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Perceptions of Dyspnea, Physical Activity, and Functional Status in Obese Women

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DEDICATION

I dedicate this dissertation to my daughters Kimberly Harbian, Bethany Bowen, and Anndria Powers. They gave up so much yet wholeheartedly supported me in my goal.

To my late mother, Leona Rivers-Jewell, who taught me to be a life-long learner and, by example, that you are never too old to further your education. She started back to school to get her GED when-40 years-old and completed her Master's degree 1 ½ months before she turned 50.

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To my grandchildren whom, every day, remind me to pass on a love for learning.

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ABSTRACT

Purpose

King's Theory of Goal Attainment guided this study exploring the physical sensation of dyspnea that obese women feel and how it affects their functioning.

Background and Significance

Obesity prevalence has doubled since 1980. Current research is investigating how to reduce prevalence and examining obesity's impact on the respiratory system. Little research was found that investigated the impact obesity has on routine activities because of dyspena and function and whether physical activity has a mitigating effect.

Methods

A comparative descriptive research design was used. A survey of dyspnea felt during routine activities was created; IRB approval to survey community-dwelling women was then obtained. Flyers asking women to complete the survey online were distributed at one inner-city and one rural church and weight-loss clinics then emailed to female college students and a Yahoo list serve. The survey was housed on SurveyMonkey; 279 surveys were completed then filtered for a body mass index (BMI) ≥ 30 kg/m^2, age 20 to 56 years, and without heart disease or chronic obstructive disease.

Results

Final N=84. Average subject was 39-years-old, non-Hispanic white with a post-secondary education, an annual household income of $50,000 to $100,000, and a mean BMI of 36.66 (SD, 6.61). Significant relationships ($p < 0.01$) were a

low positive correlation between the BMI and perceptions of dyspnea (POD) during routine activity (r = .481), specifically between obesity classes I and III ($p < 0.001$) and classes II and III ($p = 0.026$), the BMI and NYHA functional classifications (r = .479), and a moderately positive correlation between functional limitations and POD during routine activity (r = .546). Regression of POD during routine activity during routine activity for a given BMI accounted for 23% of the variance (adjusted $R^2 = 0.23$, $F = 24.68$, $p < 0.000$; 95% CI, 0.55-1.29). Neither an asthma diagnosis nor the amount of moderately intense physical activity correlated with any other variable.

Implications

The functional status and BMI classification may be helpful additions to an assessment because obese women with any functional limitation may have difficulty doing routine activities, especially those in obesity classification III.

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CHAPTER I

Introduction

Obesity is the seventh leading cause of preventable death and has long been a risk factor for multiple chronic illnesses (Centers for Disease Control & Prevention [CDC], 2007c; Field et al., 2001; Fontaine, Redden, Wang, Westfall, & Allison, 2003; He & Baker, 2004; Kurth et al., 2005; Li et al., 2006; Peeters, et al., 2003; Thompson, Edelsberg, Colditz, Bird, & Oster, 1999; Weinstein et al., 2004; Wilson, D'Agostino, Sullivan, Parise, & Kannel, 2002). Currently, approximately 32.9% of American adults are obese (CDC, 2007b) and the proportion in the highest classification of obesity is 4.7% (standard error [SE], 0.56) (Flegal, Carroll, Ogden, & Johnson, 2002). Among women, obesity is increasing more rapidly than in men (CDC, 2007b; National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2006b). There are over 26 million obese adult women in the United States (Pleis & Lethbridge-Cejku, 2006) and the prevalence is rising (CDC, 2007c; NIDDK, 2006b). In 1990, 11.5% of women (CDC, 2006b) were obese but, within a decade, 33.4% were obese (NIDDK) with over 2.8% extremely obese (Mokdad et al., 2001). An objective of *Healthy People 2010* is to decrease weight-related chronic diseases by reducing the proportion of obese adults to less than 15% (U.S. Department of Health & Human Services [USDHHS], 2000).

One recommended action to reduce or prevent obesity is to engage in more physical activity (National Heart, Lung, and Blood Institute [NHLBI], 1997, 2000; USDHHS, 2000). Independent of obesity, physical inactivity is a risk factor for death and chronic illness (Blair et al., 1996; Carnethon et al., 2003; Farrell, Braun, Barlow, Cheng, & Blair, 2002; Gulati et al., 2003; He & Baker, 2004; Hu et al., 2000; Hu, Li, Colditz, Willett, & Manson, 2003; James et al., 1998; Li et al., 2006; Ross et al., 2000; Shubair, Kodis, McKelvie, Arthur, & Sharma, 2004; Weinstein et al., 2004). However, 38% (SE, 0.40) of Americans are physically inactive (Adams & Schoenborn, 2006) and women in general are less active than men at all ages (Pleis & Lethbridge-Cejku, 2006; USDHHS, 2000); 39.8% (SE, 0.43) of women do not engage in any leisure-time activities (Adams & Schoenborn).

One reason obese individuals do not engage in physical activity may be because of poor cardiorespiratory fitness (CRF) (Blair et al.; Carnethon et al.; Farrell et al.; Gallagher et al., 2005) manifested as dyspnea, even without the presence of overt lung disease (Babb, DeLorey, Wyrick, & Gardner, 2002; Farrell et al.; Gallagher et al.; Sin, Jones, & Man, 2002). Women, whether obese or not, report dyspnea more often than men ($p = 0.005$) (Janson-Bjerklie, Carrieri, & Hudes, 1986) and obese women report more severe symptoms ($p = 0.007$) in spite of significantly higher peak expiratory flow percentages ($p < 0.001$) (Thomson, Clark, & Camargo, 2003). One may suggest that dyspnea is perceived as greater in obese women and physical activity may be a mitigating factor.

A goal of nursing is to promote health (King, 1981). To accomplish this, a nurse and individual enter into a relationship armed with their own perceptions based on their individual past experiences. To affect change, nurses must understand the individual's perceptions and how they influence behavior (King). Therefore, the purpose of this chapter is to examine the impact of obesity, specifically in women, on perceptions of dyspnea (POD) and dyspnea's limitations to daily activities, and the relationship to engagement in moderately intense physical activity.

Background and Significance

Obesity

A search of the Cumulative Index to Nursing and Allied Health Literature (CINAHL), MEDLINE, and PSYCHinfo databases revealed that the first journal article about obesity appeared in 1923. From 1923 to 1950 only 79 articles were published. However, from 1975 to the present, nursing, medical, and psychology publishers have generated over 110,000 journal articles and books about obesity.

Obesity is an excess of adiposity, or an excessive amount of body fat in relation to lean mass. Measurement of obesity is varied, affecting prevalence statistics and making it difficult to compare over time (NIDDK, 2006b). Studies have used the Metropolitan Life Insurance Tables which were based on desired weights for a given height. Others used data from the National Health Examination Surveys and the National Health and Nutrition Examination Surveys (NHANES) to statistically classify weight based on gender and age-specific percentiles of the body mass indexes (BMI), which is expressed as kilograms per meter squared (kg/m^2). "Severe overweight" was defined as the 95^{th} percentile of the BMI for each decade of age. For example, for those in their twenties, severe overweight for a man was a BMI of 31.1 kg/m^2 but, for a woman, it was a BMI of 32.2 kg/m^2 or more (NIDDK).

In 1995, the World Health Organization suggested classifying obesity into two grades, a BMI of 30 to 39.9 kg/m^2 or a BMI 40 kg/m^2 or greater. This was expanded to three grades by the International Obesity Task Force and adopted in 1998 by the United States Federal Government (NIDDK, 2006b). The BMI is used to classify weight among adults. BMI classifications, outlined in Table 1, are calculated by multiplying a person's weight (in pounds) by 703, then dividing by the height (in inches) (CDC, 2006b; NHLBI, 1997). However, even these serve only as guidelines because the BMI correlates with body fat but is not a direct measure (CDC). For example, a highly trained athlete may have a BMI over 30 kg/m^2 but this is actually due to a large muscle mass, not adiposity (NIDDK).

Table 1

BMI Classifications

Classification	Body Mass Index
Underweight	< 18.5 kg/m^2
Healthy weight	18.5-24.9 kg/m^2
Overweight	25-29.9 kg/m^2
Obesity (Class I)	30-34.9 kg/m^2
Obesity (Class II)	35-39.9 kg/m^2
Extreme obesity (Class III)	≥ 40 kg/m^2

As recently as 2006 the CDC referred to a BMI of 18.5 to 24.9 kg/m^2 as "normal weight" (CDC, 2006b). The trend in the literature, however, was shifting to describing this range as a "healthy weight" because the word "normal" was often construed as the range in which most people fall. With more than 32% of Americans obese, it seems "normal" may be higher than a BMI of 24.9 kg/m^2. Recently the CDC adopted this terminology, referring to a BMI of 18.5 to 24.5 kg/m^2 as "healthy" weight (CDC, 2007b).

The role of health care providers' advice for managing obesity has been noted; those advised by a health care provider to lose weight are three times more likely to try to lose weight than those who are not advised (OR 2.79, 95% CI, 2.53-3.08). In spite of a health care provider's impact, many are not advising obese individuals to change their lifestyles (Galuska, Will, Serdula, & Ford, 1999; Mokdad et al., 2001). Results from the Behavioral Risk Factor Surveillance System (BRFSS) survey, a random-digit national telephone survey conducted by state health departments and the CDC, show that only 42% of the 12,835 adults classified as obese were advised to lose weight at a routine physician visit during the previous 12 months, even if they were classified as the most obese (Galuska et al.; Mokdad et al.). However, because of the high prevalence of obesity, the time it takes to counsel each individual may be overwhelming.

Prevalence

Using a BMI greater than or equal to 30 kg/m^2 as the measurement for obesity, approximately 32.9% of American adults are obese, reflecting a significant increase in prevalence over the previous two decades (Blanck et al., 2006; CDC, 2007b; Fitch, Pyenson, Abbs, & Liang, 2004; NIDDK, 2006b). Obesity prevalence throughout all states in 1986 was less than 15% but, by 2006, it was less than 20% in only four states and 25% or greater in 22 states with two of these greater than 30% (CDC, 2007b). Not only are American adults becoming more obese, the magnitude of obesity is increasing. During the previous decade, the proportion of adults classified as extremely obese increased from 2.9% (SE, 0.23) to 4.7% (SE, 0.56) (Flegal et al., 2002). Obesity among adult women is increasing more rapidly than in men (CDC, 2007b; NIDDK). In 1990, 11.5% of women were obese (CD, 2006bC) but, within a decade, 33.4% were obese (NIDDK) with 2.8% extremely obese (Mokdad et al., 2001).

Costs

Obesity-related health care, combined with health care caused by those overweight, results in $92.6 billion (in 2002 dollars) spent annually in both direct and indirect costs (Finkelstein, Fiebelkorn, & Wang, 2003). Medical expenditures attributed to obesity alone accounts for 5.3% of the national health care costs (Finkelstein et al.). Daviglus et al. (2004) examined health care charges of women enrolled in the Chicago Heart Association Detection Project in Industry study (1967 to1973) after they were enrolled in Medicare at least two years between 1984 and 2002. After adjusting for age, race, education, and smoking, annual health care charges for non-overweight women were $6,224. For obese women these charges were $9,612 and, for severely obese women, they were $12,342 ($p < 0.001$).

Helping drive costs is a positive relationship between obesity and the use of medical services, including inpatient, outpatient, emergency room, and medication use (Anderson et al., 2005; Camargo, Weiss, Zhang, Willett, & Speizer, 1999; Reidpath, Crawford, Tilgner, & Gibbons, 2002; Schachter, Salome, Peat, & Woolcock, 2001; Sin et al., 2002). Obese patients comprise 44% of emergency department (ED) visits for wheezing or dyspnea (Thomson et al., 2003) and use more medications prior to arrival to the ED (Weiner, Magadle, Massarwa, Beckerman, & Berar-Yanay, 2002). Women, whether obese or not, tend to visit the ED more frequently than men, use more medications (Weiner et al.), and report more severe symptoms despite having higher pulmonary function (Thompson et al., 1999).

Health Impact

Obesity reduces life expectancy (Flegal, Graubard, Williamson, & Gail, 2005; Fontaine et al., 2003; Peeters et al., 2003) primarily because it is a risk factor for multiple diseases (Field et al., 2001; Han, Tijhuis, Lean, & Seidell, 1998; Janssen, Katzmarzyk, & Ross, 2002; Katz, McHorney, & Atkinson, 2000; Kurth et al., 2005; Shubair et al., 2004; Thompson et al., 1999; Weinstein et al., 2004; Wilson et al., 2002) including cardiovascular and cerebrovascular diseases, diabetes, select cancers (endometrial, colon, gallbladder, prostate, kidney, and breast), sleep apnea, and osteoarthritis (CDC, 2006b; NIDDK, 2006b; Thompson et al., 1999). Conditions with which obesity is associated include hirsutism, acanthosis nigricans, stress incontinence, and increased surgical risk (NIDDK, 2006b). Obesity also adversely affects quality-of-life through limited mobility, more body pain, reduced physical endurance and social discrimination (He & Baker, 2004; Katz, McHorney, & Atkinson, 2000; Kolotkin, Crosby, Williams, Hartley, & Nicol, 2001; Satcher).

Years of life lost. The years of life lost for a 40-year-old obese woman is 7.08 years (95% confidence interval [CI], 4.58 to 9.57) and, when compared to women classified as a healthy weight, the mortality hazard ratio for obese non-smoking females, after adjusting for age, is 2.27 (95% CI, 1.72 to 2.99). After adjusting for hypertension and diabetes at baseline, the hazard ratio is 1.58 (95% CI, 0.91 to 2.75) (Peeters et al., 2003). For a 20 to 30-year old Caucasian woman with a mean BMI of 45 kg/m^2 or more, eight years of life will be lost; five years for an African American woman (Fontaine et al., 2003).

Cardiovascular. From 1999 to 2004, heart disease was the second leading cause of death for women age 20 to 57 (CDC, n.d.) and obese women have a 30.4% to 34.5% lifetime risk of developing coronary heart disease (Rexrode et al., 1998; Thompson et al., 1999). Mortality increases because obesity is associated with hypertension (Shubair et al., 2004; Weinstein et al., 2004; Wilson et al., 2002) and hyperlipidemia (Shubair et al.; Thompson et al.). An analysis of data from the Nurses' Health Study shows that, after adjusting for age, smoking status, and race, women with a BMI greater or equal to 35 kg/m^2 are more likely to develop heart disease (odds ratio [OR], 1.5; 95% CI 1.3 to 1.8) and hypertension (OR, 2.3; 95% CI, 2.1 to 2.6) within 10 years when compared to women with a BMI less than 25 kg/m^2 (Field et al., 2001). However, the odds ratio of obesity's association with hyperlipidemia is 0.7 (95% CI, 0.6 to 0.7) which did not reach significance (Field et al.).

Cerebral. From 1999 to 2004, stroke was the fourth leading cause of death for women age 20 to 57 (CDC, n.d.). Obesity's relationship to cerebrovascular disease is not well defined in the literature but recent research indicates that, as weight increases, the risk for stroke also increases (NHLBI, n.d.). Analysis of data from the Nurses' Health Study indicates that obesity is associated with a stroke (relative risk [RR], 1.1; 95% CI, 0.8 to 1.7) but it does not reach significance when compared to women with a BMI less than 25 kg/m^2 (Field et al., 2001). This study, however, did not compare types of stroke. With data from the Women's Health Study, Kurth et al. (2005) found that obesity is a risk for ischemic stroke (hazard ratio [HR], 1.72; 95% CI, 1.30 to 2.28) but not hemorrhagic stroke (HR, 0.82, 95% CI, 0.43 to 1.58).

Type II Diabetes. From 1999 to 2004, diabetes was the fifth leading cause of unintentional death for women age 20 to 57 (CDC, n.d.). Much like obesity, the prevalence of diabetes is increasing. In 1990 the age-adjusted prevalence of diabetes in women age 20 years or older was 4.9% but, by 2000, it was 7.3%, an increase of 49% within one decade (Mokdad et al., 2001). Research shows that obesity is an independent risk factor for developing Type II diabetes. After adjusting for multiple covariates, including engagement in physical activity, data from the Women's Health Study show that, compared with healthy weight women, obese women have a strong risk of developing diabetes (HR, 9.06; 95% CI, 7.60 to 10.8) (Weinstein et al., 2004). A second study supported these findings using data from the Nurses' Health Study. Researchers again found that women with a BMI of 35 kg/m^2 or more are far more likely than healthy weight women to develop diabetes (OR, 17; 95% CI, 14.2 to 20.5) (Field et al., 2001).

Respiratory. As the prevalence of obesity has increased asthma prevalence has also increased. Self-reported data from the 2005 National Health Interview Survey showed that 7.2% (SE, 0.18) of adults claim an asthma diagnosis; 9.2% (SE, 0.25) of women (CDC, 2007a). Recent studies have examined whether obesity is a risk factor for asthma (Aaron et al., 2004; Camargo et al., 1999; Guerra, Sherrill, Bobadilla, Martinez, & Barbee, 2002; Schachter et al., 2001; Sin et al., 2002; Thomson et al., 2003; Weiner et al., 2002) but the results are inconclusive. A prospective cohort study using data from the Nurses' Health Study II found that women who gain weight after their 18^{th} birthday are at significant risk of developing asthma within four years ($p < 0.001$) (Camargo et al.). After controlling for age, race, smoking, physical activity, and food intake, the relative risk for obese women to develop asthma is 4.3 (95% CI, 3.1 to 6.0) (Carmargo et al.). A strength of this study is that those with the strongest indication that they were asthmatic not only claimed a physician diagnosis but also reported the use of prescribed long-term preventive medications. However, weaknesses were that this study primarily relied on a self-reported asthma diagnosis and did not include pulmonary function tests (PFT), a common method of diagnosing airflow obstruction, or confirmation of atopy through positive allergy skin testing. Using atopy status or PFTs, especially the airway's response when inhaling a histamine, other studies question a relationship between obesity and asthma.

One study examined atopy and found no significant differences among obesity classifications ($p = 0.27$) (Schachter et al., 2001). The adjusted odds ratios for atopic subjects with a BMI of 35 kg/m^2 or greater (obesity classes II and III combined), when compared with subjects in a healthy BMI range, were not as strong as non-atopic subjects whether looking at wheezing within the previous year, a recent asthmatic episode, shortness of breath on exertion, or medication usage (Table 2). For obese women in obesity class I the odds ratio for airway hyperresponsiveness is 1.08 (95% CI, 0.56 to 2.08) but for non-atopic subjects in obesity class I it was 0.51 (95% CI, 0.005 to 3.88). The results for airway hyperresponsiveness were unavailable for more obese non-atopic women but the odds ratio for atopic subjects in obesity classes II and III combined is 1.01 (95% CI, 0.36 to 2.81) (Schachter et al.). These results suggest that atopy may be a stronger risk for asthma than obesity but obesity is a risk for difficulty breathing.

Table 2

Odds Ratios for Atopic and Non-atopic Subjects with a BMI ≥ 35 kg/m^2

Compared to Healthy Weight Subjects in a Study by Schachter et al. (2001)

	Atopic OR (95% CI)	Non-atopic OR (95% CI)
Wheezing	1.71 (0.73 to 4.02)	5.10 (2.27 to 11.45)
Asthmatic episode	*1.43 (0.54 to 3.79)*	4.08 (1.52 to 10.98)
SOB on exertion	2.96 (1.15 to 7.62)	8.83 (3.79 to 20.58)
Medication usage	1.76 (0.75 to 4.16)	3.30 (1.40 to 7.81)

Note: SOB = shortness of breath.

The findings from Schachter et al. (2001) and other researchers suggest that obesity may not be a risk factor for asthma but actually increases the risk of receiving an asthma diagnosis (OR, 2.10; 95% CI, 1.31 to 3.36) (Guerra et al., 2002). Using data from the Third National Health and Nutrition Examination Survey (NHANES III) 16,171 subjects with a mean age of 45.8 ± 20.0 years and primarily consisting of women (67.9%), were divided into five BMI levels. Airflow obstruction was defined as less than or equal to 80% of the predicted value of expiratory volume to forced vital capacity. Results indicate that those with a BMI greater than 31 kg/m^2 self-report asthma more often (OR, 1.5; 95% CI, 1.24 to 1.81) but have significantly lower measures of airflow obstruction ($p < 0.0001$) (Sin et al., 2002). These findings suggest that asthma is over-diagnosed in obese individuals and that an etiology other than asthma is the cause for obesity-related dyspnea. An emerging theory is that dyspnea in obese individuals may be caused by poor cardiorespiratory fitness (CRF).

Cardiorespiratory Fitness

A subject's tolerance to activity (Luce, 1980), or the amount of activity in which the subject can engage, is commonly measured by PFTs during exercise (Babb et al., 2002; Blair et al., 1996). This is often called the subjects' cardiorespiratory fitness (CRF). There are several theories as to why some obese women have poor CRF (e.g. mass loading of the chest, lack of exercise). Researchers are examining the effects of poor CRF and whether it more accurately explains dyspnea experienced by obese women.

Men and women 18 to 30 years of age participated in the Coronary Artery Risk Development in Young Adults (CARDIA) study. At baseline subjects were placed into three CRF categories based on the amount of time they could walk on a treadmill, which correlates well with maximal oxygen uptake ($r > 0.92$) (Blair et al., 1996), then followed the subjects for 15 years (Carnethon et al., 2003). Baseline characteristics showed significant differences in the means between fitness categories for all health-related parameters including total cholesterol ($p < 0.001$), high density lipoproteins ($p < 0.001$), low density lipoproteins ($p < 0.001$), hypertension ($p < 0.001$), and, for women, diabetes ($p = 0.03$). Results show that low fitness, when compared to high fitness, related to the development of hypertension (HR, 2.17; 95% CI, 1.69 to 2.78), hypercholesterolemia (HR, 1.02; 95% CI, 0.76 to 1.36), and diabetes (HR, 1.75; 95% CI, 1.01 to 3.04) (Carnethon et al.).

From December 1970 through December 1989 the risk of mortality with poorer CRF was studied by Blair et al. (1996). Seven thousand eighty women were followed for an average of 7.5 years (range, 0.1 to 18.9 years) which equaled 52,982 woman-years of follow-up. At baseline subjects ranged from 20 to 88 years of age with an average BMI less than 24 kg/m^2. Time on the treadmill was used to place subjects into three fitness categories, low, moderate, and high fitness (Blair et al.).

Blair et al. (1996) found that low fitness is the only statistically significant predictor of all cause mortality (RR, 2.10; 95% CI, 1.35 to 3.26; $p < 0.001$). After adjusting for multiple variables, the all cause mortality for subjects with a systolic blood pressure of 140 mm Hg or greater (RR, 0.76; 95% CI, 0.41 to 1.40), a total cholesterol of 240 mg/dl or greater (RR, 1.09, 95% CI, 0.68 to 1.74), or a BMI of 27 kg/m^2 or greater (RR, 0.94; 95% CI, 0.52 to 1.69) was lower than for subjects in the low fitness category. The all-cause mortality for those in the low fitness category is even higher, although close, to those who smoked (RR, 1.99; 95% CI, 1.25 to 3.17). For cardiovascular-specific mortality women with a BMI 27 kg/m2 or greater (RR, 0.25; 95% CI, 0.06 to 1.26) is lower than for women who are in the low fitness category (RR, 2.42; 95% CI, 0.99 to 5.92) (Blair et al.).

Between December 1970 and December 1996, Farrell et al. (2002) also studied CRF in a cohort of 9,925 women with a mean age 42.9 ± 10.4 years. Anthropometrics placed subjects into three categories; healthy weight (BMI 18.5 to 24.99 kg/m^2), overweight (BMI 25-29.99 kg/m^2), and obese (BMI equal to or greater than 30 kg/m^2). Subjects then underwent time on a treadmill with increasing elevations. Based on age-specific ranges, subjects were placed into either a low fit, moderately fit, or highly fit classification based on the amount of time they spent on the treadmill. Subjects were then followed until their death or until December 31, 1996, with a mean length of follow-up of 11.4 ± 6.2 years equaling to 113,145 woman-years of follow-up (Farrell et al.).

Findings indicate that, when compared to the healthy BMI group, there are no significant differences in all-cause mortality among weight groups although the obese group did approach significance (RR, 1.08; 95% CI, 0.71 to 2.05; $p = 0.08$) (Farrell et al., 2002). However, after adjusting for age, smoking status, and baseline health status, there are significant differences in all-cause mortality among the three fit classification groups ($p = 0.002$). Compared with low-fit women, the relative risk for all-cause mortality for moderately fit women is 0.48 (95% CI, 0.34 to 0.68) and highly fit women is 0.57 (95% CI, 0.40 to 0.82). Results from Blair et al. (1996) and Farrell et al. suggest that CRF may be a more significant predictor of all-cause mortality than obesity. Farrell et al. suggests health care professionals should concentrate more on CRF than weight and should encourage unfit women to improve their CRF, despite their weight.

Descriptive characteristics of subjects were limited in Blair et al. (1996) so it is difficult to determine demographic limitations. Limitations of Ferrell et al. (2002) were that their sample was primarily Caucasian (98%) and the mean BMI of the 597 obese subjects was $34.1 kg.m^2$. Although significantly different than the subjects who were classified as “normal” weight or overweight ($p < 0.0001$), the three obesity classifications were not compared. Therefore, there are no data to determine whether greater obesity affects all-cause mortality as much as lower CRF. In both Blair et al. and Farrell et al., the BMI and CRF were only measured initially. If either had changed over time another measurement may have more accurately compared their relationship with all-cause mortality.

Gallagher et al. (2005) did not study CRF by time on a treadmill but used the NYHA criteria to examine limitations of function. Developed by the Criteria Committee of the New York Heart Association and revised in 1994, the New York Heart Association (NYHA) functional classifications are commonly used by health care providers to categorize heart failure patients into disease severity groups. These classifications are then used as one piece of data to prescribe physical activity (American Heart Association, 2006). Table 3 indicates the degrees of cardiac impairment graded on a one to four scale with four being the highest degree of impairment (American Heart Association; Bennett, Riegel, Bittner, & Nichols, 2002).

In Gallagher et al. (2005) 43 subjects, age 42.2 ± 10.7 years with a mean BMI of 47.8 ± 5.1 kg/m^2 and without cardiorespiratory disease, were compared to 235 subjects, age 48.5 ± 9.6 years with a mean BMI of 30.1 ± 5.7 kg/m^2 ($p < 0.0001$) and diagnosed with systolic heart failure (left ventricular ejection fraction 21.5 ± 8.4%) with NHYA functional classification II to IV (Table 3). No significant differences ($p = 0.14$) in the mean maximum oxygen uptake (VO_{2max}) after treadmill exertion were found between obese subjects and those with heart failure. These data support the thesis that obese subjects have as poor CRF as subjects with class II to IV heart failure. An additional finding was that a significant number of those living with heart failure engage in more physical activity than their obese counterparts ($p = 0.0002$). This lead Gallagher et al. to suggest that less physical activity contributes, in part, to low CRF in markedly obese individuals.

Table 3

New York Heart Association Functional Classifications

Class	Symptoms	Functional Limitations
I	None	No limitation to ordinary physical activity
II	Mild	Comfortable at rest but has slight limitation during ordinary activity
III	Marked	Comfortable only at rest with marked limitation to activity, even during less-than-ordinary activity
IV	Severe	Severe limitations and experiences symptoms even at rest

A limitation of Gallagher et al. (2005) is that subjects with heart failure were significantly different than healthy obese subjects. Obese subjects were primarily younger ($p = 0.0001$), Caucasian ($p < 0.0001$), and female ($p < 0.0001$). Also, although significantly different from healthy obese subjects ($p < 0.0001$), the mean BMI of the heart failure subjects indicated obesity. Because of these differences it is difficult to say whether outcomes are secondary to age, race, gender, or different levels of obesity rather than differences between the healthy obese and those with heart failure. A stronger statement about the findings may be that younger Caucasian women in obesity class III have as poor CRF as older, obese African American men living with class II-IV heart failure (Gallagher, et al.).

Physical Activity

Physical activity is the movement of the body enough to expend calories (CDC, 2006c). They are classified as: (a) leisure-time, when it is not associated with one's job, household maintenance, or the activities needed to get from one place to another: (b) moderate, when one expends 3.5 to seven kilocalories per minute (kcal/min); and (c) intense, when more than seven kcal/min are expended (CDC, 2006c). Lack of physical activity directly contributes $24.3 billion (CDC, 2006c; NIDDK, 2006b) to health care costs and, independent of obesity, is a significant risk factor for developing coronary heart disease ($p < 0.001$) (Li et al., 2006). More so in women than men, the capacity to engage in physical activity is an independent risk factor of death, irrespective of weight (Gulati et al., 2003), and sedentary behaviors, especially watching television, are associated with the development of diabetes (Hu et al., 2003).

Health Impact

Cardiovascular. Analysis of data from the Nurses' Health Study show that, after adjusting for multiple variables including age, parental history of coronary heart disease, hormone and/or aspirin use, and BMI, the relative risk for developing heart disease is 1.58 (95% CI, 1.39 to 1.80) for subjects who engage in less than one hour per week of exercise when compared to those who engage in 3.5 hours or more of exercise per week ($p < 0.001$) (Li et al., 2006).

Cerebrovascular. Low levels of exercise places women at risk for stroke, particularly an ischemic stroke (NHLBI, n.d.). Using data from the Nurses' Health Study, Hu et al., (2000) calculated subjects' metabolic equivalent task scores (METS) according to the amount and type of exercise they engaged in weekly then placed them into one of five groups with group one as those who exercise the least and group five as those who exercise the most. After adjusting for multiple variables including age and BMI, and using group one as the referent, the risk for having any type of stroke was less for those who exercise more (RR, 0.66; 95% CI, 0.47 to 0.91; $p < 0.005$). Breaking the data into types of stroke, the same group comparisons showed that the risk for having an ischemic stroke (RR, 0.52; 95% CI, 0.33 to 0.80; $p = 0.003$) is less than for having a hemorrhagic stroke (RR, 1.02; 95% CI, 0.58 to 1.82; $p = 0.68$) (Hu et al.).

Type II Diabetes. Independent of obesity, physical inactivity significantly places women at risk for Type II diabetes. Using data from the Women's Health Study, Weinstein et al. (2004) calculated subjects' METS then placed them into one of four groups. After adjusting for multiple variables including age, family history of diabetes, and BMI, the hazard ratio of women who exercise the most is 0.89 (95% CI, 0.73 to 1.09; $p = 0.004$) when compared to those who do not expend any time exercising. When comparing obese subjects who expend less than 1,000 kcal/wk to those who expend 1,000 kcal/wk or more, the multivariate hazard ratio is not significant ($p = 0.73$).

Risk Reduction

Total body weight reductions of 5-15% have been shown to reduce risk factors for some diseases, particularly cardiac diseases and diabetes (Colditz, Willett, & Manson, 2003; Heshka et al., 2003; Hu et al., 2003; Metz et al., 2000; Ross et al., 2000; Satcher, 2001). Cholesterol levels improve and blood pressures and blood sugars lower with weight loss (Heshka et al.; Hu et al.; Metz et al.; Samsa, Kolotkin, Williams, Nguyen, & Mendel, 2001). One recommendation to achieve weight reduction is to engage in more physical activity (CDC, 2006c; NHLBI, 1997, 2000; USDHHS, 2000).

In 2005, the U. S. Departments of Health and Human Services and of Agriculture published revised guidelines for the amount of activity needed for health. To reduce the risk of chronic illness in adults, the revised guideline's recommendation is to engage in 30 more minutes over what is usual of moderately intense physical activity on most days of the week. Using the BRFSS survey adults were asked whether they engage in the recommended amounts of exercise. They were then classified as: (a) getting the recommended amount of activity, 30 minutes of moderate-intensity activities at least five days a week or at least 20 minutes of vigorous-intensity activities at least three days per week; (b) insufficient, doing more than 10 minutes of moderate or vigorously intense activities but less than the recommended amount; (c) inactive, less than 10 minutes per week of moderate or vigorously intense activities; and (d) leisure-time inactivity, no reported leisure-time physical activity (CDC, 2006c).

Between 2000 and 2001 results of the BRFSS showed an increase from 26.2% to 45.4% of those engaging in the recommended amounts of physical activity (Macera et al., 2003). However, these results may be skewed because the 2001 survey covered more activities and respondents were given the opportunity to include less intense lifestyle activities in their physical activity recall (Macera et al.). More telling is that, in the 2005 survey, 25.1% of the population did not engage in any leisure-time activities (CDC, 2007b). Among adult women, 52.1% do not engage in the recommended amount of physical activity, nearly 40% report no leisure time activity, and 16.6% report they are totally inactive (Adams & Schoenborn, 2006; CDC, 2007b; Macera et al.; Mokdad et al., 2001).

Moving an obese body requires higher oxygen consumption and produces more carbon dioxide which is complicated by less lung compliance (Luce, 1980). An emerging consensus is that obesity affects respiratory muscle function and increases the work to breathe (Lotti et al., 2005; Ray, Sue, Bray, Hansen, & Wasserman, 1983) but that physical activity may be able to improve respiratory function. After 16 weeks doing 20 to 60 minutes of intense physical activity three times per week, the maximal oxygen uptake (VO_{2max}) of women increases, even without weight loss (Fish et al., 1997). The purpose of a study by Larsson & Mattsson (2003) was to examine the effects of weight reduction on walking ability in a cohort of 57 obese women (BMI 37.1 ± 3.4 kg/m^2) with a mean age of 44.1 ± 10.7 years. They found that, over 12 weeks, subjects had a significant improvement in the VO_{2max} ($p < 0.001$) with increased walking.

Regardless of the intensity, physical activity reduces risk for some diseases, particularly those cardiac in nature (Andersen et al., 1999; Fish et al., 1997; Gulati et al., 2003; Hu et al., 2003; Metz et al., 2000). When engaging in intense physical activity for 20 to 60 minutes, three times per week, the mean blood pressure of women with unmedicated mild hypertension decreases ($p < 0.01$) (Fish et al.). Moderately intense physical activity is as good as high intensity physical activity in improving systolic blood pressure and cholesterol levels (Andersen et al.; Blair et al., 1996) and light intensity physical activity significantly lowers the risk of Type II diabetes (Hu et al.).

Forty women with a mean age of 42.9 ± 8.3 years and mean BMI of 32.9 ± 4.3 kg/m^2 were randomly assigned to groups engaging in different levels of physical activity (Andersen, et al., 1999). Group one added 30 minutes of moderate intensity physical activity (e.g. increased walking or going up stairs rather than taking the elevator) into their daily routine. Group two participated in three 45 to 60 minute step aerobics classes per week which included a warm up and cool down period. After 16 weeks oxygen consumption was significantly less in both groups ($p < 0.001$), indicating that both physical activity levels have an equal impact on the respiratory system of obese women (Anderson et al.).

Theoretical Framework

King's Theory of Goal Attainment was the organizing framework for conducting this research (King, 1981). A goal of King's open systems framework is for nurses to assist in promoting and maintaining health, whether dealing with individuals, groups, or society (King, 1981). For purposes of this research the focus was on individuals.

Perception is one concept in King's framework (King, 1971, 1981). Merriam-Webster (2005) defines perception is a "physical sensation interpreted in the light of experience" or "intuitive cognition." Perception is the basis for gathering and interpreting information and is influenced by many factors including emotions and one's concept of self (King, 1971, 1981). Because each individual has different past experiences, physical sensations, and ethics, perception is personal and selective (King, 1981). Perception gives meaning to all experiences and influences behavior (King, 1981).

A nurse and individual come into a relationship with their own perceptions to form a dyad to help the individual attain or maintain a state of health (King 1971, 1981). Each brings different knowledge, needs, and past experiences into the relationship and processes, organizes, and categorizes these experiences to provide meaning (King, 1981). To affect change, it is essential for nurses to assess someone's perceptions and how they are acting upon these perceptions because they influence attitudes toward potential outcomes when engaging in a health activity (King, 1981). For example, if one has difficulty breathing when doing moderately intense exercise this person may easily believe that it is dangerous or that they are incapable of engaging in physical activity. To better help obese women attain an improved state of health, nurses need to know more about their perception of dyspnea and how it affects their daily functioning.

Perception of Dyspnea

Dyspnea has been defined as “difficult or labored respiration” (Merriam-Webster, 2005), breathlessness (Brown, Carrieri, Janson-Bjerklie, & Dodd, 1986; Karason, Lindroos, Stenlof, & Sjostrom, 2000; Wilson & Jones, 1989), or a sensation of “difficult and uncomfortable breathing” (LaDuke, 2001). Hu et al. (2003) defined dyspnea as difficulty breathing upon exertion with a predicted value of expiratory volume to forced vital capacity greater than or equal to 80%. Hu et al. suggests that their definition eliminates dyspnea in those with COPD and asthma, however, dyspnea has been observed in subjects with defined physiological disorders such as COPD (Gift & Austin, 1999; Janson-Bjerklie et al., 1986; Woo, 2000a, 2000b), heart failure (Gallagher et al., 2005), and asthma (Thomson, et al., 2003; Sin et al., 2002). And, in the last few weeks or days of life, 27% to 75% of terminally ill subjects experience dyspnea (Bouvette, Fothergill-Bourbonnais, & Perreault, 2002; Ripamonti & Bruera, 1997) whether a cardiorespiratory diagnosis has been made or not (LaDuke, 2001) suggesting that dyspnea may be due to poor respiratory muscle strength (Ripamonti & Bruera). No matter the definition, all measurements of dyspnea are based on self-report, which is the subject’s perception of how difficult it is to breath.

Researchers have not come to an agreement on the relationship between subjects’ perception of dyspnea (POD) and obesity or the physiological cause in otherwise healthy obese women with normal pulmonary function and bronchial reactivity (Aaron et al., 2004; Babb, 2002; Ferretti, Giampiccolo, Cavalli, Milic-Emili, & Tantucci, 2001; Gallagher et al., 2005; Lotti et al., 2005; Sahebjami, 1998; Sin et al., 2002) although the association between POD with pulmonary function has been examined. For example, in a study by Sin et al. (2002) those with a BMI greater than 31 kg/m^2 self-reported POD with exertion (OR, 2.66; 95% CI, 2.35 to 3.00) but had the lowest measures of airflow obstruction ($p < 0.0001$). And, in a small study of 25 obese men and women, all of them claimed some level of dyspnea (El-Gamal, Khayat, Shikora, & Unterborn, 2005). The level of dyspnea did not correlate with the BMI but the percentage of predicted total lung capacity (TLC) was significantly different ($p = 0.04$). After surgically induced weight loss, POD significantly decreased ($p < 0.000$) (El-Gamal et al.) suggesting that CRF may be caused by mass loading of the chest.

Two studies measured obese subjects' self-report of POD during routine activities (Karason et al., 2000; Sin et al., 2002). Although subjects were primarily women, neither study concentrated on obese women. Data from NHANES III of 16,171 subjects, 67.9% women, indicated that self-reported dyspnea while walking up a hill significantly increases as the BMI increases ($p < 0.001$) (Sin et al.). Those with a BMI more than 31 kg/m^2 were nearly three times more likely to experience dyspnea when compared to those with a BMI less than or equal to 22.1 kg/m^2 (RR, 2.66; 95% CI, 2.35 to 3.00) (Sin et al.). The highest BMI group Sin et al. studied consisted of all subjects with a BMI > 31 kg/m^2 but the mean BMI was not given so it is unclear whether the measurements in this group were skewed because the mean BMI of the subjects was excessively high. If the mean was high, findings cannot be extrapolated to all obese individuals.

The second study compared obese subjects who underwent surgically-induced weight loss with a matched control group (Karason, et al., 2000). Findings showed that POD while climbing two flights of stairs, walking with people of the same age, walking on a level surface at the subjects' own speed, and when washing or dressing significantly improved after weight loss ($p < 0.001$). In addition, physical inactivity significantly decreased after weight loss ($p < 0.001$). A forming theory is that POD in obese individuals is secondary to poor CRF which may be mitigated by increase physical activity (Farrell et al., 2002).

POD and Physical Activity

The frequency, intensity, and periodicity of symptoms affect self-reported sensations of dyspnea (Janson-Bjerklie et al., 1986), thereby affecting physical activity tolerance (Luce, 1980). A vicious cycle can be triggered when dyspnea is experienced during physical activity; the activity is often suspended, which serves to further weaken the muscles, causing an increase in dyspnea when ventilatory demand is again taxed with physical activity (Gift & Pugh, 1993; Janson-Bjerklie et al.). Similarities may be found between obese subjects' reaction to physical activity and those diagnosed with COPD (Baydur, Wilkinson, Mehdian, Bains, & Milic-Emil, 2004). Although physical activity serves to reduce shortness of breath by strengthening the muscles used for breathing, subjects living with COPD often avoid physical activity to stave off dyspnea (Janson-Bjerklie et al.; Woo, 2000a, 2000b).

Gaps in the Literature

While the study of obesity has exploded, there are several gaps in the literature that are of interest to nurses. Most studies of POD are among subjects with known diagnoses that affect the respiratory system and, when there is a study of POD in obesity, subjects are more often men with physiological changes as the primary outcome measures. Studies examining POD in obese women without respiratory diseases, the affect of POD on activities of daily living (ADLs) and functional status, or whether physical activity has a mitigating effect on POD or functional status is sparse. Finally, the relationship between POD, asthma, and obesity is not clear.

Physical activity has been shown to affect cardiorespiratory status (Andersen et al., 1999; Babb, et al., 2002, Gulati et al., 2003; Heshka et al., 2003; Hu et al., 2003; Larsson & Mattsson, 2003; Metz et al., 2000; Samsa et al., 2001), however, research was not found that examined obese women's functional status and whether it is mitigated by physical activity. Gallagher et al. (2005) compared obese subjects to those with known heart failure and found that physical activity has a mitigating factor on CRF. However, they did not compare their functional status or examine the relationship between functional status and obesity.

Men and women have different physiological responses to obesity so these responses need to be studied separately. To help promote health in obese women, nurses need to know more about the affect of obesity. The examination of POD and the functional status of obese women, as well as whether POD limits an obese woman's routine activities, whether physical activity has a mitigating effect on POD, and whether different levels of obesity have increasing levels of POD in obese women would better equip nurses to address barriers to obese women and develop interventions to reduce weight and increase physical activity.

Assumptions

When examining POD and physical activity in obese women, four implicit assumptions can be made. First, obesity has become a national focus. Second, POD limits the desire to engage in physical activity. Third, there has been a plethora of information about the need for physical activity presented in the media. And finally, physical activity positively impacts the health of all individuals, no matter their weight.

Research Questions

The specific aim of this research was to examine POD, whether there is a relationship between POD during routine ADLs, physical activity, and functional capacity in obese women. The following research questions were addressed in the research. In a sample of obese women:

Q1: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and POD during routine ADLs?

Q2: Is there a relationship between BMI and the NYHA functional classes?

Q3: Is there a difference in POD during routine ADLs between obesity classes I, II, and III?

Q4: Is there a difference in the NYHA functional classes between obesity classes I, II, and III?

Q5: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and the NYHA functional classes in obesity classes I, II, and III?

Q6: Is there a difference in POD during routine ADLs between those with and without asthma?

Q7: What would be the predicted level of POD during routine ADLs for a known BMI?

Operational Definitions

Obesity

Obesity was a BMI greater than or equal to 30 kg/m^2 which was calculated by multiplying weight in pounds by 703, then dividing by the height in inches. The BMI was then classified as:

Class I. BMI 30 - 34.9 kg/m^2

Class II. BMI 35 - 39.9 kg/m^2

Class III. BMI greater than or equal to 40 kg/m^2 or more.

Perception of dyspnea

The POD was the subject's perception of the amount of difficulty breathing they experience when performing routine activities.

Physical activity

Physical activity was the number of minutes in the last seven days the subject engaged in moderately intense activities (Appendix B).

Functional status

Functional status was a self-report of limitations to ordinary physical activity. Subjects placed themselves in the following classifications.

Class I. No limitation to ordinary physical activity.

Class II. Comfortable at rest but has slight limitation during ordinary activity.

Class II. Comfortable only at rest with marked limitation to activity, even during less-than-ordinary activity.

Class IV. Severe limitations even at rest.

CHAPTER II

Methods

The purpose of this chapter is to outline the research design, sample characteristics, procedure, and data management and analyses used to examine in a sample of obese women:

Q1: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and POD during routine activities?

Q2: Is there a relationship between BMI and the NYHA functional classes?

Q3: Is there a difference in POD during routine activities between obesity classes I, II, and III?

Q4: Is there a difference in the NYHA functional classes between obesity classes I, II, and III?

Q5: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and the NYHA functional classes in obesity classes I, II, and III?

Q6: Is there a difference in POD during routine activities between those with and without asthma?

Q7: What would be the predicted level of POD during routine activities for a known BMI?

Research Design

The study design for this research was a comparative descriptive design (Burns & Grove, 1997) to mathematically state the relationships between POD during routine activities and asthma, POD during routine activities and physical activity, obesity and functional status, and to determine if there is predictability between the BMI and POD during routine activities in a sample of obese women. This research design was exploratory and the values cannot be set (Burns & Grove; Campbell & Stanley, 1963). To make inferences to the general population, the variables must have a normal distribution (Munro, 1997).

Table 4

Variables of Interest in a Study of POD during Routine Activities, Physical Activity, and Functional Status in Obese Women

Qualitative	Quantitative
Functional status	BMI
BMI classification	POD during routine activities
Race/Ethnicity	Physical activity
Household Income	Age
	Years of education

Note: BMI = body mass index; POD = perception of dyspnea during routine activities.

Variables

Table 4 outlines the variables of interest in this research. The variables tested in the first six research questions are random (Howell, 2002). However, to test the seventh research question, the fixed variable is the BMI and the random variable is POD during routine activities (Howell). Other variables of interest include socio-demographic variables; age, education, and ethnicity.

Power Analysis

An a priori power analysis determined that a sample of 80 was required for this two-tailed test with an effect size of .30 and a power of .80 at the 0.05 alpha level (Cohen, 1992).

Sample

A convenience sample (N = 84) was obtained from a population living in the Midwest region of the United States. Inclusion criteria were women 20 years of age or more but less than 57 years of age with a BMI greater than or equal to 30 kg/m^2 who were able to read English and have access to the Internet. The maximum age was set at less than 57 years to reduce the risk of obtaining data from obese women that have undiagnosed COPD. Women were excluded if they (a) were pregnant, (b) smoked, (c) were in obesity class I and participated in muscle training three times per week as this may have influenced the BMI, (d) indicated they have a cardiac condition (myocardial infarction or heart failure), or (e) have nurse or physician diagnosed COPD. An asthma diagnosis was considered positive if the subject had undergone pulmonary function or allergy skin testing.

Procedure

A flyer (Appendix A) was developed inviting women to participate. The flyer explained the research, the inclusion and exclusion criteria, the value of the subject's input, and the researcher's and University of Missouri-St. Louis Internal Review Board's contact information. Potential subjects were asked to access a website that the researcher developed using Microsoft Office FrontPage 2003 and placed on a personal webpage. The website also contained inclusion and exclusion criteria, the values of the subject's input, and the researcher's and University of Missouri-St. Louis Internal Review Board's contact information. A button on the website linked potential subject to an online survey (Appendix B) created using a tool provided by SurveyMonkey. The flyer, website, and survey contained the University of Missouri – St. Louis' School of Nursing logo.

Recruitment was multifaceted. Flyers (Appendix A) were placed in one urban and one suburban church and weight loss and exercise establishments. Using this method, 79 surveys were completed but only 11 were from obese women. Therefore, a broadcast email of the flyer was sent to female graduate students, nursing faculty and staff, and undergraduate nursing students at the University of Missouri, St. Louis. A total of 76 obese subjects were obtained through this method. Another broadcast email of the flyer was then sent to women obtained from a general Yahoo email list. These methods resulted in a total of 279 surveys completed with 84 subjects meeting all inclusion criteria.

Protection of Human Subjects

In compliance with the Health Insurance Portability and Accountability Act of 1996, care was taken to maintain the confidentiality of subjects. Approval from the University of Missouri-St. Louis Internal Review Board was obtained. Subjects were voluntary, they were not asked to provide their names, and completion of the survey implied consent. There were no risks or discomforts associated with participation in this research.

All data were de-identified and responses were confidential. Handling of the information was done by the researcher. For six years the data files will be stored on a CD in a locked file cabinet assessable only to the researcher. After that time, all files will be destroyed as required by the University of Missouri System.

Instruments

Survey

The survey (Appendix B) was written on a Flesch-Kincaid 4.9 grade reading level and contained 34 questions, including those designed to assist the researcher in filtering out those who do not meet inclusion criteria. For the subject's reference, included in the survey were examples of moderately intense physical activities which expend 3.5 to 7kcal/min (CDC, 2006c). The survey took approximately 15 minutes to complete. Listed below are specific instruments that were embedded in the survey.

Perceptions of Dyspnea

Instruments used to measure POD commonly found in the research are the Visual Analog Dyspnea Scale (VADS) and the Borg Rating of Perceived Exertion. These are valid self-reports of POD experienced if the subject is actually engaging in an activity rather than recalling the POD when an activity had been performed in the past. Lee, Friesen, Lambert and Loudon (1998) developed the University of Cincinnati Dyspnea Questionnaire (UCDQ) which measures POD during several physical, speech, and combined physical and speech activities and can be used as a recall measure. This instrument can be completed in five to ten minutes.

The UCDQ is a 30-item, 5-point Likert scale with 1 = “not at all short of breath” and 5 = “always short of breath or cannot do” (the activity). There is also a choice that indicates they are not interested in doing the activity. The 30 questions are divided into three distinct sections of 10 questions each. The sections measure POD while engaging in physical activities (e.g. running or dressing), talking (e.g. speaking to a group), and when combining speech while engaging in a physical activity (e.g. talking while dressing). Cronbach’s alpha coefficients were 0.92, 0.95, and 0.91, respectively for the three sections of UCDQ in a sample of 203 subjects with respiratory illnesses (Lee et al., 1998).

In a sample of 50 subjects with COPD, Hodgev, Kostianev, and Marinov (2003) evaluated the concurrent and construct validity of the UCDQ. There were significant positive correlations between the USDQ measure of POD during physical activities and the BORG measure ($r = 0.81$, $p < 0.001$) and the VAS (r =

0.76, $p < 0.001$). There were also significant positive correlations between the USDQ measure of POD during physical activities while speaking and the BORG measure ($r = 0.73$, $p < 0.001$) and the VAS ($r = 0.79$, $p < 0.001$).

When comparing the sections of the USDQ Hodgev et al. (2003) found significant positive correlations between physical and speech activities ($r = 0.70$, $p < 0.001$), physical and combined speech and physical activities ($r = 0.92$, $p < 0.001$), and speech and combined speech and physical activities ($r = 0.67$, $p < 0.001$). Correlations were weak between each section of the UCDQ and pulmonary function measures. The only moderate negative correlations were between the maximal inspiratory pressure (PImax) and physical activities ($r = -0.48$, $p < 0.05$) and combined speech and physical activities ($r = -0.46$, $p < 0.05$) (Hodgev et al.).

Both Lee et al. (1998) and Hodgev et al. (2003) found that POD is highest during a combination of physical and speech activities and least during speech activities alone. Specifically, these studies showed that those with respiratory illnesses have higher POD when walking up a flight of stairs, playing sports, running, when talking while walking up a steep hill or a flight of stairs, and while playing sports or running. Because of this, and the high correlation between concepts, this study applied two sections totalling 20 questions to measure POD in obese women.

Physical Activity

Physical activity has been measured through self-reporting the hours or minutes engaged in a particular physical activity then calculating metabolic equivalents (METS) (Andersen et al., 1999; Hu et al., 2003), by calculating the proportion of time doing a physical activity to what is required to expend a given number of kcal (Ross et al., 2000), or keeping track of the minutes engaged in a physical activity (Esposito et al., 2003). For purposes of this research, physical activity was a self-reported measure of the minutes the subject engaged in moderately intense physical activity over the previous week. This provided ratio data with a true zero point.

New York Heart Association (NYHA) Functional Classifications

In 1928, the New York Heart Association developed a system to classify the functional limitations of those with heart conditions (Bennett, et al., 2002). In 1994, the system was revised to include objective assessments of functional limitations. However, this revision did not include definitions of symptoms, thereby questioning test-retest reliability. After a review of studies using the NYHA classifications Bennett, et al. determined that this tool may be more reliable as a self-report. For purposes of this research, the terms describing symptoms were excluded and only the functional limitations were presented to subjects.

Social and Demographic Questionnaire

The Social and Demographic Questionnaire was a self-report of the subjects' age, years of education, income, and race/ethnicity. Age and years of education provided ratio data. Ethnicity and household income provided nominal data.

Data Management and Analysis

Data were downloaded from SurveyMonkey's website into an Excel file then cleaned and coded. A benefit of SurveyMonkey is that the researcher has the option of downloading numerical values or actual answers to the survey questions; downloading numerical values assisted in coding data. Two outlying responses were treated as non-responsive; 116 years of education and 2000 minutes per week of moderate physical activity. BMIs were calculated for each subject then an obesity classification was assigned based on the BMI. Data were filtered to exclude those who did not meet inclusion criteria then imported into the statistical software program SPSS 13.0 for Windows (SPSS, Inc., Chicago, IL) which was used for analyses.

Descriptive statistics and frequencies summarized subjects' ages, years in school, household income, and race/ethnicity. Tabulations of the reasons for exclusion were completed using frequency statistics. To further explore the sample's characteristics, a cross-tabulation was done between the obesity classifications and the NYHA functional classifications. Table 5 indicates the statistical test used for each research question. If the obesity classifications were part of the calculation a Bonferroni post-hoc test was done to measure differences between each group.

The internal consistency of the two sections from the UCDQ questionnaire, routine physical activities and the combination of routine physical activities with speech, showed a Chronbach's alpha of 0.84 and 0.85

respectively. Combining all 20 questions taken from the UCDQ questionnaire showed a Chronbach's alpha of 0.91.

Table 5

Research Questions and Corresponding Statistical Tests

Hypothesis/Research Questions	Statistical Test
Q1: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and POD during routine activities?	Pearson *r*
Q2: Is there a relationship between BMI and the NYHA functional classes?	Pearson *r*
Q3: Is there a difference in POD during routine activities between obesity classes I, II, and III?	ANOVA
Q4: Is there a difference in the NYHA functional classes between obesity classes I, II, and III?	ANOVA
Q5: Is there a relationship between the amount of moderately intense physical activity engaged in weekly and the NYHA functional classifications in obesity classes I, II, and III?	Univariate ANOVA
Q6: Is there a difference in POD during routine activities between those with and without asthma?	t-test
Q7: What would be the predicted level of POD during routine activities for a known BMI?	Simple Regression

CHAPTER III

Results

Sample Characteristics

Exclusion Characteristics

Before entering the survey women may have self-excluded because, except for obesity, exclusion and inclusion criteria were listed on the flyer and website. Two hundred seventy-nine surveys were completed online but 191 were excluded because the BMIs were less than 30 kg/m^2. No subject claimed to have COPD but two were not included because they had heart disease (Table 6). Three subjects stated they muscle train at least three times per week. These subjects were retained in the final sample because their BMIs were greater than 35.5 kg/m^2. The final sample included 84 obese women.

Demographic and Health Characteristics

Tables 7 and 8 illustrate demographic characteristics and asthma diagnosis frequencies of the final sample. Primarily, subjects were non-Hispanic white with a post-secondary education and an annual household income of $50,000 to $100,000. Ages ranged from 20.17 to 56.92 years with a mean of 39.37 years (SD, 11.25). Because recruitment of subjects with flyers placed in the community was low, female subjects from the University of Missouri – St. Louis were asked to participate. Many of these women were graduate students, elevating the mean number of years in school to 16.96 (SD, 2.96) with a range of 10 to 24 years. The highest BMI was 56.5 kg/m^2 with a mean of 36.66 kg/m^2 (SD, 6.61). POD during routine activity averaged 45.87 (SD, 12.69, range = 26 to 90) with subjects reporting 118.62 (SD, 137.78, range = 0 to 720) minutes per week of moderate exercise.

Table 6

Reasons for Exclusion from Study and Number Excluded

Reason	N
Underweight (BMI less than 18.5 kg/m^2)	18
Healthy Weight (BMI 18.5 to 24.9 kg/m^2)	111
Overweight (BMI 25 to 29.9 kg/m^2)	62
Obese with Heart Disease	2
Obese but Smokes	1
Age	1

Note: BMI = body mass index.

Table 7

Characteristics of Obese Subjects (N = 84)

Variable	M	SD	Range
Age	39.37	11.25	20.17 - 56.92
Yrs in School	16.96	2.96	10 - 24
BMI	36.66	6.61	30 - 56.5
POD	45.87	12.69	26 - 90
Activity	118.62	137.78	0 - 720

Note: BMI = Body mass index; POD = perception of dyspnea during routine activities; Activity = minutes per week of moderate physical activity.

Table 8

Subjects' Race/Ethnicity, Household Income, and Asthma Diagnosis (N = 84)

Variable	N	Percent
Race/Ethnicity		
Non-Hispanic White	69	82.1
African American	10	11.9
Hispanic White	2	2.4
Asian	2	2.4
Missing	1	1.2
Household Income		
$0-$20,000	5	6.0
$20,000-$50,000	23	27.4
$50,000-$100,000	34	40.5
More than $100,000	19	22.6
Missing	3	3.6
Asthma Diagnosis		
Yes	9	10.7
PFT Only	5	55.6
Allergy Testing Only	1	11.1
Both	3	33.3
No	74	88.1
Missing	1	1.2

Note: PFT = pulmonary function test.

Asthma. Ten subjects claimed an asthma diagnosis however, for the purpose of this study, one was considered negative as she had not had allergy or pulmonary function testing. Only 10.7% of the sample had an asthma diagnosis (Table 8) but this percentage closely mirrors the percentage of adult women in the general population with self-reported asthma (9.2%, SE, 0.25) (CDC, 2007a). Interestingly, while asthma is commonly an allergic disease, only 44.4% of subjects with an asthma diagnosis had undergone allergy skin testing.

Obesity Classification Characteristics

Of the 84 subjects, 45 (53.6%) were in obesity class I (BMI 30 to 34.9 kg/m^2), 21 (25%) in obesity class II (BMI 35 to 39.9 kg/m^2), and 18 (21.4%) in obesity class III (BMI 40 kg/m^2 or more) (Table 11). In all obesity classifications non-Hispanic whites were predominant. Household incomes and an asthma diagnosis were higher in obesity class I (Table 9) but age ($p = 0.069$) and the number of years in school ($p = 0.591$) were not significantly different across obesity classifications (Table 10). Finally, subjects engaged in an average of 118.62 (SD, 137.78) minutes per week of moderate exercise (Table 7) but the differences between the obesity classifications was not significant ($p = 0.212$) (Table 10).

Table 9

Race/Ethnicity, Household Income, and Asthma Diagnosis by Obesity Classification (N = 84)

Variable	Class I		Class II		Class III	
	n	%	n	%	n	%
Race/Ethnicity						
Non-Hispanic White	34	77.27	19	90.48	16	88.88
African American	7	15.91	2	9.52	1	5.56
Asian	2	4.55	0	0	0	0
Hispanic White	1	2.27	0	0	1	5.56
Household Income						
$0-$20,000	1	2.38	2	9.52	2	11.11
$20,000-$50,000	9	21.43	7	33.33	7	38.89
$50,000-$100,000	18	42.86	9	42.86	7	38.89
More than $100,000	14	33.33	3	14.29	2	11.11
Asthma Diagnosis						
Yes	5	11.36	1	4.76	3	16.67
No	39	88.64	20	95.24	15	83.33

Table 10

Age, Years in School, Moderate Physical Activity per Week, and Perceptions of Dyspnea between the Obesity and NYHA Functional Classifications

Variable		SS	df	MS	F	p
		Obesity Classifications				
Age	Between Groups	672.102	2	336.05	2.77	.069
	Within Groups	9823.62	81	121.28		
	Total	10495.72	83			
Yrs in School	Between Groups	9.41	2	4.71	0.53	.591
	Within Groups	683.47	77	8.88		
	Total	692.89	79			
Activity	Between Groups	59156.67	2	29578.34	1.58	.212
	Within Groups	1478444.61	79	18714.49		
	Total	1537601.28	81			
POD	Between Groups	2625.39	2	1312.70	9.90	.000*
	Within Groups	10744.17	81	132.64		
	Total	13369.56	83			

Table 10 (Continued)

Age, Years in School, Moderate Physical Activity per Week, and Perceptions of Dyspnea between the Obesity and NYHA Functional Classifications

Variable		SS	df	MS	F	p
		NYHA Functional Classifications				
Age	Between Groups	600.09	2	300.05	2.46	.092
	Within Groups	9895.63	81	122.17		
	Total	10495.72	83			
Yrs in School	Between Groups	37.05	2	18.53	2.18	.121
	Within Groups	655.84	77	8.52		
	Total	692.89	79			
Activity	Between Groups	21758.28	2	10879.14	0.57	.570
	Within Groups	1515843.00	79	19187.89		
	Total	1537601.28	81			
POD	Between Groups	4068.94	2	2034.47	17.72	.000*
	Within Groups	9300.62	81	114.82		
	Total	13369.56	83			

Note: NYHA = New York Heart Association; Activity = minutes per week of moderately intense physical activity; POD = perception of dyspnea during routine activities.

*$p < 0.05$.

Table 11

Cross-tabulation between Obesity and NYHA Functional Classifications (N = 84)

NYHA Functional Classifications	Obesity Classifications Class I	Class II	Class III	Total (%)
Class I	40	15	6	61 (72.6)
Class II	4	6	10	20 (23.8)
Class III	1	0	2	3 (3.6)
Class IV	0	0	0	0 (0)
Total (%)	45 (53.6)	21 (25.0)	18 (21.4)	84

Note: NYHA = New York Heart Association.

NYHA Functional Classification Characteristics

Subjects self-assigned into which NYHA functional classification they belonged; 61 (72.6%) placed themselves into class I (no limitation to ordinary physical activity), 20 (23.8%) into class II (comfortable at rest but has slight limitation during ordinary activity), and three (3.6%) into class III (comfortable only at rest with marked limitation to activity, even during less-than-ordinary activity). No subject placed herself into NYHA functional class IV (severe limitations and experiences symptoms even at rest) (Table 11). Because few subjects were in NYHA functional classes III or IV, for some statistical calculations subjects were re-classified as either having or not having functional limitations; 61 (72.6%) did not have a functional limitation and 23 (27.4%) were limited (Table 12).

Cross-tabulations showed that the majority of those in NHYA functional classification I were in obesity class I and 2/3 of those who were in obesity class III had at least some limitations during ordinary activity. One subject in obesity classification I was in NYHA functional classification III (Table 11). An analysis of variance (ANOVA) showed there were no significant group differences for age (p = 0. 092) and the number of years in school (p = 0. 121) (Table 10) but there were significant differences in the NYHA functional classifications by obesity classifications (p < 0.000) (Table 13). Post-hoc testing showrf that the significant differences were between NYHA functional classes I and II (p < 0.000). These data may have been influenced by the few subjects in NYHA functional class III.

Table 12

Cross-Tabulation of Obesity Classifications and Functional Limitation

Functional	Obesity Classifications			
Limitations	Class I	Class II	Class III	Total
None	40	15	6	61
Limited	5	6	12	23
Total	45	21	18	84

Table 13

Differences in the NYHA Functional Classifications by Obesity Classifications

		SS	df	MS	F	p^*
NYHA Functional	Between Groups	12.41	2	6.20	11.99	.000
Classifications	Within Groups	41.92	81	.517		
	Total	54.32	83			

Note: NYHA = New York Heart Association.

$^*p < 0.05$.

Findings

Pearson's correlations showed that BMI was significantly related to NYHA functional classifications ($r = .479$, $p < 0.01$) and POD during routine activities ($r = .481$, $p < 0.01$). There was also a moderate positive correlation between the NYHA classifications and POD during routine activities ($r = .541$, $p < 0.01$). When the functional classifications were combined to indicate either the presence or absence of functional limitations, there was a moderately positive correlation with the BMI ($r = .506$, $p < 0.01$) and POD during routine activities ($r = .546$, $p < 0.01$). No variables correlated with the number of minutes per week subjects engaged in moderate activity (Table 14).

Table 14

Correlations between Subscales for Obese Women (N = 84)

Subscale	1	2	3	4	5	6
1. Asthma	--	-.103	-.092	-.013	.043	-.158
2. BMI		--	.182	.479**	.506**	.481**
3. Activity			--	.040	-.075	.063
4. NYHA Classifications				--	.944**	.541**
5. Functional Limitations					--	.546**
6. POD						--

Note. Activity = minutes per week of moderately intense physical activity; BMI = body mass index; NYHA = New York Heart Association; POD = perception of dyspnea during routine activities.

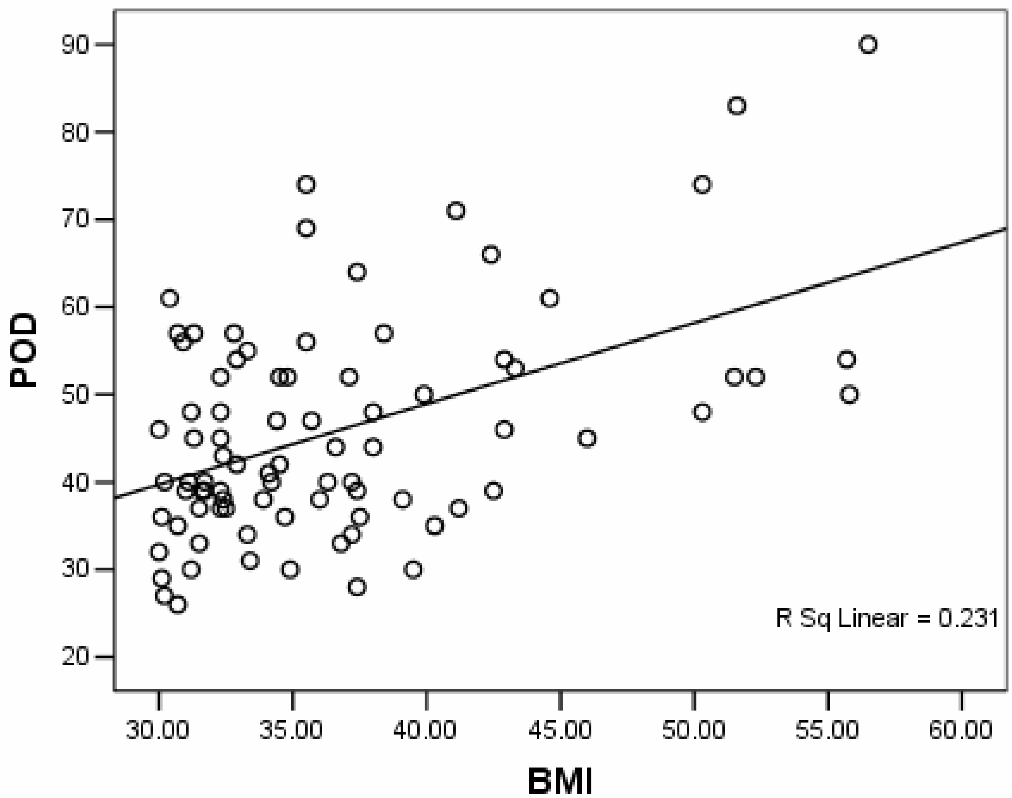
**p < 0.01

POD during Routine Activities

Obesity. Obese subjects had a mean score of 45.87 (range = 26 to 90, SD = 12.69) for POD during routine activities (Table 7). Figure 1 below is a scatter diagram that illustrates the linear relationship between the BMI and POD during routine activities. Regression of POD during routine activities on BMI accounted for 23% of the variance and was significant (adjusted $R^2 = 0.23$, $F = 24.68$, $p < 0.000$; 95% CI, 0.55 to 1.29). Predicted score for total POD during routine activities = 12.031 + 0.923 (Table 15).

Figure 1

Linear Relationship of the BMI and POD during Routine Activities



Note: POD = perceptions of dyspnea during routine activities; BMI = body mass index.

Table 15

Prediction of POD During Routine Activities for a Given BMI

Variable	B	SE B	β	p	95% CI
Constant	12.03	6.92		.086	-1.74 to 25.80
POD	.92	.186	.481	.000*	.55 to 1.29

Note. Adjusted $R^2 = 0.23$; POD = perception of dyspnea during routine activities.

*p < 0.05.

Obesity classifications. Across obesity classifications there was a significant difference in POD during routine activities (F = 9.90, p < 0.000) (Table 10). Bonferroni post-hoc testing at the 95% confidence interval found that differences between women in obesity classes I and II were not significant (p = 0.598; 95% CI, -11.38 to 3.5) but significance was reached between women in obesity classes I and III (p < 0.000; 95% CI, 6.44 to 22.14) and classes II and III (p = 0.019; 95% CI, 1.31 to 19.39). When the NYHA functional classifications were combined with the obesity classifications there were no significant differences between groups for the number of minutes per week of moderate physical activity (F = 0.65, p = 0.588) (Table 16).

Table 16

Relationship between Weekly Moderate Physical Activity by Obesity and NYHA Functional Classifications

Source	SS	df	MS	F	p
Obesity Classification	40122.78	2	20061.39	1.04	.357
NYHA Functional Classification	11618.94	2	5809.47	.30	.740
Obesity Class*NYHA Class	37251.82	3	12417.27	.65	.588

Note: NYHA = New York Heart Association.

An ANOVA was used to examine POD for each of the 20 routine activities (Table 17). Differences between obesity classifications were not significant for eight activities: (a) playing sports ($F = 2.01$, $p = 0.141$), (b) lifting 20 pounds ($F = 2.86$, $p = 0.063$), (c) running ($F = 3.03$, $p = 0.054$), (d) talking while walking up a flight of stairs ($F = 2.23$, $p = 0.114$), (e) talking or singing while taking a bath or shower ($F = 2.57$, $p = 0.083$), (f) talking while playing sports ($F = 2.04$, $p = 0.136$), (g) talking while lifting 20 pounds ($F = 0.972$, $p = 0.383$), and (h) talking while running ($F = 2.44$, $p = 0.094$). Running, however, did closely approach significance. Significant differences between obesity classifications were found for the 12 remaining activities: (a) walking around your home, ($F = 7.50$, $p < 0.001$), (b) dressing yourself ($F = 18.44$, $p < 0.000$), (c) eating ($F = 3.86$, $p = 0.025$), (d) taking a bath or shower ($F = 3.20$, $p = 0.046$), (e) going for a walk ($F = 10.55$, $p < 0.000$), (f) walking up a flight of stairs ($F = 6.64$, $p < 0.002$), (g) preparing meals ($F = 6.88$, $p = 0.002$), (h) talking while walking around your home ($F = 8.80$, $p < 0.000$), (i) talking while dressing yourself ($F = 12.86$, $p < 0.000$), (j) talking while walking on a level surface ($F = 12.49$, $p < 0.000$), (k) talking while walking up a steep hill ($F = 3.68$, $p = 0.029$), and (l) talking while preparing meals ($F = 3.72$, $p = 0.029$).

Table 17

Differences between POD during Routine Activities by Obesity Classifications

Activity		SS	df	MS	F	p
Walking around your home	Between Groups	4.49	2	2.24	7.50	.001*
	Within Groups	24.22	81	.30		
	Total	28.70	83			
Dressing yourself	Between Groups	8.52	2	4.26	18.44	.000*
	Within Groups	18.72	81	.23		
	Total	27.24	83			
Eating	Between Groups	.33	2	.17	3.86	.025*
	Within Groups	3.48	81	.04		
	Total	3.81	83			
Taking a bath or shower	Between Groups	1.96	2	.98	3.20	.046*
	Within Groups	24.85	81	.31		
	Total	26.81	83			
Going for a walk	Between Groups	19.62	2	9.81	10.55	.000*
	Within Groups	75.33	81	.93		
	Total	94.95	83			
Walking up a flight of stairs	Between Groups	16.71	2	8.35	6.64	.002*
	Within Groups	101.99	81	1.26		
	Total	118.70	83			

Table 17 (Continued)

Differences between POD during Routine Activities by Obesity Classifications

Activity		SS	df	MS	F	p
Preparing meals	Between Groups	3.13	2	1.57	6.88	.002*
	Within Groups	18.43	81	.23		
	Total	21.56	83			
Playing sports	Between Groups	7.59	2	3.80	2.01	.141
	Within Groups	153.30	81	1.89		
	Total	160.89	83			
Lifting 20 pounds	Between Groups	9.50	2	4.75	2.86	.063
	Within Groups	132.72	80	1.66		
	Total	142.23	82			
Running	Between Groups	11.69	2	5.85	3.03	.054
	Within Groups	152.55	79	1.93		
	Total	164.24	81			
Talking while walking around your home	Between Groups	9.35	2	4.68	8.80	.000*
	Within Groups	43.07	81	.53		
	Total	52.42	83			
Talking while dressing yourself	Between Groups	8.48	2	4.24	12.89	.000*
	Within Groups	26.66	81	.329		
	Total	35.14	83			

Table 17 (Continued)

Differences between POD during Routine Activities by Obesity Classifications

Activity		SS	df	MS	F	p
Talking while walking on a level surface	Between Groups	20.22	2	10.11	12.49	.000*
	Within Groups	65.59	81	.81		
	Total	85.81	83			
Talking while walking up a steep hill	Between Groups	9.30	2	4.65	3.68	.029*
	Within Groups	100.94	80	1.26		
	Total	110.24	82			
Talking while walking up a flight of stairs	Between Groups	6.53	2	3.26	2.23	.114
	Within Groups	117.11	80	1.46		
	Total	123.64	82			
Talking while preparing meals	Between Groups	3.84	2	1.92	3.72	.029*
	Within Groups	41.34	80	.52		
	Total	45.18	82			
Talking/singing while taking a bath or shower	Between Groups	6.52	2	3.26	2.57	.083
	Within Groups	101.36	80	1.27		
	Total	107.88	82			
Talking while playing sports	Between Groups	6.77	2	3.38	2.04	.136
	Within Groups	129.11	78	1.67		
	Total	135.88	80			

Table 17 (Continued)

Differences between POD during Routine Activities by Obesity Classifications

Activity		SS	df	MS	F	p
Talking while lifting 20 pounds	Between Groups	4.44	8	2.22	.972	.383
	Within Groups	180.31	79	2.28		
	Total	184.74	81			
Talking while walking on a level surface	Between Groups	7.66	2	3.83	2.44	.094
	Within Groups	127.23	81	1.57		
	Total	134.89	83			

Note: POD = perception of dyspnea during routine activities;

*Significant if $p < 0.05$.

Bonferroni post-hoc testing of each variable further examined the differences between obesity classifications. Significant differences existed between women in obesity classes I and III for 12 routine activities: (a) walking around the home ($p = 0.001$; 95% CI, -.95 to -.20), (b) dressing yourself ($p < 0.000$; 95% CI, -1.14 to -.48), (c) eating ($p = 0.043$; 95% CI, .043 to -.29), (d) taking a bath or shower ($p = 0.041$; 95% CI, -.77 to -.01), (e) going for a walk ($p < 0.000$; 95% CI, -1.89 to -.58), (f) walking up a flight of stairs ($p = 0.002$; 95% CI, -1.9 to -.37), (g) preparing meals ($p = 0.002$; 95% CI, -.80 to -.15), (h) talking while walking around your home ($p < 0.000$; 95% CI, -1.31 to -.31), (i) talking while dressing yourself ($p < 0.000$; 95% CI, -1.19 to -.41), (j) talking while walking on a level surface ($p < 0.000$; 95% CI, -1.84 to -.61), (k) talking while walking up a steep hill (p = 0.034; 95% CI, -1.58 to -.05), and (l) talking while preparing meals (p = 0.024; 95% CI, -1.06 to .06).

Significant differences also existed between women in classes II and III for eight routine activities: (a) walking around the home (p = 0.011; 95% CI, -.95 to -.09), (b) dressing yourself (p < 0.000; 95% CI, -1.02 to -.27), (c) eating (p = 0.043; 95% CI, -.33 to .00), (d) going for a walk (p = 0.030; 95% CI, -1.57 to -.06), (e) preparing meals (p = 0.012; 95% CI, -.83 to -.08), (f) talking while walking around your home (p = 0.002; 95% CI, -1.39 to -.24), (g) talking while dressing yourself (p = 0.001; 95% CI, -1.15 to -.25), and (h) talking while walking on a level surface (p = 0.001; 95% CI, -1.83 to -.42). There were no significant differences for POD during individual routine activities between obesity classes I and II.

NYHA functional classifications. The NYHA functional classifications moderately positively correlated with POD during routine activities (r = .541, p < 0.01) (Table 14). Subjects were re-grouped into those who do or do not have functional limitations then t-tests were used to examine differences between these groups and POD for each of the 20 routine activities (Table 18). The only activities that did not show a significant difference between groups were eating (p = 0.407; 95% CI, -.186 to .077), taking a bath or shower (p = 0.057; 95% CI, -.883 to .014), and talking/singing while taking a bath or shower (p = 0.056; 95% CI, -1.412 to -.020). The last two, however, closely approached significance.

Table 18

Differences between POD during Routine Activities by Functional Limitations

Activity	t	df	p	95% CI Lower	95% CI Upper
		Equal Variances Not Assumed			
Walking around your home	-2.21	26.04	.036*	-.785	-.029
Dressing yourself	-3.58	24.38	.001*	-.993	-.267
Eating	-.84	28.69	.407	-.186	.077
Taking a bath or shower	-2.01	22.00	.057	-.883	.014
Preparing meals	-2.23	22.34	.036*	-.807	-.030
Running	-3.99	57.69	.000*	-1.658	-.551
Talking while walking around your home	-2.67	27.44	.013*	-1.102	-.145
Talking while dressing yourself	-3.02	24.48	.006*	-1.050	-.199
Talking while walking on a level surface	-3.36	26.21	.002*	-1.62	-.390
Talking while preparing meals	-2.28	22.50	.032*	-.807	-.030
Talking/singing while taking a bath or shower	-2.00	26.54	.056	-1.412	-.020
Talking while playing sports	-3.04	60.95	.003*	-.793	.261

Table 18 (Continued)

Differences between POD during Routine Activities by Functional Limitations

				95% CI	
Activity	t	df	p	Lower	Upper
		Equal Variances Assumed			
Going for a Walk	-4.79	82	.000*	-1.578	-.652
Walking up a flight of stairs	-5.21	82	.000*	-1.837	-.822
Playing sports	-2.31	82	.023*	-1.428	-.107
Lifting 20 pounds	-4.19	81	.000*	-1.234	-.295
Talking while walking up a steep hill	-3.88	81	.000*	-1.034	.266
Talking while walking up a flight of stairs	-3.42	81	.001*	-1.533	-.406
Talking while lifting 20#	-2.70	80	.008*	-1.702	-.259

Note: # = pounds; POD = perception of dyspnea during routine activities.

*$p < 0.05$.

Asthma

Correlations of asthma and multiple variables are shown in Table 14. Although the sample size is small, there was no relationship between an asthma diagnosis and the BMI, minutes per week of moderate activity, the NYHA classifications, or POD during routine activities. A simple regression of asthma diagnosis and POD during routine activities confirmed that there was no between group differences ($p = 0.153$; 95% CI, -2.44 to 15.37) (Table 19).

Table 19

Percetions of Dyspnea in Obese Women Diagnosed with Asthma

	Asthma Diagnosis					
	Yes	No				
	Mean (SD)	Mean (SD)	t	df	p	95% CI
	n = 9	n = 74				
POD	51.67 (15.40)	45.20 (12.33)	1.44	81	.153	-2.44 to 15.37

Note. POD = perceptions of dyspnea during routine activities.

Research Questions

Using a comparative descriptive design the following research questions were addressed. In a sample of obese women:

1. Is there a relationship between the amount of moderately intense physical activity engaged in weekly and POD during routine activity? The number of minutes of moderately intense physical activity engaged in weekly is not correlated with POD during routine activities ($r = .063$, $p < 0.01$) (Table 14).
2. Is there a relationship between BMI and the NYHA functional classes? The BMI has a significant but low positively correlation with the NYHA functional classifications ($r = .479$, $p < 0.01$) (Table 14).
3. Is there a difference in POD during routine activities between obesity classes I, II, and III? There is a significant difference of POD during routine activities between the obesity classifications ($p < 0.000$) (Table

17). The greatest significance is between class I and III ($p = 0.001$). There is also a significant difference between obesity classes II and III ($p = 0.026$) but there are no significant differences between obesity classes I and II ($p = 0.151$).

4. Is there a difference in the NYHA functional classes between obesity classes I, II, and III? There is a significant difference between the NYHA functional classifications by obesity classifications ($p < 0.000$) (Table 14).
5. Is there a relationship between the amount of moderately intense physical activity engaged in weekly and the NYHA functional classes in obesity classes I, II, and III? Moderately intense physical activity engaged in weekly has no relationship with any variable tested, including when the NYHA functional classes and obesity classes were combined ($p = 0.588$) (Table 16).
6. Is there a difference in POD during routine activities between those with and without asthma? A positive asthma diagnosis shows no significant differences for POD during routine activities than with those who do not have asthma ($p = 0.153$; 95% CI, -2.44 to 15.37) (Table 19).
7. What would be the predicted level of POD during routine activities for a known BMI? There is a positive correlation between POD during routine activity and the BMI ($p = 0.481$) but the regression of POD

during routine activities on BMI accounted for 22% of the variance which was significant ($p < 0.000$; CI .55 to 1.29) (Table 15).

CHAPTER IV

Discussion

Summary of the Problem

There are approximately 26 million obese adult women in the United States and the prevalence is increasing faster than in men (CDC, 2006b, 2007b, & 2007c; NIDDK, 2006b; Pleise & Lethbridge-Cejku, 2006). Obesity increases health care costs (Daviglus et al., 2004; Finkelstein et al., 2003) and reduces life expectancy of women by five to eight years (Fontaine et al., 2003; Peeters et al., 2003). Costs and life expectancy are affected by higher use of medical services (Anderson et al., 2005; Camargo et al., 1999; Reidpath et al., 2002, Schachter et al., 2001; Sin et al., 2002) and because obesity is a risk factor for multiple conditions including cardiovascular and cerebrovascular diseases, Type II diabetes, select cancers, and respiratory disorders (Camargo et al., 1999; CDC, 2006b; Colditz et al., 2003; El-Gamal et al., 2005; Farrell et al., 2002; Field et al., 2001; Kurth, et al., 2005; Mokdad et al., 2001; NHLBI, 1997, 2000; NIDDK, 2006b; Rexrod et al., 1998, Shubair et al., 2004; Thompson et al., 1999; Weinstein et al., 2004; Wilson et al., 2002). Reducing obesity has been identified as a focus area of *Healthy People 2010* (USDHHS, 2000) with a goal to reduce the prevalence of obesity among adults to less than 15%. One recommended action is to engage in more physical activity (NHLBI, 1997, 2000; USDHHS).

Independent of obesity, physical inactivity negatively affects health care costs (CDC, 2006c; NIDDK, 2006b) and is a risk for death and chronic illness (Carnethon et al., 2003; Gulati et al., 2003; Hu et al., 2000, 2003; James et al., 1998; Li et al., 2006; Weinstein et al., 2004). Many Americans are physically inactive but nearly 40% of women do not engage in any leisure-time activities (Adams & Schoenborn, 2006; CDC, 2007b). One reason obese women may not be engaging in leisure-time activities is because of poor CRF manifested as dyspnea (Blair et al., 1996; Carnethon et al.; Farrell et al., 2002; Gallagher et al., 2005).

Summary of the Purpose

Obese women perceive the sensation of dyspnea more acutely than women with a healthy weight even with higher peak expiratory flow percentages (Thomson et al., 2003). Using King's Theory of Goal Attainment (King, 1981) as the organizing framework for conducting this research, the overall purpose of this study was to explore the physical sensation of dyspnea obese women feel and how it affects their functioning. Specifically, the purposes of this research were to determine the amount of POD experienced while doing routine activities, whether POD while doing routine activities is different according to obesity classifications, whether there is a correlation between POD while doing routine activities and asthma, physical activity, and functional status, and to determine whether there is predictability between the BMI and POD while doing routine activities in a sample of obese women.

Discussion of the Results

Using a survey placed online, obese women were asked 34 questions with the University of Cincinnati Dyspnea Questionnaire (Lee et al., 1998) and the NYHA functional classification questions imbedded. Of the 279 responses, 84 subjects met inclusion criteria; nine (10.7%) of which had self-reported asthma supported by claims that they had PFT and/or allergy testing. The average subject was a 39-year-old Caucasian woman with a BMI of 36.66 kg/m^2, educated almost 17 years, making between $50,000 and $100,000, and engaging in close to two hours of moderately intense activities per week. These results can be partially explained because, after receiving minimal response with community-based efforts to recruit subjects, this study drew on graduate students and a population of nurses, including faculty. Nurses are primarily Caucasian and more than 45-years-old (USDHHS, 2006). It is also reasonable to assume that recruiting from graduate students rose the mean years in school and recruiting from faculty raised the mean income.

Forty-five (53.6%) subjects were in obesity class I, 21 (25%) in class II, and 18 (21.4%) in class III. Between classes there were no significant differences in age ($p = 0.069$), number of years in school ($p = 0.591$), or the number of minutes per week they engage in moderately intense physical activity ($p = 0.212$). Sixty-one (72.6%) subjects self-assigned into NYHA functional class I, 20 (23.8%) in class II, and three (3.6%) in class III. No subject self-assigned into NYHA functional classification IV. A cross-tabulation showed that, while only 11.1% of the subjects in obesity class I claimed a functional limitation, 28.6% of the subjects in obesity class II and 66.7% in obesity class III claimed some level of limitation.

An ANOVA showed that there were significant between-group differences in NYHA functional classification by obesity classification ($p < 0.000$). This appears to be the first time these differences have been examined. While Gallaher et al. (2005) compared the pulmonary function of obese subjects to those with heart failure in NYHA functional classifications II to IV, no comparison was made as to the differences between the obesity classifications.

POD during Routine Activities

Obesity classifications. Pearson's correlations were used to determine that the BMI has a low positive correlation with POD during routine activities ($r = .481$, $p < 0.01$). Further testing using an ANOVA found that there are significant differences of the means for POD during routine activities between the obesity classifications ($p < 0.000$) with post-hoc testing showing that the differences are significant between those who are in obesity classes I and III ($p < 0.000$; 95% CI, 6.44 to 22.14) and classes II and III ($p = 0.019$; 95% CI, 1.31 to 19.39).

When POD while engaging in individual activities were examined separately using an ANOVA no significant differences were found for eight activities a) playing sports, (b) lifting 20 pounds, (c) running, (d) talking while walking up a flight of stairs, (e) talking or singing while taking a bath or shower, (f) talking while playing sports, (g) talking while lifting 20 pounds, and (h) talking while running. These activities take a good deal of exertion and these findings may reflect that they are difficult for all obesity classifications rather than not difficult for any. Significant differences between obesity classifications were found for the 12 remaining activities: (a) walking around your home, (b) dressing yourself, (c) eating, (d) taking a bath or shower, (e) going for a walk, (f) walking up a flight of stairs, (g) preparing meals, and talking while: (a) walking around your home, (b) dressing yourself, (c) walking on a level surface, (d) walking up a steep hill, and (e) preparing meals.

Post-hoc testing showed that the differences were not significant between obesity classes I and II but were significant between obesity classes I and III for: (a) walking up a flight of stairs, (b) going for a walk, (c) walking around the home, (d) taking a bath or shower, and (e) dressing yourself. Significant differences also exist between classes II and III for: (a) going for a walk, (b) walking around the home, and (c) dressing yourself. Although there were no differences between obesity classes I and II for any activity, as a woman becomes extremely obese she has dyspnea even when engaging in what may be considered low intensity activities such as eating, preparing meals, walking around the home, and dressing.

Function. Pearson's correlations were used to determine that there is a moderately positive relationship between POD during routine activities and function whether looking at the NYHA functional classifications ($r = .541$, $p < 0.01$) or grouped as to having a functional limitation or not ($r = .546$, $p < 0.01$). T-tests showed that the differences were not significant between those who did or did not claim a functional limitation only for three routine activities: (a) eating, (b) taking a bath or shower, and (c) talking or singing while taking a bath or shower. However, taking a bath or shower and talking or singing while taking a bath or shower approached significance. Because 17 of the 20 routine activities were significantly different between those with and without functional limitations, assessment of functional limitations may be a more accurate way to determine the impact of dyspnea in obese women.

Physical activity. While many studies showed that physical activity improves lung function (Andersen, et al., 1999; Fish et al., 1997; Larsson & Mattsson, 2003) the current study showed that the number of minutes per week obese women engage in moderate activity did not correlate with their POD during routine activities ($r = .063$). Even when taking into consideration obesity and the NYHA functional classifications, moderately intense physical activity was not significant ($p = 0.588$). Self-recall of the number of minutes a subject engaged in moderate activity as well as her knowledge of what constituted a moderate activity may have limited these results.

Functional Classifications

The New York Heart Association (NYHA) functional classifications have been commonly used by health care providers to categorize the impact heart failure has on patients (American Heart Association, 2006; Bennett et al., 2002). Gallagher et al. (2005) found no significant differences ($p = 0.14$) in the mean maximum oxygen uptake (VO_{2max}) after treadmill exertion between obese subjects (BMI 47.8 ± 5.1 kg/m^2) without cardiac impairment and subjects with heart failure (BMI 30.1 ± 5.7 kg/m^2). Results supported the thesis that obese subjects have as poor CRF as subjects with class II to IV heart failure. In the current study the NYHA functional classifications were compared to the BMI and individual obesity classifications. Although there was a significant correlation between the BMI and the NYHA functional classifications ($p < 0.01$; .479) it was low. And, as mentioned earlier, when compared with obesity classifications there was a between group difference ($p < 0.000$) between NYHA functional classifications I and II.

Asthma

Pearson's correlations indicated that asthma was not significantly related to the BMI, the amount of moderately intense activities in which a subject engages, and functional classifications or limitations. A t-test also showed that there was no significant difference between obese women's POD during routine activities and a diagnosis of asthma. When examining these results, however, one must be aware that only a small percent (10.7%) of the sample had been diagnosed with asthma.

Implications for Theory and Nursing Science

King's open systems framework was the organizing framework for this study (1981). King suggests that a nurse enters into a relationship with an individual then they work together to accomplish the goal of promoting and/or maintaining health. Into this relationship the two bring their own perceptions which are personal and based on past experiences, physical sensations, and ethics (1971, 1981). The following are results from this is study which sought to help nurses know more about obese women's perception of dyspnea and how it affects their daily functioning.

Obesity and Dyspnea

Sin et al. (2002) found that self-reported dyspnea when walking up a hill significantly increases as the BMI increases ($p < 0.001$) which was supported in this study. This research placed a subject's BMI into the appropriate obesity classification then compared the classifications with POD during routine activities. Although walking up a hill was not analyzed, there was a significant difference between obesity classifications ($p = 0.029$) when walking up a hill while talking. When examining this further, the current research found that the differences were primarily between obesity classes I and III ($p = 0.034$; 95% CI, -1.58 to -.05). Research question seven was whether one could determine what the predicted level of POD during routine activities for a known BMI. There was a positive relationship between POD during routine activities and the BMI but the BMI only accounts for 22% of the variance.

Karason et al. (2000) compared self-reported dyspnea of obese subjects before and after surgically-induced weight loss. Compared to their pre-surgical weight, subjects who lost weight experienced significantly less dyspnea while engaging in several routine activities; climbing two flights of stairs, walking with people of the same age, walking on a level surface at the subjects' own speed, and when washing or dressing ($p < 0.001$). These findings were also supported in the current research. There were significant differences between obesity classifications for walking up a flight of stairs, going for a walk, walking around your home, taking a bath or shower, and dressing yourself.

Research question three was whether there is a difference in POD during routine activities between the obesity classifications. Results from this study show that there was a significant difference but the differences were between classes I and II and class II and III. No significant differences were found between classes I and II. Although 12 of the 20 activities were significantly different across obesity classifications, no differences were found between obesity classes I and II for any activity. These results imply that, as a woman becomes extremely obese, she has dyspnea even when engaging in what may be considered low intensity activities such as eating, preparing meals, walking around the home, and dressing.

Cardiorespiratory Functioning

POD during routine activities may be due to poor cardiorespiratory functioning. Gallagher et al. (2005) showed that obese subjects may have as poor CRF as subjects with class II to IV heart failure. The current research used the same tool as Gallagher et al., the NYHA functional classifications, to compare CRF between obesity classifications. Research question two was whether there is a relationship between BMI and the NYHA functional classes. Results showed that an obese woman's self-assigned NYHA functional classification and her BMI have a significant, but low, positive correlation. Research question four is whether there is a difference in the NYHA functional classes between obesity classes I, II, and III. This study showed that there is a significant difference but they are primarily between classes I and II.

A moderately positive relationship also exists between the NYHA functional classification and POD during routine activities. These relationships persist even when functional limitations are re-classified into either having any level of functional limitation or not having any functional limitation. Nineteen of the 20 routine activities either approached significance or were significantly different between those with and without functional limitations. Assessing functional limitations may be a more accurate way to determine the impact of dyspnea in obese women than the BMI level alone. Research question five was whether there is a relationship between the amount of moderately intense physical activity engaged in weekly and the NYHA functional classes in obesity classes I, II, and III. This study found that the number of minutes per week obese women engage in moderately intense physical activity engaged was not related to any variable tested, including when the NYHA functional classes and obesity classes were combined. Again, however, these results may not be accurately quantified because subjects may not be able to recall the number of minutes per week they engaged in moderately intense physical activity.

Dyspnea and Physical Activity

Although three studies did not research dyspnea during routine activities, physical activity was shown to reduce oxygen consumption (Anderson et al., 1999) and increase the VO_{2max} in obese women (Fish et al., 1997; Larsson & Mattsson, 2003). The current research examined dyspnea and physical activity. The first research question was whether there is a relationship between the amount of moderately intense physical activity engaged in weekly and POD during routine activities. Results indicate that there is no relationship. Physical activity did not correlate with any variable, including POD during routine activities. However, subjects may not have been able to accurately recall the number of minutes they engaged in a moderately intense activity or have known what constitutes a moderately intense activity.

Dyspnea and Asthma

Some researchers posit that the risk of asthma increases as the BMI increases (Camargo et al., 1999) but others have found that those with a BMI greater than 31 kg/m^2 actually self-report asthma more often even though there is little evidence of airflow obstruction (Sin et al., 2002). The present study found that there is no relationship between obese women's POD during routine activities and a diagnosis of asthma and that asthma has little, if any, correlation with the BMI, the number of minutes per week of moderate activity, or functional limitations. One caveat is that only a small percent (10.7%) of the sample was diagnosed with asthma. The percentage of subjects in the sample who had asthma, however, was larger than in the general population of women in the United States (CDC, 2007a). Research question six was whether there is a difference in POD during routine activities between those with and without asthma. There were no differences in POD during routine activities between those who do or do not have a diagnosis of asthma. One caveat is that the number of subjects with asthma was small.

Implications for Nursing Practice

Based on the findings from this study, several implications for nursing practice can be seen. For years nurses have obtained a height and weight during an assessment. Nursing practice that focuses on a thorough assessment of the BMI classification and impact of obesity on women should be stressed. Many healthcare providers are not advising obese individuals to change their lifestyles (Galuska et al., 1999; Mokdad et al., 2001). Nursing practice has the opportunity to be on the forefront of using knowledge about the impact of obesity to develop interventions and educate obese women.

Nursing practice must first understand the impact of POD before developing or encouraging interventions aimed at improving health (for example, increasing physical activity). Nurses should be aware of the relationship between the obesity classification and POD during routine activities. Women in obesity class III have significantly more POD during routine activities when compared to women in obesity classes I and II. Even light activities affect women in obesity class III. These women may have difficulty with simple activities of daily living. At a minimum, nurses should assess these women for POD while bathing, walking, going up a flight of stairs, lifting heavy objects, and talking while doing any activity.

The significant relationship between the NYHA functional classifications and POD should also be emphasized. Nurses should be aware that measurement of the functional classification may be a more important tool in determining POD's affect on obese women, no matter the BMI classification. Nursing practice may find that obese women who classify themselves with any level of physical limitation may have difficulty with activities similar to what is seen in those diagnosed with COPD or heart failure. Nurses may need to counsel women who experience higher levels of functional limitations in managing everyday tasks such as bathing and walking before they will increase their physical activity.

Nursing practice should be aware that the relationship between asthma and POD or obesity has not been definitively established. Nurses may find it useful to establish obese women's atopic status and/or pulmonary function prior to starting interventions used in asthmatics with dyspnea.

Obese women hear many messages through the media about weight reduction and the importance of exercise. Often these messages are confusing; for example, is a low carbohydrate or low fat diet better. They see images of thin women on the television (often married or dating an obese man) so they know it is not socially desirable to be obese. Yet, the prevalence of obesity is rising. Educating these women may be very difficult but it is imperative they understand the health impact of obesity.

Finally, those practicing patient care nursing should open up communication with the nurse scientists. For example, if a nurse found anecdotal evidence of what influences obese women to decide to increase physical activity, this should be communicated to the nurse scientists to formally research whether specific interventions work for many obese women.

Implications for Future Research

Implications for future research became evident before this study began. For example, it became apparent that a qualitative study of the lived experience of obese women, particularly those in obesity class III, would be valuable. This would allow nurses to better understand the unique difficulties faced by obese women, specifically how arduous it is to engage in activities of daily living and methods used to manage dyspnea.

Results from this study indicate that more research should be done examining POD in obese women. For example, this study found that POD while engaging in eight activities that take a good deal of exertion was not significant between obesity classifications. Additional research needs to be done to determine whether these activities are difficult for all obesity classifications rather than not difficult for any. This might be accomplished by comparing results of obese subjects to subjects in the healthy BMI classification. Using a tool such as a VADS or the Borg Rating of Perceived Exertion, which are valid self-reports of POD experienced if the subject is actually engaging in an activity, might be used while a subject is walking up a flight of stairs, running, dressing, etc.

Another study examining POD in obese women could be the affect mass loading has on dyspnea. This study did not differentiate between subject's adipose distribution. One questions whether women who have adipose tissue primarily in their abdomen and breasts have more dyspnea than those with adipose primarily in other areas because of mass loading.

Determining which tool more accurately measures the impact obesity has on functional limitations needs to be examined. This tool needs to be one nurses can use to illicit recall of limitations. It is conceivable that the NYHA functional limitation classifications more accurately measure the impact of dyspnea in obese women than the BMI alone. This tool should be studied in a larger population with tests for validity and reliability. If validity and reliability tests are high, this tool should be compared to the VADS, Borg Rating of Perceived Exertion, and UCDQ to determine whether they measure different phenomenon.

Results from this research indicate that much more about the role physical activity plays in the POD and functional limitations in obese women needs to be studied. If it is found that physical activity is a mitigating factor, the level of activity and dose response needs to be studied. If it is found that physical activity does not reduce dyspnea and/or functional limitations, research should be done that explores what can improve these factors.

Finally, asthma's relationship to POD also could be a future area of research. This study found that asthma did not correlate with any variable but the number of subjects diagnosed with asthma was very small. Future research could compare the POD of obese subjects without asthma to the POD of match controlled obese women with asthma confirmed by a positive atopic status or pulmonary function testing, not self-report.

Limitations of this Study

There are several limitations to this study that must be addressed. The most glaring limitation is that all answers were self-reports. Self-report of weight is somewhat mitigated by anonymity and, as shown in the Rand Health Insurance Study, a subjects' self-reported weight and their actual weight highly correlate ($r = 0.98$ to 0.99) when given to health professionals (Katz et al., 2000). Of more concern is the subjects' recall of the number of minutes they engaged in moderately intense physical activity over the previous week and their ability to identify a moderately intense activity. The range for physical activity was zero to 720 minutes (one answer of 2,000 minutes was treated as non-responsive) with a mean of 118.67 (SD, 137.78) and did not correlate with any other variable. These data support the concern over this limitation.

A second limitation concerns subjects' respiratory status. A small percentage of the sample self-reported a diagnosis of asthma making comparisons questionable. Additionally, some subjects may have an undiagnosed respiratory illness.

Other limitations are that subjects were volunteers, primarily Caucasian, and the majority was obtaining a post-secondary education; many working toward or had obtained advanced degrees. Finally, a social desirability bias may have occurred. These limitations mean results cannot be generalized to other populations.

Strengths of this Study

A strength of this study is that the dissertation committee was specifically chosen for their research and educational expertise. For example, the committee chairman and one member have used technology in previous research. The researcher is a certified case manager with experience managing obese clients and using technology for data management and is on the Board of Directors of the St. Louis Regional Asthma Consortium and Chairman of the Consortium's Advocacy committee. Results of this study will allow nurses to understand POD of obese women during routine activities and build effective interventions to assist their subjects in managing dyspnea. Finally, a strength of this study is that the results have potential personal and social implications for obese women.

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Appendix A - Flyer

College of Nursing
at the University of Missouri-St. Louis

A registered nurse and doctoral student requests your help.

Hello, I am doing a study as part of the process to get my doctorate at the University of Missouri at St. Louis. You are invited to participate in this study to find out more about breathing problems, weight, and physical activity in women and I need your help if you:

- Are a woman;
- Are age 20 to 56;
- Do not have chronic obstructive pulmonary disease;
- Are not pregnant;
- Do not smoke;
- Do not muscle train three times or more per week; and
- Do not have a heart problem such as a heart attack or heart failure.

If you meet all these conditions, will you please go to a secure Internet site to answer the questions in a survey? It will take you about 10 minutes to complete the online survey. Approximately 80 subjects will be involved in this research. There are no risks or discomforts associated with this research. All the information asked on the survey is needed to make the research as accurate as possible. Please be assured that responses are confidential; there is no information on the survey that would identify you.

Your survey answers will be combined with others' to calculate information. Handling of the information will be done by the researcher. The data files will be stored in a locked file cabinet accessible only to the researcher for six years. After that time, all files will be destroyed as required by the University of Missouri System. There are no participation costs. Completion of the survey implies consent to use your answers in the final analysis. The survey is on this website: http://webpages.charter.net/phdrn2b**.** Thank you for your help with this study. **Remember:** Your participation is voluntary.

Sincerely,

Donna Jewell, PhD(c), RN, CCM

You may contact me at phdnurse2b@charter.net or (618) 541-0530 if you have questions about this research. If you have any questions about your rights as a research subject, you may call the Chairperson of the Institutional Review Board at (314) 516-5897.

Appendix B - Survey

The College of Nursing logo and the following questions will be placed onto an online survey. The order in which they appear here will be the same on the online survey however, the overall look will not be the same. Prior to entry into the survey the criteria listed on the flyer will be repeated.

Instructions: You do not have to answer all these questions. However, to assure that the study is the most accurate possible, it is VERY important you fill in the questions as accurately and completely as possible. Please be assured that responses are confidential; there is no information on the survey that would identify you.

1. Has a doctor or nurse told you that you have:

   COPD (chronic obstructive pulmonary disease) Y N

   Heart Problems (heart attack, heart failure) Y N

   Asthma Y N

2. If you have been told you have asthma, have you had skin testing that showed you are allergic to several things? Y N
3. If you have been told you have asthma, have you had pulmonary function tests done? Y N
4. How tall are you? _____ feet ____ inches
5. How much do you weigh? ______ pounds
6. Do you do muscle training at least three times per week? Y N
7. What is your age? ______ years ______ months

8. Are you female? Y N

9. Do you smoke? Y N

10. How many minutes in the last 7 days did you do moderate exercise?

Examples are listed below. ___________ minutes

Aquatic aerobics

Bicycling 5 to 9 miles per hour on level road

Carrying a child weighing less than 50 pounds

Cleaning gutters

Gardening: raking the lawn, digging, weeding while standing or bending

Golfing: pulling cart or carrying clubs

Horseback riding

Mowing the lawn

Playing Frisbee

Playing tennis doubles

Playing with animals

Playing with children while walking, running, or climbing

Recreational swimming

Refinishing furniture

Scrubbing floors

Shoveling grain

Shoveling light snow

Singing while actively moving

Wading in a stream

Walking at a pace 3 to 4.5 miles per hour such as walking:

- To class, work, or the store
- For pleasure
- The dog

While using crutches

Washing windows

Weight lifting Nautilus machines or free weights

Yoga

11. During a typical day, how would you describe your reaction to ordinary daily activity?

No limitations	☐
Comfortable at rest but slight limitation during ordinary	☐
Comfortable only at rest with marked limitation to activity, even during less-than-ordinary activity	☐
Severe limitations, even at rest	☐

12. Which of these best describes your race/ethnicity?

Non-Hispanic White	☐	Hispanic Black	☐	Pacific Islander	☐
Hispanic White	☐	African American	☐	Asian	☐

Other: ____

13. Please rate your shortness of breath when you do the following activities. Choose the ONE button which best describes how you feel when you do the activity.

Check the 1st button if you are not at all short of breath.

Check the 3rd button if you are occasionally short of breath.

Check the 5th button if you are always short of breath

You may also choose the buttons in-between (2nd and 4th).

If you would LIKE to do the activity, but cannot because of your shortness of breath, choose the 5th button. If the activity is something you are NOT INTERESTED in doing, choose the last button.

	Not at all short of breath		Occasionally short of breath		Always short of breath or cannot do	Not Interested
Walking around your home	1	2	3	4	5	9
Dressing yourself	1	2	3	4	5	9
Eating	1	2	3	4	5	9
Taking a bath or shower	1	2	3	4	5	9
Going for a walk	1	2	3	4	5	9

Walking up a flight of stairs	1	2	3	4	5	9
Preparing meals	1	2	3	4	5	9
Playing Sports	1	2	3	4	5	9
Lifting 20 lbs (2 watermelons or 2 cans of paint)	1	2	3	4	5	9
Running	1	2	3	4	5	9
Talking while walking around your home	1	2	3	4	5	9
Talking while dressing yourself	1	2	3	4	5	9
Talking while walking on a level surface	1	2	3	4	5	9
Talking while walking up a steep hill	1	2	3	4	5	9
Talking while walking up a flight of stairs	1	2	3	4	5	9
Talking while preparing meals	1	2	3	4	5	9
Talking/singing while taking a bath or shower	1	2	3	4	5	9
Talking while playing sports	1	2	3	4	5	9
Talking while lifting 20 lbs (2 watermelons or 2 cans of paint)	1	2	3	4	5	9
Talking while running	1	2	3	4	5	9

14. What range is your household income?

$0-$20,000	☐	$20,000-$50,000	☐
$50,000-$100,000	☐	More than $100,000	☐

15. What is the highest grade in school you finished? ___________

VITA AUCTORIS

Donna Althea Jewell was born in Kansas City, Missouri on October 5, 1954, to the late Don William Jewell and the late Leona T. Rivers-Jewell. She has three adult daughters, Kimberly Faith Harbian, Bethany Ilene Bowen, and Anndria Jewell Powers. Ms. Jewell attended St. Luke's Hospital School of Nursing located in Kansas City, Missouri, and graduated with a diploma in nursing in 1977. In 1999 she graduated from University of Missouri – St. Louis with a Bachelor of Science in Nursing. Ms. Jewell is currently a candidate for the degree of Doctor of Philosophy at the University of Missouri – St. Louis. She is a certified case manager and a member of Sigma Theta Tau International, nursing's honor society, and the North American Association for the Study of Obesity. While completing this research, Ms. Jewell is working as adjunct faculty for several regional universities, serves on the board of directors of the St. Louis Regional Asthma Consortium (SLRAC), and is the Chairman of the SLRAC's Advocacy committee.