strongest influences on physical functional ability. Wu et al (1999) estimated the incidence of chronic ADL disability in older adults in Taiwan, and giving consideration to a number of physical, social, and environmental factors, concluded age is the most significant predictor of functional decline in older adults.

Although age appears to be associated with a decline in physical function, the ability for individuals to recognize this decline is sometimes absent. Therefore, it is not entirely unusual for some individuals to not report an awareness of functional decline. Individuals who can complete a task often do not report a functional decline because they are not recognizing the increased time to complete a task, modification of a task, or decreased frequency in which a task is performed (Brach et al, 2002). This may explain the lack of sensitivity of questionnaire instruments that limits their application to individuals who have completely lost the ability to perform some ADLs. As a consequence of problems associated with self-report inventories, there has been some interest in the development of performance-based tools to evaluate physical function. Yet, at an even more fundamental level, it is equally important that we arrive at a consensus as to how we first define physical function.

Physical Function: Defined

Physical function can be defined as the integration capacity, physical performance, and psychosocial factors. Where physiological capacity refers to "the basic cellular & anatomic function such as cardiac ejection fraction, nerve conduction velocity, or muscle strength per cross-sectional area; physical performance is the ability to integrate these physiological systems into coordinated, efficient movements to achieve optimum physical function; & psychosocial factors such as confidence, motivation, perceived ability, depressive symptomology, & social race" (Cress et al, 1996). Physical function can also be defined as the ability to perform mobility tasks, activities of daily living, and instrumental activities of daily living that are important for achieving & maintaining an independent living status (Kaplan et al, 2001).

Functional limitations are restrictions in performing fundamental physical and mental actions used in daily life (Verbrugge & Jette, 1994). Functional limitation as a factor in the Disablement Process refers to individual capabilities without reference to situational requirements (Haber, 1990). The Disablement Process describes how chronic and acute conditions affect functioning in specific body systems, fundamental physical and mental actions, and activities of daily life, and it describes the personal and environmental factors that speed or slow disablement (Verbrugge & Jette, 1994). "Disablement" is general for covering all consequences of pathology for functioning (Verbrugge & Jette, 1994). The term "process" reflects interest in the dynamics of disablement, that is the trajectory of functional consequences over time and factors that affect their directions, pace, and pattern of change (Verbrugge & Jette, 1994). However, many performance tests are designed to capture the functional limitations of severely limited persons and therefore have ceiling effects for persons with higher-level function (Cress, 1997). Moreover, Cress (1997) found no floor effects for older adults without deficiencies in ADL tasks or ceiling effects in the 199 highly active community dwellers that participated in the study.

With this broad definition of physical function, developing a single test to measure function has been a struggle for researchers, and as a result there are numerous acceptable measurements of function. Therefore, there are many different means of identifying functional decline in the aging population.

Recently, assessment of physical function has shifted from self-reported questionnaire evaluation of functional limitations to performance-based assessment of selected tasks (Cress et al., 1999). Physical performance tests have become popular because of research concerns that self-reported function provides insufficient information about the type of impairment and lacks sensitivity to change (Cress et al, 1996). In contrast, many investigators and clinicians find physical performance measures appealing because of their potential for insight to change, and face validity (Cress et al, 1996). Test of physical and mental actions have various formats: self-reports of difficulty performing an action, an interviewer's observation of the subject performing an action, with a rating of the subjects performance, and equipment/task-based evaluation of performance, including timed tasks (Verbrugge & Jette, 1994). Physical performance tests that have been developed to measure functional fitness include: the continuous scale physical functional performance (CS-PFP) test (Cress et al., 1999), American Alliance of Health, Physical Education, Recreation, and Dance (AAHPERD) fitness assessment, six-meter walk and chair stand (Brill et al., 1998), and 10-foot walk time and grip strength (Young et al., 1995).

Moreover, to address a broader range of activities important to independence in older adults, Cress developed the CS-PFP test, based on the concept of integrating physiological capacity, physical performance, and psychological factors. The CS-PFP test was developed to quantify whole-body physical functional performance and determine the contribution of several physical domains, such as strength, flexibility, balance, and endurance (Cress et al., 1999).

The CS-PFP is a battery of 10-15 everyday tasks. Because participants perform common activities, essential to independent living, effects of learning or strategizing are minimized (Cress, 1997). Each task reflects one primary domain, which minimizes on other domains to accomplish the task and unlike other physical performance test; the participants perform real, not simulated, tasks with the CS-PFP (Cress, 1997). This instrument offers promise as a method to evaluate function, functional impairment and tracking the time-course change in function in higher functioning older adults (Cress, 1997). The ability of the CS-PFP to quantify whole-body physical functional performance and other physical domains offers a unique measure of function that is important for assessing ones functional ability to perform real ADLs, which is important for living independently.

Quality of Life: Defined

In addition to the association of a decline in function with age, there is also a decline in HRQL. HRQL can be defined as "those attributes valued by patients, including: resultant comfort or sense of well-being; the extent to which they are able to maintain reasonable physical, emotional, and intellectual function; and the degree to which they retain their ability to participate in valued activities with the family, in the workplace, and in the community" (Wenger & Furberg, 1990).

Quality of Life: Measured

HRQL can be measured using several different questionnaires. First, the SF-36 is a 36-item questionnaire which measures 8 parameters of healthy status: physical functioning (10 items), role limitations due to emotional problems (3 items), role limitations due to physical problems (4 items), social functioning (2 items), validity (4 items), and general health perceptions (5 items). For each parameter, scores are coded, summed, and transformed to a scale from 0-100, with higher scores indicating better health (Lyons et al., 1994). Secondly, the VITA questionnaire consists of 6 individual subscales, which can be combined to form an aggregate score (VITA score). Furthermore, the questionnaire contains details about the respondents' general state of health, current medications and general satisfaction with different areas of life (Deck et al., 2002). And lastly, the MQOLS (multidimensional QOL scale-cancer version) is a

33-item questionnaire measuring 5 dimensions of QOL: psychological well-being, physical well-being, symptom management, nutrition and interpersonal well-being (Dibble et al., 1998).

Gender Differences in Function and Quality of Life

Few studies have examined the existence of gender differences in the process of age-related functional decline. However, the data that are available indicate that women tend to score more poorly on tests of physical function than their age-matched male peers. This has been observed using both performance-based and self-report examinations (Merrill et al., 1997; Rahman and Liu, 2000). Merrill et al. report gender differences in the semi-tandem stand, full tandem stand, single rise from a chair, 8-foot walk, and shoulder rotation; with a greater number of women scoring poorly on all summary measures in comparison to men. It is no surprise then, that women also tend to report not only more functional limitations then men, but also report a greater incidence of disability in comparison to men (Merrill et al, 1997). Furthermore, Smith and Baltes (1998) observed 258 men and 258 women between the ages of 70-103 years, using BASE questionnaire, which focuses on old age. The comparison of life contexts of men and women in BASE revealed more differences than similarities; 24 of the 30 constructs examined revealed gender differences. For physical health, women reported more illnesses than men, and were more likely to describe their health status as satisfactory or adequate, whereas men described themselves as good or very good (Smith and Baltes, 1998). Moreover, women were found to have lower functional capacity and reported less ability to independently perform basic ADL activities and instrumental ADL activities in comparison to men (Smith and Baltes, 1998).

In view of the gender differences observed in functional decline, it is not surprising to find the HRQL appears to deteriorate faster in women than men. Deck et al (2002) studied 80 older adults (45 women, 35 men) with a mean age of 64 years, and observed significant gender differences for the subscales health complaints and sexuality, with men reporting higher than women. Additionally, women reported significantly higher level of impairments than those of men, and the overall total VITA score displayed significant gender differences to the disadvantage of women as well. Therefore, Deck et al (2002) found that overall men report a higher HQOL than women in all subscales of the VITA, which includes well-being, vitality, health complaints, fitness, sexuality, and total VITA score. Results of the factor analysis found by Dibble et al (1998) suggest that women and men perceive the same items differently and that those items cluster together in different ways for each gender. Based on their findings, Dibble et al (1998) have suggested that gender-specific measurement tools need to be used to evaluate QOL; however, to date, no such instruments are known to exist.

Thus, the few available studies seem to be indicating that women deteriorate in physical function and HRQL at a faster rate than men. However, there is little consensus as to one specific cause. Rather, it is likely that a myriad of factors influence differential aging in men and women. An examination of the daily lives of men and women offers a unique opportunity to enrich our understanding of the problems they face. Among the oldest old, gender-based disparities are evident in functional status, socioeconomic status, and social resources (Barer, 1994). While these factors tend to favor men, other factors favor women. Based on a sample size of 150 older adults, 111 women mean age 89.2 years and 39 men (mean age 88.1 years), Barer (1994) reported factors that may be associated with a faster rate of functional decline in older women. These included that only 10% of the women studies were married, while two-thirds live alone. Many of the women reported economic problems, and also reported unusually high rates of disability due chronic health conditions. Moreover, Barer (1994) suggested that as a result of depleted energy and limited mobility, women are less able to independently manage their ADLs, and most often need help with household maintenance. Their physical limitations further restrict their ability to exercise control over their environment and to maintain motivations (Barer, 1994). Interestingly, however, Barer (1994) also reported that there are factors that tend to serve as advantages for older women. Many have more often coped with many losses is life, such as the loss of strength, independence, independent living, and the loss of a spouse. In particular, the older women studied included increased social supports from children and friends as helpful and important coping mechanisms.

With respect to men, on the other hand, Barer (1994) observed that men appeared to be at an advantage physically and have less need for social supports. However, as their needs increase, cultural norms and the timing of events may threaten their well-being (Barer, 1994). The disadvantages that men face include coping with widowhood care giving, and relocation; therefore, men in advanced old age have a high risk of social isolation when confronted with widowhood in late late life (Barer, 1994).

While few studies have examined gender related differences in functional decline and deterioration of HRQL, even fewer have addressed gender related differences in the association between function and HRQL. Numerous studies, including those conducted in our laboratory (Wood et al., 1999) and unpublished data from Dunbar et al. support the plethora of studies that suggest a direct association between function and health-related quality of life (HRQL).

While there is, at present, no consensus on the nature of gender differences in the relationships among function, perceived function, and quality of life among the elderly, Dibble et al (1998) and Rahman & Liu (2000) assert that measurement of HRQL requires gender-specific questions to accurately address the dimensions of the concept of HRQL in females and males. Consequently, the approach to validation of instruments used to assess physical function in older adults should address the question as to whether the instrument possesses some degree of gender bias.

Due to the problems with under- and over-reporting function according to questionnaires (i.e., perceived function), there has been interest in developing objectives tools for assessing function in older adults. One such instrument is the relatively newly proposed Continuous-Scale Physical Functional Performance test (CS-PFP) (Cress et al., 1996). In our laboratory we have implemented the CS-PFP. The CS-PFP is designed to provide a comprehensive, in-depth measure of physical function that reflects abilities in several separate physical domains (Cress et al., 1996). This instrument offers valid and reliable quantification of whole-body physical functional performance, as well as, assessment of five physical domains: upper and lower body strength, upper body flexibility, balance and coordination, and endurance (Cress, 1997). Cress has validated this study against self- reported quality of life and need for dependent-care services (Cress et al., 1996, 2003).

While the measurement of function using the CS-PFP has clearly shown strong associations with quality of life, the instrument has not been used to examine gender differences in these associations. Therefore, with respect to previous research, the purpose of this study is to examine whether the relationship between function as defined by the CS-PFP and HRQL is also gender-specific. Previous literature suggests that we will find that men will score higher on HRQL as compared to women with similar PF scores. However, preliminary data from our laboratory suggest that the nature of the relationship between PF and HRQL will be different in men and women such that the relationship in women is linear, whereas the relationship in men will be better described by power curve.

Many studies have suggested a direct association between function and HRQL. Although data is scarce, the available data interestingly suggest that functional decline may be associated with a greater rate of decline in HRQL among older women as compared to older men (Kaplan et al, 1991; Deck et al, 2000). Using a health status model, known as the General Health Policy

Model, that estimates differences in well-years of life for men and women; Kaplan et al (1991) found that Quality of Well Being deteriorates faster in women than in men. More recently, Deck et al (2000) assessed gender differences in HRQL using the VITA questionnaire. Their data confirm earlier findings, reporting that men tend to assess their HRQL more positively than women in a number of dimensions (Deck et al, 2000).

Studies have also suggested that women tend to report a greater impact of functional limitation on HRQL (Dibble et al, 1998) and perceived difficulty in performing ADLs (Rahman & Liu, 2000). Rahman and Liu (2000) examined gender differences in both self-reported ADLs and physical-performance measures for 1,893 men and women aged 50 and older in rural Bangladesh; significant differences in men and women were reported. In addition, gender differences were also reported at the same level of physical-performance and age, older women reported that they had difficulty with or were unable to do ADLs in comparison to the older men (Rahman & Liu, 2000). The authors have offered possible suggestions to explain their findings; they include; women tend to over report and men tend to under report, gender-specific nature of activities, and men and women may have different perception of what constitutes "difficulty" (Rahman & Liu, 2000).

On the other hand, in comparison of self-reported disability and performance measures, Merrill et al (1997) reported a high accuracy of perceived abilities among a sample of 1,458 elderly men and women aged 71 years and older. However, for those who in accurately reported, more men than women under reported disability and more women than men over reported disability (Merrill et al, 1997). Similarly to Rahman and Liu (2000), Merrill et al (1997) also offered suggestions to explain the gender differences in function among older adults. They include: women consistently report more functional problems than me, differential reporting of functional problems by men and women, and women are more likely to interpret physical discomforts as symptoms and have a greater tendency to recall and report those symptoms (Merrill et al, 1997).

Summary

It is understood that aging is associated with a decrease in physical function and health-related quality of life; however, it is not completely understood how gender factors into the equation. Functional decline in older women appears to be somewhat steeper than in men. Therefore, the gender gap in functional life-span (about 2.8 years) is about half of that which is noted for expected life-span (about 5.0 years). Gender differences in functional decline and functional life-span are presumed to be associated with differences in the way that men and women adapt to aging. It has been suggested that older men are further advantaged in their health status and, they have significantly fewer problems with functional limitations and are less restricted in their mobility in comparison to older women. Furthermore, significantly more older women than men have some impairment in their activities concerning personal care and a greater difference for activities of daily living in comparison to older men (Barer, 1994).

Along side the age-related decline in function comes a decrease in the older adult's HRQL. Not surprisingly, gender differences also appear in age-related changes in HRQL. Investigators reported that older men report a higher HRQL in comparison to age-matched women.

While it is tempting to speculate that the gender differences in HRQL would mirror those seen in function, this is not necessarily the case. Rather, it would appear that other factors are involved insofar as older women with similar functionality to older men tend to score lower on HRQL inventories.

The relationship between HRQL and Function in the aging adult appears quite complex. Because of the complexity of the issues, longitudinal investigation is necessary to uncover changes that can truly attributed to aging and loss of function.

VITA

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