The Relationship Between Physical Activity and Perceived Health Status in Older Women: Findings from the Woman's College Alumni Study

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Abstract:

Using data collected from the Woman's College (WC) Alumni Study, the purpose of this study was to determine whether perceived health status is related to physical activity in older women. A multiple linear regression analysis was conducted to examine the relationship between amounts of physical activity and self-reported health status. The results of the current study reveal that the level of physical activity is significantly correlated with perceived health status. The findings of this study have implications for the assessment of older individuals' health and may lead to interventions that are tailored to increase physical activity among older women.

Keywords: physical activity | exercise | aging | women | health status

Article:

Introduction

A large body of literature links physical activity to positive health outcomes, including lower rates of chronic disease, better cognitive and physical function, as well as mental health (Bassuk & Manson, 2005; Burke et al., 2001; Newman et al., 2009; Rockhill et al., 2001). However, less is known about the association between physical activity and perceived health.

Perceived health and other subjective rating of health have been of interest in health research for some time, and self-rated health has been shown to be a valid indicator of true health status (Ferraro & Farmer, 1999). Health was traditionally defined as the absence of disease or illness (Saracchi, 1997). Many researchers have criticized this definition, suggesting that health is a more subjective phenomenon that is experience driven and based on how a person is feeling and "doing" despite the presence of disease (Lyon, 1990). Many individuals can never meet the traditional definition of health, since more people are developing and living a large portion of their lives with chronic diseases such as diabetes or obesity. This is particularly true for aging

adults, as the likelihood for developing a chronic disease increases with age (Andersen-Ranberg, Schroll, & Jeune, 2001).

Many studies have attempted to identify what factors are correlated with perceptions of health. Influences such as lifestyle, social conditions, demographic factors, and chronic disease have all been shown to be determinants of perceived health (Benyamini, Leventhal, & Leventhal, 2007; Ferraro, Farmer, & Wybraniec, 1997; Molarius & Janson, 2002). However, there is limited evidence linking physical activity to perceived health, especially in older females. The majority of data on physical activity and perceived health in older adults have included only men in the subject pool, despite the fact that women tend to live longer than men (Sun et al., 2010). Furthermore, positive self-rated health is one of the most important predictors of survival in elderly women (Ford, Spallek, & Dobson, 2008). Unfortunately, women usually perceive their health status to be lower than men's (Benyamini et al., 2007; Denton & Walters, 1999). This is typically because females tend to use a broader definition of health than males that takes into account different factors like emotional distress or non-life-threatening illnesses when self-rating their health.

The current study explores the relationship between physical activity and perceived health status among older women. Using data collected from the Woman's College (WC) Alumni Study, this project will explore (a) the WC alumnae rates of physical activity; (b) how the WC alumnae rate their health status; and (c) the relationship between physical activity and perceived health status among WC alumnae, controlling for factors that may influence health status (age, Body Mass Index [BMI], chronic disease diagnosis, marital status, smoking status, financial security, and spiritual satisfaction). We hypothesize that perceptions of health would be associated with physical activity among WC alumnae.

Methods

Sample

Participants were alumnae of the Women's College of the University of North Carolina, now known as the University of North Carolina at Greensboro (UNCG). UNCG was established in 1891 by state legislation. The institution has been called by a variety of names, including the State Normal and Industrial School (1892–1897), the State Normal and Industrial College (1897–1919), the North Carolina College for Women (1919–1931), and the Women's College of the University of North Carolina (1932–1963), before adopting its current name after becoming a coeducational institution in 1963.

The total sample for the current study consisted of 1,024 predominately Caucasian adult females between the ages of 60 and 99 (See Table 1). Alumnae attended either the North Carolina College for Women or the Women's College of the University of North Carolina between 1920 and 1963. The vast majority of the sample attended the latter, or the WC, as it was affectionately referred to by its students.

TABLE 1 Characteristics for the WC Alumni	
Categorical Variable	**Percent of Cohort**
Years of Graduation*	
1920-1930	0.6%
1931-1940	5.9%
1941-1950	30.6%
1951-1960	48.0%
1961-1963	12.9%
Further Education Beyond WC	
Yes	59.8%
No	36%
Self-Reported Ethnicity*	
Caucasian	97.9%
Black	0.1%
Native American	0.7%
Current Annual Household Income	
<$25,000	8.5%
$25,000-$45,000	18.9%
$45,000-$65,000	19.6%
$65,000-$85,000	19.8%
>$85,000	33.1%
*Missing data on some respondents	

The UNCG Alumni Office provided a list of 8,969 WC graduates with an active address. Those without addresses, deceased, any males who attended special programs during the WC years, those who had specified no contact, no mail, and/or no e-mail, as well as those persons outside the United States were eliminated from the list. A random sample of 1,818 alumnae was drawn from this list. Of the 1,818 alumnae, 77 were determined to be deceased, and 49 were returned undeliverable; hence 1,693 women probably received the questionnaire. Of these, 1,024 returned a completed questionnaire for a response rate of 56.33%. Another 8.2% responded in some form (i.e., family member returned questionnaire indicating individual was deceased or incapable of completing form) and 35.3% did not respond in any form. Table 2 summarizes the response rate.

TABLE 2 Response Rates for Woman's College (WC) Alumni Study		
Status	**Frequency**	**Percent**
Finalized Cases		
Complete questionnaire received	1,024	56.33
Deceased	77	4.09
Incapable	21	1.15
Received blank	13	0.71
Refusal by mail	26	1.43
Refusal by telephone	15	0.82
Return mail	48	2.64
Other no response cases	594	32.67
Total	1,818	100.00

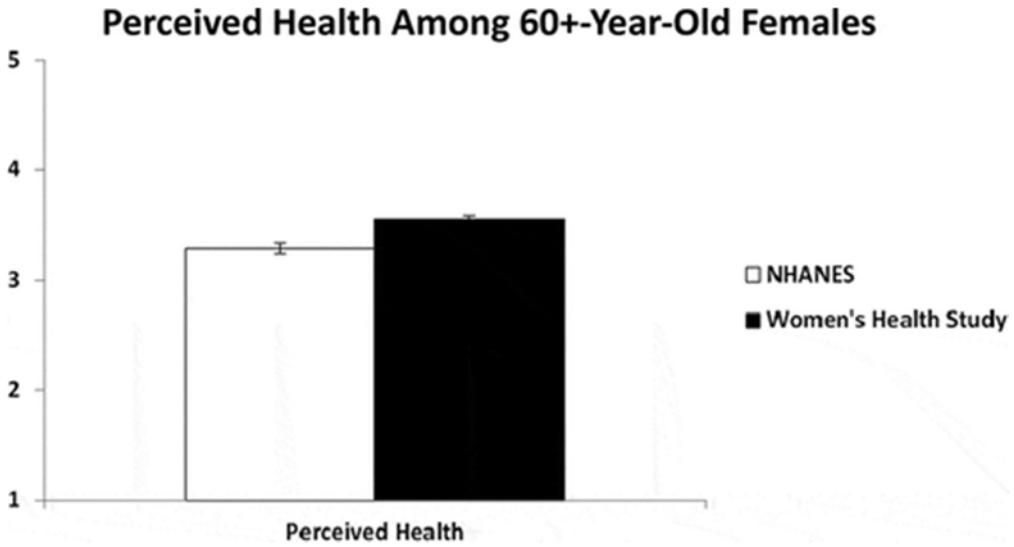
Survey Development

The WC Alumni Study was conducted by the Center for Women's Health and Wellness (CWHW), which is part of the School of Health and Human Services at UNCG. The mission of the CWHW is to advance the health and wellness of all women and girls through collaborative research, educational programs, and community engagement. The CWHW was interested in the relationship between the roles WC women played (e.g., worker, spouse/partner, mother, community volunteer) and their health and quality of life. The main purpose of the WC Alumni Study was to identify the factors that affected the quality of life and health of women as they age. The CWHW contracted with the Odum Institute for Research on Social Science at UNC Chapel Hill to manage the logistics of the survey. Working with Odum staff, the CWHHW revised and finalized the questionnaire, conducted a cognitive test of the instrument, and conducted a pilot study with 100 randomly selected WC alumnae.

The content of the final survey was informed by the results from the pilot study and from input solicited and received from faculty around UNCG's campus. The 44-page questionnaire included separate sections on: (a) their experiences at WC; (b) volunteer service; (c) employment/paid work; (d) spouse/partner; (e) children; (f) family; (g) friends, neighbors and community; (h) thoughts about their life; (i) physical activity; (j) leisure activity; (k) health; and (l) miscellaneous background information. For this particular project, we were interested in data regarding physical activity and perceived health status. Additionally, we examined age, BMI, chronic disease diagnosis, marital status, smoking status, financial security, and spiritual satisfaction because of their potential to influence perceived health.

Our interest in this area was a result of preliminary findings that compared perceived health status of the WC alumnae to adjusted data from the National Health and Nutrition Examination Survey (NHANES). A nonparametric (Kruskal–Wallis Test) was run to compare the WC alumnae to the typical American population in regards to their perceived health. The group was matched for age, sex, and education status. The nonparametric test yielded statistically significantly different results, which suggested that the WC alumnae may have a higher rating of perceived health than typical American females of a similar age and education level ($p = .000$)

(Figure 1). This finding began an exploration into the perceived health ratings of the WC alumnae.



Measures

The CWHW defined physical activity as any activity that causes at least small increases in heart rate and breathing. WC alumnae were asked to report the specific number of hours they spent doing a variety of physical activities, intense or leisure, in a typical week during the past four weeks. Fifteen options were provided, including walking, gardening, and golfing, among other things.

Metabolic equivalent (MET) was determined for each activity. MET is used to determine the intensity of activities and is calculated as the ratio of the activity metabolic rate to a standard resting metabolic rate of 1.0 (Ainsworth et al., 2000). For this study, total physical activity was broken into quartiles based on the intensity of the exercise completed. The quartiles were broken down as follows: high (>5 METS), medium high (4–5 METS), medium low (3–4 METS), or low (<3 METS) METS. For each alumna, rates of physical activity were totaled and mean scores were calculated using MET × Hr/Wk for each quartile.

Health status was determined with a single question. WC alumnae were asked to rate their health as excellent, very good, good, fair, or poor. Despite its simplicity, this one item has been shown to accurately capture an individual's cognitive awareness of their personal health (Benyamini & Idler, 1999; Bosworth, 1999).

Variables with potential to influence perceived health ratings were obtained through various questions. Age was determined by a single question: "In what year were you born?" BMI was calculated based on participants response to "Currently, how tall are you?" and "Currently, how much do you weigh?" Relationship status was obtained through the question, "What is your current relationship status?" Response options included very important, somewhat important, not very important, or not at all important.

Data Analyses

To access correlations between subject characteristics and perceived health, a multiple regression was used. The statistical analysis was run on SPSS Version 20 (Armonk, NY). Independent variables measured included total MET × Hr/Wk, BMI (Kg/m2), age (years), number of doctor diagnosed diseases, financial security, spiritual satisfaction, whether they were currently married, and whether they were a current smoker. The quartiles for the total MET × Hr/Wk were analyzed separately from the other independent variables. The enter method was used initially, followed by a stepwise method to determine which variables contributed the most to the rating of perceived health. The stepwise method consisted of entering a dependent variable with probability of $F \leq 0.05$ while removing a dependent variable with probability of $F \geq 0.1$.

RESULTS

Physical Activity

The mean weekly self-reported physical activity (PA) assessed as MET × Hr/Wk was similar in the 60–69 and 70–79 age groups (63.4 and 62.7 MET × Hr/Wk respectively) but was reduced in the 80–89 and 90+ age groups (47.5 and 40.4 MET × Hr/Wk respectively). This 36.3% reduction in weekly PA across four decades represents a significant reduction in activity ($p < .001$). See Figure 2.

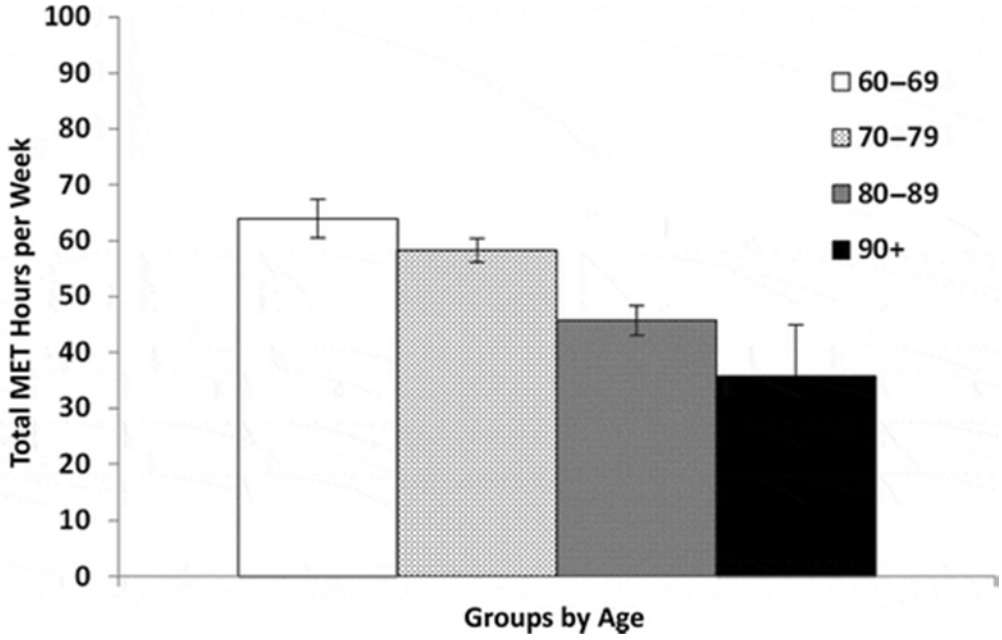


FIGURE 2 Mean MET × Hr/Wk by age groups.

Perceived Health Status

The proportion of the WC sample by self-perceived health status was the following: 3% evaluated their own health as excellent, 12% preferred very good, almost 30% chose good, most of them favored fair (39%), and some selected poor (16%; see Table 3).

TABLE 3 Mean Perceived Health by Age Groups

Perceived Health Responses	Excellent	Very Good	Good	Fair	Poor	No Response
Number of Respondents (%)	27 (3%)	115 (12%)	293 (30%)	390 (39%)	161 (16%)	38

Relationship Between PA and Health Status

When all of the independent variables (PA, smoking, age, number of diseases, BMI, financial security, spiritual satisfaction, and marital status) were entered into a multiple regression for the dependent variable perceived health, there was a significant correlation ($p = .000$). However, the correlation did not account for a large proportion of the changes in ratings of perceived health ($R2 = 0.319$), and many coefficients had standardized values less than 0.1. When the stepwise model was used, BMI, financial security, spiritual satisfaction, and marital status were not included as independent variables. The stepwise multiple regression was statistically significant with an adjusted R2 value of 0.30 ($p = .001$; Table 4).

The independent variable with the highest correlation to perceived health was the number of doctor-diagnosed diseases ($\Delta R2 = 0.23$, $p = 0.000$). Total MET × Hr/Wk alone was able to account for 4.9% of the variance in the rating of perceived health ($\Delta R2 = 0.053$, $p = .000$). When PA was broken into quartiles by intensity and run using a separate stepwise model, both low and medium-low intensities were removed from the multiple regression. The high and medium-high intensity PA was able to account for 5.5% of the variance in the rating of perceived health ($R2 = 0.055$, $p = .000$). If the high and medium-high MET × Hr/Wk were used in the multiple regression in place of total MET × Hr/Wk, there was no difference in the percent of variance accounted for in the rating of perceived health. Both smoking status and age were left in the model, accounting for 2.4% and 1.7% of variance respectively.

TABLE 4 Results of Multiple Regression					
	Unstandardized Coefficients		**Standardized Coefficients**		
	B	***SE***	**β**	***t***	**Sig.**
Constant	5.723	0.093		42.872	0.000
Number of diagnosed diseases	-0.325	0.029	-0.443	-11.183	0.000
Total MET hours per week	0.005	0.001	0.195	4.938	0.000
Smoking status	-.0618	0.135	-0.178	-4.563	0.000
Age	-0.023	0.006	-.0140	-3.555	0.000
Note. Adjusted $R^2 = 0.30$ (Standard Error of the Estimate = 0.84334)					

Discussion

Data from a large sample of older women demonstrate a statistically significant positive relationship between physical activity and perceived health status. Although perceived health status has been shown to be associated with PA, the current study to our knowledge is the first to reach this conclusion using an older, all-female sample.

The results of the current study reveal that physical activity participation shapes a subjective health assessment in older women. However, other factors were also influential. A statistically significant correlation between the number of diagnosed chronic diseases, smoking, and age were also observed for perceived health. Moreover, factors shown in other studies to be influential on perceived health—BMI (Ebly, Hogan, & Fung, 1996), financial security (Garbarski, 2010), spiritual satisfaction (Krause, 2010), and marital status (Lindstrom, 2009)—were not significantly related to perceived health in this sample of older women.

Supporting our hypothesis, PA was the second-strongest predictor of perceived health status. This is similar to previous findings from both The Cardiovascular Health Study (Newman et al., 2003) and the Harvard College alumni study (Vaillant & Mukamal, 2001), which found a strong association between physical activity and improved overall health status. In a study by Kwasniewska, Bielecki, and Drygas (2004), participants who regularly exercised at least two to three times a week for a minimum of 30 minutes assessed their health much better that those who were leading a sedentary lifestyle. As previously mentioned, the WC alumnae are extremely active, especially when compared to nationally recommended amounts of physical activity needed by adults to "improve and maintain health" from the American College of Sports Medicine and the American Heart Association (Haskell et al., 2007). This is quite unusual because the majority of older adults do not achieve the recommended levels of physical activity (Egerton & Brauer, 2009). It is well documented that individuals tend to overreport PA (Washburn & Montoye, 1986), but even if the WC alumnae overreported by 50%, the least-active group (34 MET·hr/wk) would still average on the high end of the recommended amounts. Many of the WC alumnae have clearly developed a propensity for active living that has lasted

well into their senior years. This could possibly be attributed to the strong education and emphasis on physical activity that many of these women received while attending the WC (Trelease, 2004). This issue clearly requires further investigation, as it highlights the importance of understanding the educational influences that impact the development of physically active lifestyles in women.

Similar to other studies, the single best predictor of perceived health was the number of chronic diseases. This finding is comparable to other studies that examined perceived health status. Shields and Shooshtari (2001) found that men and women with two or more chronic diseases were less likely to report very good or excellent health than those who did not have chronic disease. Additionally, a study by Ebly et al. (1996) found that the number of functional limitations and chronic illnesses were the strongest explanatory variable for poor perceived health in persons aged 85 years. Although this finding appears to be somewhat contradictory to our hypothesis that physical activity would be the primary factor influencing perceived health, it is extremely important to realize that there is an inverse relationship between physical activity and chronic diseases, which has been the focus of a significant amount of research. Many studies have investigated the relationship between physical activity and the prevention of chronic diseases (e.g., high blood pressure, depression, obesity, diabetes, osteoporosis, etc.; Centers for Disease Control and Prevention [CDC], 2009; Oberg, 2007; Von Bonsdorff et al., 2008; Vuori, 2004). According to the CDC (1997, pg. 1), "regular physical activity is important for the primary and secondary prevention of many chronic diseases, disabling conditions, and chronic disease risk factors." The fact that WC alumnae report exceptionally high rates of weekly exercise as well as low rates of chronic disease may partially explain this finding.

Finally, smoking status and age made a minor contribution to perceived health status. These results are not unexpected. In a study of old and middle-aged Chinese adults, Ho, Lam, Fielding, and Janus (2003) found that smoking was significantly associated with poor self-rated health. This was also found in Shields and Shooshtari's (2001) study. They reported that heavy cigarette smokers were less likely to report very good or excellent health than counterparts who had never smoked daily. Likewise, a study by Liang et al. (2005) found that perceived health decreased with age, especially between the ages of 60 and 85. Pinquart (2001) also found subjective health changes associated with age, which further support our findings.

We recognize that none of the variables examined in this study was highly predictive of perceived health status. This could be due to several factors. The WC alumnae are very homogenous. Low correlations could be a result of a large sample size with little to no variability. For example, of the factors shown in other studies to be influential on perceived health (i.e., BMI, financial security, spiritual satisfaction, and marital status), it is quite surprising that BMI did not have a significant effect. However, since the WC alumnae had relatively low BMIs with little variance among the group and incredibly low rates of obesity when compared to national prevalence data from the Behavioral Risk Factor Surveillance System Survey (CDC, 2009), it is possible that the influence of BMI on perceived health would be difficult to detect in the WC alumnae. Secondly, it is possible that the WC alumnae define health in a way that was not captured in the questionnaire. When asked to rate overall health, some people may use

additional information beyond general health. Because the single question used to obtain health status did not focus on physical health specifically, it is possible that participants considered other dimensions of their health, such as mental or emotional well-being.

Strengths and Limitations

The present study's strength lies in the fact there is a lack of data on physical activity and health in older women. The findings are a useful addition to current literature, as they clearly show that perceived health in older women is influenced by physical activity. Additionally, few studies have had access to such a full range of variables thought to be related to perceived health status. The comprehensive nature of the WC Alumni Study permitted us to examine individually and simultaneously the predictive value of known correlates to perceived health status.

This study has several limitations. First, data reflect the participant's current situation. No data were collected longitudinally, making any observation of change over time impossible. Additionally, as is the case with all survey research, consideration must be given to which individuals responded to the questionnaire. It is possible that the healthier alumnae were the ones who participated. One must consider the possibility that women who live longer may be inherently healthier due to lifestyle choices that make them more likely to be active and have lower rates of chronic disease (Rowe & Kahn, 1997). Likewise, it is important to consider that we know nothing about the chronic disease rates and physical activity patterns of the WC alumnae that were already deceased.

Implications

Despite ample evidence for the benefits of regular physical activity in older adults, most people tend to become less active as they age (Agency for Healthcare Research and Quality, 2002). With the number of people age 65 and older projected to more than double between 2010 and 2050 to 88.5 million or 20% of the population (National Institute on Aging [NIA], 2009), the health of the aged population has become increasingly important.

The findings from this study draw attention to the impact of physical activity as we age. This is of unique concern, considering the low rates of physical activity among seniors, but especially among older women. The current study provides important information for medical and health professionals who are interested in healthy aging and optimal health in later life. The results can be used to promote the benefits of a more active lifestyle in older women. Continued research regarding physical activity and perceived health status is of the essence, and this information is essential to further expand our current understanding of the aging process.

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Notes

*Missing data on some respondents.

Note. Adjusted R2 = 0.30 (Standard Error of the Estimate = 0.84334).

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