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Predictors of Physical Activity Among Persons With Multiple Sclerosis

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ABSTRACT

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Multiple Sclerosis is a chronic neurological disease whose prevalence within the world's population is increasing. Symptoms of this disease are fatigue, loss of coordination, numbness and tingling, paralysis, and blindness. Currently there is no cure for the disease and, with its disabling variety and severity of symptoms, it is important to look for possibilities that could help slow its progression.

Physical activity is one health behavior that promises to slow the progression of the MS among persons afflicted with this disease. Research has revealed that an exercise program improves several measures of well-being, reduces fatigue, and improves strength. While physical activity has been suggested as a management tool, those with MS demonstrate lower levels of physical activity compared to those without MS in the U.S. population.

This thesis investigates what influences individuals with MS to participate in physical activity. Its purpose is to look into the possibility that demographic, social hierarchy, social support, and psycho-social/personality characteristics may help predict physical activity regimens among persons with MS. Isolating the determinants of

voluntary exercise in the MS subpopulation would enable clinicians and the public health community to develop effective policies and interventions that promote physical activity.

(56 pages)

PUBLIC ABSTRACT

Predictors of Physical Activity Among Persons with Multiple Sclerosis

Multiple Sclerosis is a chronic neurological disease with a wide range of symptoms that vary from fatigue to paralysis. People diagnosed with MS will have the disease for the rest of their lives because there is no cure. If there was a way to alleviate the severity of the symptoms or slow the progression of the disease then that would be something important of those with MS to know.

A health behavior that promises to slow the progression of the MS for people diagnosed with this disease is physical activity. Research has shown that an exercise program improves several measures of well-being, like reduced fatigue and improved strength. While physical activity has been suggested as a management tool, those with MS demonstrate lower levels of physical activity compared to those without MS in the U.S. population.

This research is focused on what influences individuals with MS to participate in physical activity. Its purpose is to look into the possibility that demographic, social hierarchy, social support, and psycho-social/personality characteristics may help predict physical activity regimens among persons with MS. Isolating the determinants of voluntary exercise in the MS subpopulation would enable clinicians and the public health community to develop effective policies and interventions that promote physical activity.

This analysis adds to the research that has already been performed by looking at many different socio-demographic topics. The research could have been improved had more aspects been available for analysis. The data set used in this research came from the questions asked in the National Health Interview Survey. Improvements in future research on the topic of MS and the predictability of physical activity among those with the disease are dependent on the development of new studies or possible improvement of surveys already produced like the NHIS. Two main improvements in new studies need to be an increased sample size and questions that are tailored towards social support and psycho-social measures.

Any research into this area will expand the knowledge base of what determinants could influence people with MS to voluntarily participate in physical activity. One potential benefit of this outcome is an effective way to help those with MS to manage their symptoms and possibly delay their onset. This, in turn, would improve their quality of life. In the end, that is the ultimate goal of all research on this topic.

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INTRODUCTION

Multiple Sclerosis

Fatigue, loss of coordination, numbness and tingling, paralysis, and blindness are all symptoms of a chronic, neurological disease called Multiple Sclerosis (MS). This disease occurs when the body attacks the myelin sheath that covers the nerve fibers along the brain and spinal cord, often called demyelination (Motl, McAuley, and Snook 2005). This causes the once fully functioning nerve fibers to be exposed and damaged. The messages sent to the rest of the body are then misread, causing the symptoms associated with the disease (NMSS 2011).

MS impacts the lives of more than 400,000 people in the United States and over 2.1 million worldwide (NMSS 2011). It is estimated that about 200 new cases are diagnosed weekly in the United States. MS is characteristically 2-3 times more common in women than men, and diagnosis usually occurs between the ages of 20 and 50 (NMSS 2011). While not fatal, MS can cause disability in those suffering with the disease. Many use some sort of aid to help them perform normal daily activities such as walking (Mitchell et al. 2005; NMSS 2011). With a steady increase in the number of diagnoses, the unpredictable illness trajectory, and no cure at this time (Kayes et al. 2011; Benito-Leon et al. 2003; Motl et al. 2005), the topic of MS, and slowing the progression of the disease, is one of increasing importance for research.

Physical Activity and Multiple Sclerosis

Scientific research suggests that physical activity can be a useful management tool for individuals with MS. Physical activity is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure" (Caspersen, Powell, and Christenson 1985:126). Physical activity is considered a modifiable behavior, meaning that it is a lifestyle choice that can be altered by the individual (Huisinga et al. 2011; Motl and Gosney 2008). The majority of deaths in western countries are due to lifestyle choices such as lack of exercise, improper diet, as well as alcohol and tobacco usage (Rogers 1997). These are all modifiable behaviors. Without a cure for the disease, and with substantial limitations for effective long-term pharmacological interventions for persons with MS (Stroud, Minahan, and Sabapathy 2009; Kayes et al. 2011), physical activity is a potentially important alternative intervention method. Because of physical activity's importance in managing MS symptoms and potentially slowing disease trajectory, I will attempt to discover personal characteristics may help predict voluntary participation in physical activity.

There is an extensive research base on the positive effects of physical activity for individuals with MS. While historically, individuals with MS have been advised not to perform physical activity (Snook et al. 2009), this is no longer the case. Physical activity improves measures of well-being, reduces fatigue, and improves strength (Petajan and White 1999). Similarly, Stroud and Minahan (2009) found that individuals with MS who regularly participate in physical activity score better on indicators of fatigue, depression and quality of life (QoL) than those with MS who do not participate regularly in physical activity.

In addition to quality of life issues, it is postulated that physical activity has the potential to hinder the progression of MS (Dalgas and Stenager 2012). Physical activity among individuals with MS also promises to delay the onset of disability, aiding independence in daily life (Romberg et al. 2004). This is important because it provides persons with MS some sense of control over a disease that is often characterized by unpredictable illness trajectories. Physical activity among individuals with MS has shown such encouraging results that scholars recommend that regular aerobic exercise should be part of the rehabilitation process for MS patients (Mostert and Kesselring 2002).

Despite research indicating physical activity as an ideal disease management tool, evidence suggests that persons with MS have lower levels of physical activity compared to the general population (Motl and Gosney 2008; Marrie 2011; Petajan and White 1999; Motl et al. 2005; Romberg et al. 2004). A study by Ng and Kent-Braun (1997) examines activity levels among those with MS, as well as a sedentary control group. Through the use of accelerometer readings and questionnaire data, even when compared to the sedentary control group, individuals with MS show lower levels of physical activity. Only 22 percent of MS patients participate in light to moderate physical activity, and only 19 percent participate in leisure time activity (Ferrier, Dunlop, and Blanchard 2010). This is 20 percent lower than the general population, which reports participation in physical activity at 40 percent (Seefeldt, Malina, and Clark 2002).

This disconnect between evidence and action is cause for renewed research focus on the determinants of physical activity among persons with MS. Since only 1 in 5 people with MS avoid considerable disability (Mitchell et al. 2005), studying ways to prolong the onset of disability is important. Physical activity has the potential to slow the

progression of MS symptoms but, as noted, individuals with MS have lower levels of physical activity than the general population. Therefore, the aim of my research is to improve understanding about the social determinants of physical activity among those with MS.

By examining various theoretical approaches to this issue, I isolate a number of potentially important predictor variables, including social hierarchy, social support, and psycho-social characteristics. These characteristics include demographic, behavioral, social, and psychological factors that may either encourage or dissuade persons with MS to engage in routine physical activity. The following section will discuss the theories supporting these measures.

THEORETICAL BACKGROUND

Social Hierarchy

Socioeconomic position is known in social epidemiology to exert a considerable influence over health. Consequently, the fundamental cause explanation has become a mainstay in social epidemiology and the demography of health and aging. According to Link and Phelan (1995:81), a fundamental cause "involves access to resources, resources that help individuals avoid diseases and their negative consequences through a variety of mechanisms." Socioeconomic status (SES) is the most central fundamental cause of disease according to the theory. Measurements of SES include education, income, wealth, and occupational classifications. Different socioeconomic positions are associated with access to vital resources that determine the likelihood of harmful exposures and health improvement resources (Lynch and Kaplan 2000). An example of this can be seen in the study of AIDS and sexually transmitted diseases. No matter how knowledgeable a person may be about the risk of unsafe sexual behavior, homeless persons or extremely poor women forced to take up prostitution to survive may not feel they have a choice but to engage in risky behaviors. "Medical sociologists and social epidemiologists have… demonstrated a substantial causal role for social conditions as causes of illness" (Link and Phelan 1995:83). For my thesis, physical activity is the resource that will help individuals with MS improve their health outcomes, and SES can be viewed as a fundamental cause or explanation why some persons with MS participate in physical activity, but others do not.

Several studies on the topic of MS examine SES as a key determinant across a range of outcomes. One study that focuses on employment status among persons with MS found that unemployment can have a dramatic effect on self-worth (Smith and Arnett 2005). In turn, joblessness can result in financial difficulties that cause stress to persons with MS and their caregivers. Another study reports that while 90 percent of persons with MS are employed prior to diagnosis, after diagnosis only 20 to 40 percent continue in the workplace (Patti et al. 2007). Unemployed individuals report low scores in many health related quality of life domains. Maintaining employment should be encouraged for individuals with MS because the occupational activity required by a job is likely to be an important factor associated with more daily physical activity. Therefore, employment is one modifiable characteristic that could contribute to increased physical activity for those with MS (Motl et al. 2007).

Educational attainment and insurance coverage are two other aspects of a person's position in a social hierarchy—at least in the United States, where universal health insurance coverage does not yet exist. Patti et al. (2007) found that low educational attainment among individuals with MS was associated with worse physical health composite scores than those with secondary education. In other studies on MS and physical activity, researchers have made similar discoveries, concluding that higher levels of education are associated with increased likelihood of participating in physical activity (Beckerman et al. 2010; Marrie et al. 2008).

Another SES measure is insurance coverage. This topic is not addressed in MS literature on physical activity, but studies examining cancer among women have made similar discoveries to those involving education and employment status in the MS

literature. For example, Ayanian et al. (1993) showed that women who were either not insured or were insured through Medicaid had significantly more advanced disease upon diagnosis than women who were privately insured. Survival during the 54 to 89 months after diagnosis was worse among women who were uninsured or on Medicaid, compared to those with private insurance (Ayanian et al. 1993). Another study found that women with high educational attainment were more likely to report a cancer screening than women with lower education (Link et al. 1998). These findings are congruent with the fundamental cause explanation and suggest that position within the social hierarchy may help predict patterns of physical activity among persons with MS.

Social Support

Social support is another mechanism that could help encourage physical activity among persons with MS. Social support's role in health maintenance has become more prominent in research over the years. Studies show that individuals with spouses, family members, and friends who provide support are generally in better health than those with fewer social contacts (Cohen and Wills 1985).

Durkheim was among the first to study associations between social support or group ties and health behaviors. Durkheim believed that social integration is stimulated through regular social contact. This, in turn, provides emotional support and a feeling of belonging (Geertsen 1997). This argument was illustrated through Durkheim's research on suicide. One of Durkheim's central hypotheses is that married persons, especially those with children, are more socially integrated and less likely to commit suicide compared to people with fewer social ties.

Household ties are a main area of focus within the literature on social support and health. The household is a significant social group in the lives of many individuals. Meal preparation, child care, treatment during illness, etc. all take place around this social body (Geertsen 1997). Indicators of household ties include marital status and household size.

Studies show that participation in physical activity is easier to start and maintain when there is support from other persons (Geertsen 1997; Sherwood and Jeffery 2000). Indeed, research has found that social support is one of the strongest predictors of physical activity (Saebu 2010). This holds true across different diagnoses and age categories. Also, it is interesting to note that individuals who join a health program with their spouse are more likely to still be involved after 12 months than those that joined without a spouse (Sherwood and Jeffery 2000).

However, social support and its association with physical activity among those with MS is a newer topic. In one cross-sectional study of 786 persons with MS, those with higher levels of social support have higher quality of life (QOL), which in turn is associated with participation in physical activity (Motl et al. 2009). In this study, social support is measured by a 24-item Social Provisions Scale, which measures attachment, guidance, social integration and reassurance of worth (Motl et al. 2009).

Psychosocial and Personality Characteristics

There are many different individual psychosocial and personality characteristics that could potentially be used to predict whether or not a person with MS will participate in physical activity. They include measures of self-efficacy, type A and type B behavior patterns, as well as depressive or anxious feelings.

Indicators of depression and anxiety provide one important way to evaluate psychosocial characteristics. Symptoms of depression may include unhappy mood, loss of ability to feel pleasure, increased sense of worthlessness, fatigue, and obsession with death and suicide (Strawbridge et al. 2002). This definition also embodies important elements of self-efficacy. If a person does not believe that he can perform certain activities, the likelihood that he will have some form of depression or anxiety is increased. Depression has been extensively studied among those with MS. As many as 40 percent of persons with MS report symptoms of depression. In a study done in Eastern Norway, it was shown that depression occurs twice and anxiety three times more often among persons with MS compared to the general Norwegian population (Beiske at al. 2008). If it were possible to relieve the severity of anxiety and depression symptoms among persons with MS, then routine voluntary leisure-time physical activity participation could increase in this subpopulation.

Hypotheses

My analysis for this thesis will include education attainment, employment status, and insurance coverage as SES measures. I hypothesize that, among persons with MS, the odds of participating in voluntary, leisure-time physical activity will increase as educational attainment increases. With regard to employment status, I hypothesize that individuals with MS who are unemployed will be less likely than those who are employed to engage in regular physical activity. I also hypothesize that the final SES measure, health insurance coverage, encourages routine physical activity among those diagnosed with MS. If an individual does not have health insurance, she will be less

likely to be physically active.

The rationale for these hypotheses is derived from the fundamental cause explanation (Link and Phelan 1995). For instance, individuals with a high level of education will generally have greater knowledge and material resources, which facilitates participation in physical activity. Also, health insurance coverage could encourage physical activity through improved symptom management and advice from physicians. Employment could also encourage physical activity as it improves resources necessary to initiate and maintain exercise programs, such as steady income and potential workout partners. Although not hypothesized here, it is also plausible that unemployment could have the opposite effect on leisure-time physical activity because unemployed individuals may have more free time to participate in physical activity than employed individuals.

In my investigation, marital status is the only indicator of social support that is available in the data source that I use. For Durkheim, marital status was a key indicator of social support, as married individuals tend to be more socially integrated and have "built in" support systems. I hypothesize that if a person with MS is married the odds that s/he will participate in physical activity will be higher than if s/he is not.

Finally, as alluded to previously, psycho-social characteristics will be evaluated based on the extent of depression and anxiety symptoms among persons with MS. I predict that persons with depression and anxiety symptoms will be less physically active compared to persons who do not exhibit feelings of depression or anxiety.

I will examine these hypotheses using data from the National Health Interview Survey (NHIS). The NHIS is a repeated, cross-sectional household interview survey that monitors trends in illness and disability in the U.S. population. The reasoning for using

this data set as well as the types of analysis performed is discussed in the next portion of my thesis.

METHODS

Data

The Centers for Disease Control and Prevention (CDC) does not require physicians to register patients that are newly diagnosed with MS. This poses some difficulties when attempting to find data that can be used for analyses of the MS subpopulation. For this reason, the data set chosen for use in this study is provided by the National Center for Health Statistics (NCHS), a component of the CDC. It is called the National Health Interview Survey (NHIS). This survey monitors trends in illness and disability. These data are also used by the public health research community in the U.S. for epidemiological and policy analysis (CDC 2011), which makes it an appealing resource for this analysis.

The NHIS is a type of repeated, cross-sectional household interview survey. The sampling used is a multistage area probability design. It is used so that those being sampled are representative of households in different regions of the United States. The household survey is conducted by trained individuals employed by the U.S. Bureau of the Census according to procedures specified by the NCHS. The participating families are randomly selected and one adult per family provides the answers (CDC 2011). The sections of the NHIS that will be used in this study are the Sample Adult, and Person-Level questionnaires.

The use of a large cross-sectional data source has certain advantages over previous studies. Most existing studies are cohort studies, but with non-random sampling designs and very few participants, limiting statistical power and the ability to generalize

to the wider MS population. To find subjects with MS, researchers in these studies often use snowball selection, which is a type of referral sampling (Lode et al. 2009; Mitchell et al. 2005; Motl and McAuley 2009). This can be problematic because it weakens the external validity of the study. Nationally representative cross-sectional data may provide a better resource for estimating the determinants of physical activity among persons with MS in the U.S.

I will use data from the 2002 and 2008 NHIS in my analyses. I selected these waves of NHIS because they are the only two years where NHIS includes a question pertaining specifically to the MS diagnoses. In other years, MS was combined into the category of "other neurological diseases" instead of into a category of its own. In these two waves of NHIS data, 205 people stated that they have MS – a relatively small yet population-based subsample that is considerably larger than most of the cohort-based studies described previously.

Measures

Dependent Variable: The dependent variable for my analysis is physical activity. One of the questions on the NHIS questionnaire asks how many times per week the participant engages in light or moderate physical activity. The CDC recommends 150 minutes of moderate aerobic activity per week and some sort of muscle-strengthening activities two or more days a week (CDC 2011), but because the number of individuals that reach this suggested amount is so few, I chose to create a categorical variable that measures either no physical activity or any physical activity during a week. It should be noted that the respondent could also answer that they are *unable* to do light to moderate

activity, so it is assumed that if the respondent indicates zero hours of activity, s/he could participate in physical activity but chooses not to. There are 24 individuals in the MS subsample that reported the inability to do light or moderate activity. These 24 respondents as well as those that responded "don't know" or "refused" (31 in combination) are excluded from this analysis. Table 1 is a summary table of physical activity levels among NHIS respondents with MS in 2002 and 2008.

Table 1: Number of People with MS Who Perform Light/Moderate Activity During the Week

	n=205	
	Frequency	**Percent**
Performs PA	81	39.51
No PA	93	45.37
Not able to perform PA	24	11.71
Refused	1	0.49
Not ascertained	1	0.49
Don't Know	5	2.44

Independent Variables: There are a total of five independent variables of interest in my analyses. These are education, insurance coverage, employment status, marital status, and depression/anxiety. Educational attainment is grouped into four classes: "High School Graduate or Less," "Some College or Associate's Degree," "College Graduate," and "Advanced Degree." Insurance coverage is assessed through the question "What is your coverage status for health care?" to which respondents could reply "Not covered," "Covered," or "Don't Know". Employment status is measured by the question "Did you work for pay in the last year?" Respondents could reply "yes" or "no."

Marital status is collapsed into a dichotomous measure of either "Not Married" or "Married." This variable measures whether or not respondents are currently married or living with their partner. Divorced, widowed, separated, or not married individuals are all combined into the "Not Married" category. The depression/anxiety variable is measured differently across waves of NHIS data. The 2002 wave asked respondents "During the past 12 months, have you been frequently depressed or anxious?" The 2008 survey asked if the respondent has ever had depression or generalized anxiety. For both questions, participants answered either "yes," or "no." Table 2 provides frequency distributions for all independent variables used in this analysis.

Covariates and Potential Moderators: Two demographic covariates are used in my analysis. These measures are sex and age. Age is divided into three categories: 18-34, 35-54, and 55+. Gender, while a covariate, could also be a potential moderator, which is why in my analysis I stratify certain logistic regression models by sex.

In addition to age and sex, I examined activities of daily living (ADL). The ADL control variable is used to assess the impact of the independent variables after accounting for current level of disability. In my study, the ADL index is a compilation of different questions that evaluate any ADL limitation a person might have. These questions include, how difficult is it to: "walk ¼ of a mile without special equipment?," "climb 10 steps?," "stand for 2 hours?," "stoop, bend or kneel?," "lift/carry 10 lbs?," "go out to special events?," and "participate in social activities?" All questions use the same 5-point scale which is "Not at all difficult," "Only a little difficult," "Somewhat difficult," "Very difficult," "Can't do at all." A Pearson's correlation coefficient was examined to evaluate the association between the different variables listed above. Pearson's correlation

coefficients assign values between +1 and -1. All of the given values within the correlation matrix are higher than .6. This supports the ADL construct; it appears that all of these variables belong in a single, common index of ADL capability.

Table 2: Sample Demographics

Variable		**n= 173**
	Frequency	**Percent**
Gender		
Male	48	27.75
Female	125	72.25
Age		
18-34	34	19.65
35-54	71	41.04
55+	68	39.31
Education		
Less than HS/HS	31	17.92
Some College/AD	40	23.12
College Graduate	56	32.37
Advanced Degree	46	26.59
Health Insurance		
Not covered	15	8.67
Covered	158	91.33
Employment		
Not Working	78	45.09
Working	95	54.91
Marital Status		
Not married	83	47.98
Married	90	52.02
Depression/Anxiety		
Depressed	73	42.2
Not Depressed	100	57.8

Analysis

Statistical analyses were performed using SAS 9.2 statistical software. As data are cleaned and new categorical variables are created, whenever participants answer a question "don't know" or "not ascertained", they are excluded from the analysis. As mentioned previously, 31 participants with MS are ineligible because they are either unable to perform physical activity or answer "don't know" or "not ascertained" on the physical activity question. This shrinks the eligible sample size slightly to 174. Only one additional person with MS had missing data on any of the independent variables used in this investigation. This individual was excluded from analysis, resulting in a final sample size of 173.

A series of logistic regression models will be estimated to isolate determinants of physical activity among all persons with MS. Five different models will be estimated using the three different theoretically-driven predictors described previously: social hierarchy, social support, and psycho-social personality. Model 1 will be a baseline model that consists of sex, age and the ADL index. Model 2 will use variables from the previous model and also include educational attainment, insurance coverage and employment status. This will represent the social hierarchy measures. Model 3 will analyze the baseline variables along with marital status, which is the social support variable for the analysis. Model 4 will add a measure of depression/anxiety to the baseline model to evaluate my hypothesis about psycho-social characteristics. Model 5 will be a compilation of all previous models.

In addition to these models among all NHIS participants with MS, logistic regression analyses are stratified by gender to estimate the odds of physical activity

participation among both men and women with MS. Each set of gender-stratified logistic regression analyses consists of four models. Model 1 contains age, the ADL index and the social hierarchy measures, which again include educational attainment, insurance coverage, and employment status. Model 2 looks at age, ADL and a social support variable, marital status. Model 3 is examines the effect of depression on physical activity, after controlling for age and ADL status. Lastly, model 4 combines all the previous models. These additional regression analyses permit comparisons between men and women and also separate examinations within each gender group.

RESULTS

The following section discusses the results found in the logistic regression analyses, which are used to predict physical activity among individuals with MS. I estimated logistic regression models for all individuals with MS, and also completed two additional sets of regression analyses that are stratified by gender. An alpha level of .1 was used as the criterion of statistical significance because of the small sample size.

Logistic Regression Findings for all Individuals with MS

Model 1: Table 3 shows the results for predicting physical activity among all individuals in the NHIS survey with MS. Model 1 is the baseline model, which includes simple demographic measures (gender and age) and the ADL indicator. A female is 12 percent less likely than a male to perform physical activity. This number is not very large and the difference in gender as a predictor of physical activity participation is not statistically significant. With regard to age, persons between the ages of 35 and 54 are 1.15 times more likely than those aged 18-34 to participate in physical activity. Individuals aged 55 or greater are 1.1 times more likely to participate in physical activity than those in the youngest age group. As with gender, these outcomes for different age groups are not statistically significant. The ADL control variable shows that as an individual with MS is able to perform daily activities, his/her likelihood of physical activity participation increases by 45 percent. This finding is statistically significant at an alpha level of .05.

Model 2: Model 2 in table 3 examines the effects that social hierarchy measures have on the odds of physical activity participation. When adding educational attainment, insurance coverage, and employment status to the original model, the odds ratios change for gender and age. In the baseline model women are less likely to participate in physical activities. In model 2 that association is reversed. Females have 1.11 higher odds of performing physical activity than males. Those ages 35 to 54 have an adjusted odds ratio of .99, which is essentially identical to the 18-34 age category. The likelihood of a 55 year old or older participating in physical activity is 12 percent lower than those aged 18-34. However, these results for age and gender are not statistically significant. The ADL measure displays a statistically significant odds ratio of 1.42. This indicates a 42 percent increase in odds of physical activity participation when the individual with MS is capable of performing daily activities.

The reference group for educational attainment is a person with a high school education or less. The odds of participating in physical activity are 1.60 times higher among those that have some college education or an associate's degree than those with a high school education or less. Despite the strength of this association, it is not statistically significant. Among persons with MS, college graduates are only 1.01 times more likely to perform physical activity than those in the reference group. This odds ratio is not statistically significant. However, individuals with advanced degrees are 3.05 times more likely to participate in physical activity than those with a high school or less education. This odds ratio is statistically significant with a p-value of .016.

With regard to insurance coverage in the MS subpopulation, the odds of participating in physical activity are 1.94 times higher among persons with insurance

coverage compared to persons without coverage. Among employed individuals, the odds of participating in physical activity are 1.3 times higher than someone who is not employed. Although both of these associations appear to be strong (particularly the effect of insurance coverage), neither achieves the 0.1 criterion of statistical significance.

Model 3: Model 3 includes the social support variable marital status. Age and gender are again included and, as can be seen in table 3, the odds ratio for gender has decreased from model 2. The odds of a female participating in physical activity are 11 percent less than a male. This is not a large difference and it is not statistically significant. The effect of age has reversed and is more consistent with model 1. The 35-54 age group and 55+ are both quite similar in their odds of participating in physical activity compared to the 18-34 year old age group. Their odds ratios are 1.12 (35-54) and 1.09 (55+), and neither is statistically significant. Individuals with MS who are able to perform daily activities have 1.45 greater odds of participating in physical activity than a person less able to perform ADL. This result is statistically significant using an alpha level of .05.

Table 3 shows that married individuals are 1.1 times more likely to participate in physical activity than persons not currently married. This effect of marital status on physical activity participation is not statistically significant.

Model 4: The intent of Model 4 is to assess the influence of psycho-social characteristics, measured in these analyses via depressive/anxious symptoms. As seen in table 3, if a person has not had any depressive/anxious symptoms, his/her odds of participating in physical activity are 21 percent less than an individual that is depressed and/or anxious. As with most variables examined thus far, the results are not statistically significant.

However, the odds ratios for control variables are stronger when depression/anxiety is added to the model. The odds of a female participating in physical activity are 18 percent lower than a male. The odds of engaging in physical activity are 1.16 times higher among persons aged 35-54 than among persons aged 18-34. An older individual aged 55 years or older has 1.14 higher odds of participating in physical activity than younger persons aged 18-34. The ADL measure in model 4 is statistically significant. As an individual with MS is able to perform specific daily activities, his/her likelihood of physical activity participation increases by 47 percent.

Model 5: The last model looks at the effects of all three predictor types on physical activity participation. The baseline measures, gender, age, and ADL, have odds ratios similar to the prior models seen in table 3. As before, age and gender are not significant predictors of physical activity. Consistent with all previous models, the ADL control variable is statistically significant at an alpha .05 level. The odds of a person with MS participating in physical activity are increased by 1.48 when the individual is able to perform ADL.

Results for educational attainment are similar to the results found in model 2, which examined social hierarchy variables. The odds of participation in physical activity are 1.74 times higher among individuals with some college or an associate's degree when compared to those with a high school or less education. A college graduate is 1.08 times more likely to perform physical activity than someone with a high school or less education level. Neither of these two education categories is statistically significant. Having an advanced degree raises the odds of performing physical activity by 3.69 relative to those with only a maximum high school education attainment. This odds ratio

is statistically significant at an alpha level of .05.

Still within the social hierarchy realm, when all variables are added to the model, insurance coverage increases in the odds of physical activity participation. Relative to those without health insurance, the odds of physical activity participation among those with health insurance increases from 1.94 in model 2 to 2.23 in model 5. Despite the increase in coefficient strength, this odds ratio still fails to achieve statistical significance.

Employment status also increases the odds of physical activity participation when all variables are included in the model. The new odds of a person with employment performing physical activity are 1.38 times higher than someone who is not employed. Like most variables, employment status is not statistically significant.

When all measures are accounted for in the model, the odds of physical activity decline to some extent among married individuals. The odds ratio is now smaller at .94, instead of 1.1 when it was in a model of its own. This measure, like model 3 is not statistically significant either.

When all other measures are placed into one model, the odds of participating in physical activity among those without depression/anxiety are reduced, compared to those with depression or anxiety. The odds ratio changes from .79 in model 4 to .56 in model 5. This means that a person without depression/anxiety is 44 percent less likely than someone with depression/anxiety to participate in physical activity. However, these results are not statistically significant and therefore there it is not possible to say with confidence that depression/anxiety affects participation in physical activity.

Table 3: Logistic Regression of Predictors of Physical Activity Among Individuals with MS

	Model 1			Model 2			Model 3			Model 4			Model 5		
	AOR	90 % CI		AOR	90 % CI		AOR	90 % CI		AOR	90 % CI		AOR	90 % CI	
Sex															
Male	1.00			1.00			1.00			1.00			1.00		
Female	0.88	0.49	1.58	1.11	0.60	2.09	0.95	0.52	1.74	1.22	0.66	2.25	0.99	0.51	1.92
Age															
18-34	1.00			1.00			1.00			1.00			1.00		
35-54	1.15	0.56	2.36	0.99	0.46	2.13	1.06	0.51	2.22	1.16	0.56	2.39	0.99	0.45	2.16
55+	1.10	0.51	2.36	0.88	0.38	2.07	1.07	0.49	2.31	1.14	0.53	2.47	0.97	0.41	2.31
Education															
Less than HS/HS				1.00									1.00		
Some College/AD				1.60	0.67	3.82							1.68	0.69	4.10
College Graduate				1.01	0.43	2.34							1.05	0.45	2.48
Advanced Degree				3.051**	1.26	7.37							3.425**	1.35	8.72
Health Insurance															
Not covered				1.00									1.00		
Covered				1.94	0.71	5.33							2.12	0.75	5.94
Employment															
Not Working				1.00									1.00		
Working				1.30	0.65	2.62							1.43	0.70	2.92
Marital Status															
Not married							1.00						1.00		
Married							1.46	0.85	2.49				1.19	0.66	2.11
Depression/Anxiety															
Depressed										1.00			1.00		
Not Depressed										0.789	0.45	1.383	0.556	0.3	1.861

** P<.05 *P<.1

Logistic Regression Findings for Females with MS

In the next set of logistic regression analyses, I stratify models by gender to look at possible differences in predicting physical activity participation among females and males.

Model 1: The first of these logistic regression models is found in table 4, which examines physical activity predictors among females. The first model includes measures of age, ADL and social hierarchy. Although not statistically significant, as age increases, the odds of participating in physical activity appear to increase. The odds of physical activity for someone between the ages of 35-54 are 1.84 times higher than someone between the ages of 18-34. A female aged 55 or older is 2.16 times more likely to participate in physical activity than a female aged 18-34. The ADL control variable shows that as a female with MS is able to perform daily activities, her likelihood of physical activity participation increases by 68 percent. This result is statistically significant at an alpha level of .05.

When comparing educational attainment of a female with a high school education or less to women with some college or an associate's degree, women with some college experience are 1.81 times more likely to participate in physical activity. Females that have obtained a college degree are 27 percent less likely to participate in physical activity than women with a high school education or less. A woman with an advanced degree increases the odds of performing physical activity by 2.77. Among women with MS, the effect of educational attainment is statistically significant for those with a college or advanced degree.

In addition, insurance appears to play an important role in predicting physical

activity among women with MS. This is a statistically significant finding. Having insurance coverage increases the odds of participation in physical activity by 3.57. Employment status, as found in table 4, shows a woman that is currently working has an odds ratio of physical activity performance of 1.44 compared to women not currently employed. This finding is not statistically significant.

Model 2: The second model examines the effect of marriage on physical activity. When the model includes age, ADL, and marital status, age plays less of a role in predicting physical activity. A woman aged 35-54 has 2.07 increased odds of physical activity participation, relative to a woman aged 18-34. A female aged 55 or older is 2.75 times more likely to be physically active than a woman aged 18-34. Like model 1, age is not statistically significant on any level. The ADL measure indicates that as a woman with MS is capable of perform daily activities, her odds of physical activity participation increases 1.73 times. This finding is statistically significant using an alpha level of .05.

The variable of main interest in this model is marital status. A female that is married is 1.05 times more likely to perform physical activity than a non-married woman. This finding, however, is very weak and not statistically significant.

Model 3: Model 3 analyses age, ADL and whether or not a female has had depression/anxiety symptoms. Women between the ages 35-54 are 2.1 times more likely to participate in physical activity than women between the ages of 18-34, though this is not statistically significant. The odds of physical activity for an older woman, aged 55 or higher, are 2.89 times higher than a younger woman. This finding is not statistically significant either. The ADL measure displays a statistically significant odds ratio of 1.79. This indicates a 79 percent increase in odds of physical activity participation when a

female with MS is capable of performing specific daily activities.

Depression/anxiety plays the same role on physical activity participation for women as it did for the entire study of persons with MS. Women with no depression/anxiety symptoms are 27 percent less likely to participate in physical activity compared to those women that do have depression/anxiety. This difference is not significant however.

Model 4: Included in model 4 are all measures of the previous models. Age is not a statistically significant predictor. Consistent with the preceding models for females, as well as amid all individuals, the ADL control variable is statistically significant on an alpha .05 level. The odds of a woman with MS participating in physical activity are increased by 1.8 when the she is able to perform ADL.

Educational attainment varies quite widely depending on level of education a female with MS has gained. Women with some college or an associate's degree are 2.13 times more likely to participate in physical activity than women with a high school graduate degree or less. A college graduate is 14 percent less likely to perform acts of physical activity. Like the logistic regression analysis of all individuals with MS, women with advanced degrees are significantly more likely—four times more likely, in fact—than women with at most a high school education to participate in physical activity.

As in model 1, health insurance is a statistically significant predictor of physical activity. The odds of physical activity among women with health insurance are 3.83 times higher than women without health insurance.

If a female is employed, her odds of being physically active are increased by a factor of 1.64. This finding is not statistically significant. This could either reflect

insufficient statistical power or no real difference in physical activity between women who are employed and women who are not.

There is no effect on marital status when adding all other measures to the model. If a woman is currently married, her odds of participating in physical activity are decreased by 5 percent. However, this is not statistically significant.

When all measures are accounted for, if a female does not have depression/anxiety the odds of participating in physical activity are 55 percent less than an individual with depressive/anxious symptoms. This finding is statistically significant on an alpha .1 level, suggesting that participation in physical activity could be dependent on levels of depression/anxiety among women with MS.

Logistic Regression Findings for Males with MS

Table 5 includes a set of logistic regression models for predictors of physical activity among males with MS. Insurance is left out of all the models because of quasi-complete separation. This happens because there were no men who did not have insurance coverage and who also did not participate in physical activity; the statistical software cannot perform a complete analysis when this happens.

Model 1: Model 1 includes the variables age, ADL, educational attainment, and employment. While not statistically significant, the findings for age show that as age increases, a male's odds of physical activity diminish. For a male between the ages of 35-54 the odds of physical activity participation is 65 percent lower when compared to the younger age group of 18-34. Men age 55 or older have even smaller odds of physical activity performance. Their odds are 78 percent lower than a younger man. The ADL

control variable shows that as a male with MS is able to perform specific daily activities, his likelihood of physical activity participation increases by 2 percent. Unlike the analysis of all individuals or females, this finding is not statistically significant.

As shown in table 5, except for males with some college or an associate's degree (who are not different from males with a high school education or less), the higher the level of education, the higher odds of performing physical activity. Males with some college or an associate's degree have an odds ratio of .57, or they are 43 percent less likely to participate in physical activity than a man with a high school or less education. A college graduate is 2.17 times more likely to participate in physical activity. A man with an advanced degree has 3.1 higher odds than a male with a high school education or less to participate in physical activity. Despite the clear strength of these associations, not one of them is statistically significant.

The odds of performing physical activity are 1.15 times higher among employed men relative to their non-working counterparts. This increase is quite small and not statistically significant, so the small difference seen is not large enough to conclude that physical activity is dependent on employment among males with MS.

Model 2: Marriage and age are the variables of interest in model 2. As with model 1, males have lower odds of physical activity as age increases. A male aged 35-54 is .7 times less likely to participate in physical activity when compared to a male between the ages of 18-34. This finding is not statistically significant, but the odds ratio for physical activity among males aged 55 years and older is significant. Males aged 55 or greater are .86 times less likely to participate in physical activity than the reference group of younger males aged 18-34. The odds ratio for the ADL measure is 1.00 and not statistically

Table 4: Logistic Regression of Predictors of Physical Activity Among Female Individuals with MS

	Model 1			Model 2			Model 3			Model 4		
	AOR	**90 % CI**		**AOR**	**90 % CI**		**AOR**	**90 % CI**		**AOR**	**90 % CI**	
Age												
18-34	1.00			1.00			1.00			1.00		
35-54	1.84	0.68	4.98	2.07	0.83	5.16	2.10	0.84	5.21	1.91	0.69	5.27
55+	2.16	0.70	6.62	2.75	1.00	7.55	2.89	1.05	7.95	2.46	0.79	7.74
Activities of Daily Living	1.68**	1.27	2.23	1.73**	1.34	2.23	1.79**	1.37	2.34	1.80**	1.34	2.42
Education												
Less than HS/HS	1.00									1.00		
Some College/AD	1.81	0.64	5.12							2.13	0.72	6.26
College Graduate	0.73*	0.26	2.06							0.86*	0.23	2.48
Advanced Degree	2.77*	0.89	8.67							4.01**	1.17	13.72
Health Insurance												
Not covered	1.00									1.00		
Covered	3.565*	1.03	12.29							3.83*	1.09	13.44
Employment												
Not Working	1.00									1.00		
Working	1.44	0.63	3.28							1.64	0.70	3.83
Marital Status												
Not married				1.00						1.00		
Married				1.05	0.55	2.01				0.95	0.47	1.93
Depression/Anxiety												
Depressed							1.00			1.00		
Not Depressed							0.73	0.38	1.41	.45*	0.21	0.97

** P<.05 *P<.1

significant.

The odds of physical activity participation are 1.83 times greater among married males compared to males who are not currently married. This finding is not statistically significant, suggesting that physical activity does not depend upon marital status for men with MS.

Model 3: Model three is interested in the effect of depression/anxiety on physical activity participation among males with MS. The first variable to look at is age. As with all other models for males, age decreases the odds of physical activity participation. Men aged 35-54 have an odds ratio of .42. This means that the likelihood of participating in physical activity is reduced by 58 percent. The p-value for this age category was not low enough to be considered statistically significant. Males of age 55 or greater show a statistically significant finding of 78 percent lower odds of physical activity participation then their younger reference group. Identical to model 2, the odds ratio for the ADL control variable in model 3 is 1.00 and not statistically significant.

Males with no depression/anxiety symptoms are 35 percent less likely to participate in physical activity compared to those men that do have depression/anxiety. This statistic is very similar to the results found while assessing all individuals with MS and only females. However, unlike females, this difference is not significant.

Model 4: Model 4 is a compilation of the previous 3 models. Age is the first variable to be analyzed. Consistent with all the other models, as a male's age increases the odds of physical activity participation decreases. A male aged 35-54 has a likelihood of physical activity participation that is 70 percent less than a younger male between the ages 18 to 34. Males aged 55 or older have an 80 percent lower chance of being

physically active than their younger male counterparts. The odds ratios for both males aged 35-54, and males aged 55 + are not statistically significant. The ADL odds ratio for model 4 is .96. The odds of a male participating in physical activity are decreased by 4 percent if he is less restricted by ADL. This finding is not statistically significant.

When all measures are taken into account, model four has the same outcome as the previous models. With regard to educational attainment, as the level of education increases so do the odds of physical activity participation, except when looking at a male with some college or an associate's degree. For a man with some college or an associate's degree, the likelihood of participating in physical activity is 57 percent lower compared to a man with a high school or less education. When a male is a college graduate, the odds of engaging in physical activity is 1.8 times higher than the reference group of high school education or less. For men with advanced degrees, the odds of physical activity are 2.52 times higher than men in the reference group. None of these findings are statistically significant. The odds of being physically active are 1.43 times higher among males that are currently employed compared to those not employed. This finding is not statistically significant.

Married men are 1.72 times more likely to participate in physical activities than men who are not currently married. Despite the strong association, it is not statistically significant. The same can be said for depression/anxiety. Men with no depression/anxiety symptoms are 29 percent less likely to perform physical activity than men with depression/anxiety. However, this finding is not significant even though it is quite strong. These findings suggest that limited statistical power among men is obfuscating some potentially important predictors of physical activity.

Table 5: Logistic Regression of Predictors of Physical Activity Among Male Individuals with MS

	Model 1			Model 2			Model 3			Model 4		
	AOR	**90 % CI**		**AOR**	**90 % CI**		**AOR**	**90 % CI**		**AOR**	**90 % CI**	
Age												
18-34	1.00			1.00			1.00			1.00		
35-54	0.35	0.09	1.45	0.31	0.08	1.32	0.42	0.11	1.62	0.30	0.07	1.40
55+	0.22	0.05	1.00	0.18*	0.04	0.73	0.22*	0.06	0.85	0.20	0.04	0.96
Activities of Daily Living	1.02	0.63	1.65	1.00	0.70	1.41	1.00	0.71	1.41	0.96	0.58	1.58
Education												
Less than HS/HS	1.00									1.00		
Some College/AD	0.57	0.08	3.99							0.43	0.05	3.52
College Graduate	2.17	0.36	13.05							1.80	0.28	11.63
Advanced Degree	3.10	0.66	14.63							2.52	0.40	12.40
Employment												
Not Working	1.00									1.00		
Working	1.15	0.21	6.38							1.43	0.24	8.73
Marital Status												
Not married				1.00						1.00		
Married				1.83	0.58	5.76				1.72	0.45	6.56
Depression/Anxiety												
Depressed							1.00			1.00		
Not Depressed							0.65	0.19	2.29	0.71	0.19	2.59

** P<.05 *P<.1

Summary

Logistic regression models for all individuals with MS showed that educational attainment is associated with physical activity. Physical activity participation odds do not change among different educational levels until an advanced degree is obtained. When an advanced degree is obtained then the odds of performing physical activity increase significantly.

Stratifying by gender and running different logistic regressions for females and males produced different results. In logistic regression analyses for females only, three measures are found to be statistically significant. Like all individuals, the odds of preforming physical activity increase significantly among females with advanced degrees. A woman with a college degree, however, is less likely to participate in physical activity. Also, females with health insurance have significantly increased odds of physical activity participation compared to their non-insured counterparts. Findings also demonstrated that women with no depression/anxiety symptoms are significantly less likely than women with depression/anxiety to participate in physical activity.

Logistic regression models for men produced no statistically significant findings when all measures are accounted for in model 4. However, in models 2 and 3, which incorporates social support and psycho-social measures, being aged 55 or older did have a statistically significant effect on physical activity. It appears that the odds of participating in physical activity declines among men with MS after they reach age 55.

When individuals are not limited by ADL limitations, the likelihood of participation in physical activity increases. The same can be said for females, but not males. The ADL measure amid males has no significant findings.

DISCUSSION

Findings

Results from the analysis of all individuals with MS show that obtaining an advanced degree will increase the likelihood of participating in physical activity. With only one statistically significant finding in the analysis for all persons in the survey with MS, stratification by gender was performed to probe at this question of what predicts physical activity a bit further. When this was executed, differences between men and women emerged in terms of the social determinants of physical activity participation. Education, health insurance and depression/anxiety all play an important role in determining whether or not a female will participate in physical activity. The only significant finding among men, however, was that with increasing age, the odds of physical activity participation decreased. This suggests that for females, both position in the social hierarchy and psycho-social characteristics influence physical activity participation. Conversely, my analyses suggest that these factors may not be important drivers of physical activity among males.

As expected, among individuals with MS, ADL appears to be a statistically significant predictor of physical activity. This same result is found among females, but amid males ADL does not seems to have any bearing on physical activity participation. This is likely caused by the small sample of males in this study. This limitation is discussed further in the limitation section.

While many of my findings were not statistically significant, the patterns seen in

all three of the logistic regressions took a similar form to what I hypothesized: As age increases, a person's odds of physical activity decrease. Advancing education increases the chances of performing physical activity. If a person has health insurance, the odds of him/her being physically active increases. The same effect is seen in employment status. A person with MS who is married will be more likely to participate in physical activity than someone unmarried. The one measure that actually had an opposite effect than what was hypothesized was depression/anxiety. The finding was that someone without depression and/or anxiety is less likely than someone with to perform physical activity. My hypothesis was that if an individual does possess depressive/anxious feelings, s/he will be less physically active compared to persons who do not exhibit those feelings. The result of decreased odds of physical activity could be because an individual without depression/anxiety may not be as worried about their health. Someone with depression/anxiety is more aware of the implications that physical activity has on their health and more active in doing something about it. Another possible reason for this outcome is that persons with depression could be physically active to help improve their depression/anxiety symptoms.

Not having many statistically significant variables could mean that many of the variables I chose as predictors of physical activity participation have no bearing on whether or not someone with MS will participate in physical activity or these results could be caused by other limitations that will be further discussed.

Limitations

One of the limitations to my study is the small sample size. With only 173 cases

of those with MS that are able to perform physical activity, it is difficult to make statistical inferences. This is one possible explanation for why there were few statistically significant findings. Had the sample size been larger, my hypotheses of all measures being significant predictors of physical activity may have been true. The logistic regression models for females and males, as can be seen in tables 4 and 5, produced large odds ratios for many of the measures. However, because of insufficient statistical power, these findings were not considered statistically significant. This could be remedied by the NHIS leaving MS as its own measure and not combining it with "other neurological diseases", or using a different data set.

Another limitation to my study is that questions from the NHIS are not geared towards the type of measures I am interested in studying. This mostly deals with social support and psycho-social matters. While marital status and depression/anxiety are two important aspects of either social support or psycho-social characteristics, I feel my analysis would have been stronger had I been able to incorporate more variables that deal with these two topics. These would include questions about self-efficacy, or the belief in one's ability to perform physical activity, and questions about perceived support from family and friends.

Data Resources for MS Research

Improvements in future research on the topic of MS and the predictability of physical activity among those with the disease are dependent on the development of new studies or possible improvement of surveys already developed like the NHIS. Two main improvements in new studies need to be an increased sample size and questions that are

tailored towards social support and psycho-social measures.

Future research on the topic of MS could be improved just by making a small number of changes to NHIS. I recognize that while the intent of the NHIS is not solely used for analysis of individuals with MS and physical activity participation, if a handful changes were made to this survey, the study of persons with MS, as well as other diseases, could be improved.

One useful change would be to create a separate variable for those with MS, as well as for the other diseases that are currently grouped into "other neurological diseases", as was done in the 2002 and 2008 years of the survey. While the prevalence of these diseases may be small, all neurological diseases are not the same or similar in symptoms. Grouping them into one category does not allow for a representative analysis for any of the combined diseases. Having a variable that would measure whether or not someone has MS separate from "other neurological diseases" would provide an increase in the sample size of individuals with MS over multiple waves of NHIS, and an increase in sample size would improve statistical inference.

Table 6 examines the different variables that have been used in the extant literature, and how my study fits into this broader set of studies. Each author provides a list of variables that are important for predicting physical activity but none include all. My research has attempted to combine all sections of research. However, it would be improved if the data had including more measures for social support and psycho-social/personality characteristics.

This can be done by making changes to the NHIS that would improve future research on physical activity among MS individuals. These changes would be to add

Table 6: Variables Used in Current and Thesis Related Research to Predict Physical Activity

	Social Hierarchy	Social Support	Psycho-Social/Personality Characteristics
Bennett 2013	Educational Attainment Insurance Coverage Employment Status	Marital Status	Depression/Anxiety
Smith and Arnett 2005	Employment Status		
Patti et al. 2007	Educational Attainment Employment Status		
Motl et al. 2007	Employment Status	Marital Status Parental Status	
Motl et al. 2009		Social Provisions Scale	MS Self-Efficacy Scale Exercise self-efficacy Scale.
Motl et al. 2006			Exercise Self-Efficacy Scale
McAuley et al. 2007	Educational Attainment Income	Marital Status	Exercise Self-Efficacy Scale
Beiske et al. 2007			Depression/Anxiety

questions about self-efficacy and social support perceptions. Additional questions that could be included are, “Do you feel supported by those around you?,” “How many close friends do you have?,” and scales concerning one's belief about his/her ability to perform certain activities. Exercise self-efficacy questionnaires, like those incorporated by Motl and McAuley, would be another helpful tool for assessing psycho-social characteristics. These questions would not only help examine social support and psycho-social characteristics for MS individuals but also the many other ailments the NHIS includes in its survey.

The Importance of Psycho-Social/Personality Characteristics

One of the strongest psychological correlates of exercise behavior is self-efficacy. With regard to physical activity, self-efficacy is an individual’s belief in her ability to be physically active (Sherwood and Jeffery 2000). According to Maddux and Rogers (1983), all processes of psychological change are based on an individual’s expectations of personal mastery. If the person does not believe that the skill can be mastered, the likelihood of that individual participating in the activity is lower. With regard to physical activity, the same notion is applied. If the individual does not believe that the benefits of participation will outweigh the negatives, or that they will be able to master the necessary exercises, the chances of participation in physical activity are quite low. “People fear and tend to avoid threatening situations they believe exceed their coping skills, whereas they get involved in activities and behave assuredly when they judge themselves capable of handling situations that would otherwise be intimidating” (Bandura 1977:194). Persons with greater self-efficacy are more likely to continue participating in an exercise program

until the behavior becomes routine (Sherwood and Jeffery 2000).

Another psychosocial behavioral theory emphasizes the importance of type A and type B behavioral patterns. Type A behavioral pattern is a compilation of psychological and behavioral characteristics that include aggression, competitiveness, and a sense of time urgency (Blumenthal et al. 1980). These types of people are more likely to participate in risky activities. Type B behavioral patterns are the exact opposite of type A. Type A behavior patterns were first described by Friedman and Rosenman to define the types of behavior commonly seen in patients suffering from cardiac disorders (Matthews 1982).

Type A behavior patterns may also influence whether or not someone will participate in physical activity. Studies indicate that persons with strong tendencies toward type A behavior patterns are less likely to stick with an exercise program, or even begin one (Dishamn, Sallis, and Orenstein 1985). A reduction in this Type A behavior is related to improvements in physical exercise involvement (Hassmen, Koivula, and Uutela 2000). If it were possible to describe personality types among persons with MS, it might also be possible to predict participation in and maintenance of physical activity routines. Knowing the type of behavior pattern a person has would also help establish the type of health intervention that would work best for that individual.

Although self-efficacy is a difficult characteristic to measure, it is potentially just as important as SES and social support measures in determining whether or not a person with MS will participate in physical activity.

Policy Implications

An important reason for my analysis was to see how the results produced might

inform public health policy on physical activity participation in the MS community. If predictors could be found, programs could be established to inform the MS community of the necessity of physical activity and ways to sustain that activity.

One of the major significant findings in my analysis was that of education. As education increased, so did the odds of physical activity participation, whether for all individuals or separately as men and women. Public health policy makers within the MS community need to focus more attention on those who are less educated. These are the people with MS that are least likely to participate in physical activity. Individuals with increased educational attainment have better access to resources, increasing their knowledge about the benefits of physical activity. Public health officials should focus on ways to inform MS persons with lower levels of education, and attempt to provide those individuals with the same knowledge about physical activity that is available to those with advanced degrees.

Other clues to aid public health policy on physical activity participation in the MS community are unearthed via models stratified by gender. Differences between males and females illustrate the need to individualize interventions or health brochures when attempting to encourage males and females with MS to participate in physical activity. Instead of one generic way of convincing people with MS to participate in physical activity, it may be more helpful for these individuals to receive tailored services based on gender and other characteristics, such as age and education.

What's Next?

While this study did not produce a large number of statistically significant results,

predicting physical activity among persons with MS is still and will continue to be a topic of great importance until a cure for MS is found. Even if future research replicates my findings in this thesis, this would only indicate that other determinants of physical activity need to be discussed and studied. As mentioned in the beginning of my thesis, MS is an unpredictable disease, and many individuals will end up needing some sort of aid to help them move around. Physical activity has been shown to improve disease trajectories, allowing persons with MS to live independently longer. To the extent that social, demographic and psychological characteristics are associated with physical activity or improve the odds of following a physical activity intervention, then they need to be discovered.

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