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Gender, mental health service use and objectively measured physical activity: Data from the National Health and Nutrition Examination Survey (NHANES 2003–2004)

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Abstract

Objective—To examine the relationship between physical activity levels measured objectively by accelerometry and the use of mental health services (MHS) in a representative sample of males and females.

Method—NHANES 2003–2004 is a cross-sectional study of the civilian, non-institutionalized US adult population. Participants reported whether or not they had seen a mental health professional during the past 12 months. Three measures of daily physical activity (light minutes, moderate-vigorous minutes, and total activity counts) and sedentary minutes were determined by accelerometry. The relationship between physical activity and use of MHS was modeled with and without adjustments for potential socioeconomic and health confounders.

Results—Of the 1846 males and 1963 females included in this analysis, 7 and 8% reported seeing mental health professionals during the past 12 months, respectively. Men who used MHS were significantly less active than men who did not use MHS (227,700 versus 276,900 total activity counts, respectively, $p < 0.05$). Men who did not use MHS engaged in 38 min (95% CI 16.3, 59.0) more of light or moderate-vigorous physical activity per day than men who used MHS. Physical activity levels of women, regardless of MHS use, were significantly lower than men who did not use MHS. Differences in total physical activity between women who did and did not use MHS were small (1.3, 95% CI – 14.0, 11.4).

Conclusion—Men and women who used MHS were relatively sedentary. Additional research is warranted to determine if increasing physical activity levels results in improved mental health in individuals who use MHS.

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Keywords

Mental health care utilization; Mental health services; Accelerometry; Physical activity; Exercise; NHANES

1. Introduction

Population-based studies have shown an inverse relationship between physical activity and depression or depressive symptoms; individuals with high activity levels report less depression or depressive symptoms than individuals with low activity levels (Abu-Omar, Rutten, & Lehtinen, 2004; Farmer et al., 1988; Goodwin, 2003; Kritz-Silverstein, Barrett-Connor, & Corbeau, 2001; Stephens, 1988). In addition, persons with severe mental illness (schizophrenia, major depression, or bipolar disorder) were less physically active than the general population (Daumit et al., 2005). With respect to physical activity, individuals who use mental health services have not been studied. Individuals using mental health services represent a population with a broad spectrum of mental health disorders and symptoms that may respond positively to physical activity (Biddle, Fox, & Boutcher, 2000; Broocks et al., 1998; Cattán, White, Bond, & Learmouth, 2005; Fox, Stathi, McKenna, & Davis, 2007; Meyer & Broocks, 2000; Morgan, 1997; Taylor, Sallis, & Needle, 1985).

Physical activity may be an effective alternative or additive treatment for individuals who use mental health services. As a therapeutic intervention, physical activity has several advantages including fewer side effects than pharmaceutical options and the improvement of emotional as well as physical well-being (Biddle et al., 2000). Also, physical activity may be a viable alternative for individuals who refuse medications or other treatments, and may improve adherence to medications by reducing antipsychotic-induced weight gain. Beyond its impact on mental health, physical activity reduces the risk of chronic comorbidities such as heart disease, diabetes, and obesity (Davidson et al., 2001; Prince et al., 2007) that are frequently observed in individuals with mental health disorders. Finally, annual direct medical expenditures have been shown to be \$2785 lower for active versus sedentary individuals with mental disorders (Brown, Wang, & Safran, 2005).

Previous population studies have relied on self-reported measures of physical activity that are prone to recall errors, over-reporting of duration and/or intensity of physical activities, and social desirability bias (Freedson & Miller, 2000; Kriska & Casperson, 1997; Montoye, Kemper, Saris, & Washburn, 1996; Sallis & Saelens, 2000). The limitations of self-reported physical activity are avoided with objective monitoring of physical activity. Objective monitoring of physical activity allows measurement of (1) low-intensity and nonstructured physical activities such as walking that are difficult for participants to self-report (Department of Health and Human Services Center for Disease Control and Prevention, 2004), (2) physical activities related to transportation, occupation, and household activities as well as leisure-time physical activities, and (3) physical activity over extended time periods (days or weeks) (Freedson & Miller, 2000). Objective monitoring has been shown to be reliable and valid (Freedson, Melanson, & Sirard, 1998; McClain, Sisson, & Tudor-Locke, 2007; Welk, Blair, Wood, Jones, & Thompson, 2000), and is often used as the validity criterion for self-reported measures of physical activity (Kriska & Casperson, 1997; Sallis & Saelens, 2000).

Walking is an unstructured and low-intensity physical activity that is under-reported with self-reports (Bassett, Cureton, & Ainsworth, 2000). An objective measurement of walking is essential for studies investigating physical activity and mental health since walking is the primary mode of physical activity among individuals with mental illness and a greater percentage of persons with severe mental illness report walking as their only form of physical

activity compared to the general population (29% versus 10%, respectively) (Daumit et al., 2005). Since under-reporting of walking may have occurred more frequently in the mentally ill than the general population, previous findings based on self-reported measures of physical activity may have been biased away from the null hypothesis. This study avoids this potential bias by objectively measuring physical activity.

The National Health and Nutrition Examination Survey (NHANES) 2003–2004 data provide the unique opportunity to examine the relationship between physical activities measured objectively by accelerometer and self-reported use of mental health services in a representative sample of the US adult population. While there is no gold standard for measuring use of mental health services, self-reported use and administrative records have been shown to provide equivalent estimates of mental health service use (Golding, Gongla, & Brownell, 1988; Rhodes, Lin, & Mustard, 2002). The association between use of mental health services and physical activity was examined separately for men and women since significant gender differences have been observed with respect to physical activity (Centers for Disease Control and Prevention, 2003; Hagstromer, Oja, & Sjostrom, 2007; Trost, Owen, Bauman, Sallis, & Brown, 2002). Our primary hypotheses were that men and women who use mental health services would be less physically active than men and women who do not use mental health services. By measuring physical activity objectively, these hypotheses will be investigated not only for total activity, but also by intensity of physical activity and may yield a different perspective on the relationship between mental health and physical activity than previously reported in studies that used self-reported measures of physical activity.

2. Method

The National Center for Health Statistics of the Centers for Disease Control conducted NHANES as a cross-sectional observational study using a stratified, multistage probability design to obtain a nationally representative sample of the civilian, non-institutionalized US population (Department of Health and Human Services Center for Disease Control and Prevention, 2005b). From January 2003 through December 2004, NHANES participants who agreed to a medical examination were recruited for physical activity monitoring (Department of Health and Human Services Center for Disease Control and Prevention, 2006). Only 16% ($n = 880$) of the adult population ($n = 5620$) did not participate in the physical activity monitoring. Reasons for nonparticipation included: declining the medical examination, declining physical activity monitoring, or having physical impairments limiting walking or wearing the ActiGraph thus not being eligible to receive one (Department of Health and Human Services Center for Disease Control and Prevention, 2006). Only adults aged 18–85 years ($n = 4740$) were included in this present analysis.

Physical activity was measured by accelerometry using the Acti-Graph AM-7164 monitoring device (ActiGraph, Ft. Walton Beach, FL) (Department of Health and Human Services Center for Disease Control and Prevention, 2006). The ActiGraph is considered the gold standard of accelerometer measurement and it has been used in 196 published studies to date (<http://www.theactigraph.com/oldsite/studysearch2.asp>). The ActiGraph has been validated with indirect calorimetry, and as expected, higher correlations were observed for laboratory ($r = 0.76$ – 0.85) than lifestyle activities ($r = 0.48$) (Welk et al., 2000). High interinstrument reliability was observed in free-living adults (intraclass correlations >0.97). The ActiGraphs were set to measure the duration and intensity of uniaxial movement within 1-min epochs. Participants wore the accelerometer on an elasticized belt over the right hip for seven consecutive days (Department of Health and Human Services Center for Disease Control and Prevention, 2006). If there were no activity counts for ≥ 60 min, the accelerometer was considered not worn for that interval of time. For this report, analyses were restricted to those respondents with valid and reliable accelerometry data according to standard NHANES

protocol and who wore the accelerometers for at least 10 h a day for four or more days. Each minute epoch was assigned an activity level based on the number of counts per minute; sedentary (<260 counts), light (260–1951 counts), or moderate/vigorous (≥ 1952 counts). For the most part, strenuous physical activities such as running, cycling, brisk walking and other aerobic activities were included in this definition of moderate/vigorous activity. As part of secondary analyses, we also defined moderate/vigorous activities with a lower cutpoint (≥ 760 counts) that encompassed activities of daily living with lower intensities (Bassett, Ainsworth, et al., 2000). This alternative definition would classify washing dishes, laundry and light cleaning as light activities; and vacuuming, sweeping, mopping, walking for errands and exercising as moderate/vigorous activities (Bassett, Ainsworth, et al., 2000). Daily totals of sedentary, light, and moderate-vigorous minutes as well as total activity counts were averaged and modeled as the outcome variables.

During the household interview, the use of mental health services was assessed by asking: “During the past 12 months, that is since (*date*), have you seen or talked to a mental health professional such as a psychologist, psychiatrist, psychiatric nurse, or clinical social worker about your health?” Participants responded yes or no, and the reference group was individuals who did not report using mental health services.

Half of the individuals aged 20–39 years were administered the Composite International Diagnostic Interview (CIDI, version 2.1) for major depression, generalized anxiety disorder (GAD), and generalized panic disorder during the past 12 months. The CIDI is administered by lay interviewers and does not rely on medical records or outside informants. Respondents were coded as a positive or negative diagnosis for each disorder.

3. Data analysis

Descriptive summaries and statistical analyses are presented separately for men and women. All analyses were performed using Stata (release 9, StataCorp, College Station, TX). The three estimates of physical activity (light minutes, moderate-vigorous minutes, and total activity counts) and sedentary minutes were the dependent variables in the separate linear regression models. Use of mental health services was modeled as the independent variable. Initially, the association between each outcome and use of mental health services was modeled. Next, age, race, education, body mass index (kg/m^2) (BMI), smoking status (current smoker if ≥ 10 ng/dl of cotinine), and health status (poor, fair versus good, very good, excellent) were added as potential confounders. Subsequent models added chronic health conditions (cardiovascular disease, chronic lung disease, diabetes, cancer, dialysis, liver disease, musculoskeletal disease, stroke, congestive heart failure, angina, emphysema, chronic bronchitis, and/or dialysis) and excluded participants with potentially mobility limiting chronic health conditions (stroke, congestive heart failure, angina, emphysema, chronic bronchitis, and/or dialysis). Finally, interactions between using mental health services and age, race, education, and chronic health conditions were added separately to the multivariate models (data not shown). Interactions were only retained in the multivariate models if the p -value was ≤ 0.05 .

In the linear regression models, age was modeled as a quadratic term based on lowess splines (Vittinghoff, Glidden, Shiboski, & McCulloch, 2005). Lowess splines are smoothing functions used to depict the linear or non-linear relationship between two variables. This nonparametric function indicates the appropriate functional form of the independent variable. Each model was adjusted for the weighting and clustering of the complex sampling design to obtain results representative of the US adult population (Department of Health and Human Services Center for Disease Control and Prevention, 2005a).

Additional analyses were performed to determine the representativeness of the subsample with accelerometry data compared to the subsample without accelerometry data. The subsample without accelerometry data included adults who participated in the physical activity monitoring but did not provide valid and reliable accelerometry data ($n = 931$), and adults who did not participate in the physical activity monitoring ($n = 880$). Demographic, health, and use of mental health services variables were analyzed using Pearson Chi-Square statistics for categorical variables and linear regression for continuous variables.

4. Results

Overall, 2696 adult men and 2924 adult women participated in the household interview. Only one man and two women did not answer the question on mental health service utilization. Approximately 15% of these respondents ($n = 414$ for men and $n = 466$ for women) did not participate in the physical activity monitoring. Among those who participated in the physical activity monitoring ($n = 2282$ for men and $n = 2458$ for women), 80% of the sample ($n = 1846$ for men and $n = 1963$ for women) provided reliable and valid accelerometry data. Neither men nor women exhibited significant differences for those with and without accelerometry data in the use of mental health services ($p > 0.45$), diagnoses of at least one of three mental health disorders ($p > 0.19$), chronic health conditions ($p > 0.22$), mobility limiting chronic health conditions ($p > 0.14$) or BMI ($p > 0.58$). However, statistically significant ($p < 0.05$) differences between those with and without accelerometry data were observed for race, age, health status (in women only), education, and smoking status. In both men and women, individuals with accelerometry data were approximately 6 years older, and a greater percentage were college-educated, non-smokers, Hispanics or Caucasians.

Descriptive characteristics of the participants with accelerometry and use of mental health service data are provided in Table 1. Of the 1846 males and 1963 females included in this analysis, 7 and 8% reported seeing mental health professionals during the previous 12 months, respectively. For both men and women, a greater percentage of individuals who used mental health services smoked (Table 1). Among men, chronic health conditions were reported more frequently for those who used mental health services (58%) compared to nonusers (40%).

On average, men engaged in more minutes of moderate to vigorous activities than women (men: 31 ± 23 , women: 17 ± 15 min/day) regardless of mental health service use. Among men, sedentary minutes were greater and activity (light, moderate/vigorous, and total activity) was lower in those who used mental health services compared to those who did not use mental health services (Fig. 1). Based on the univariate and multivariate models, men who used mental health services averaged at least 30 min less of light physical activity, 5 min less of moderate physical activity, and 42,000 fewer total activity counts per day than men who did not use mental health services (Table 2). Conversely, men who used mental health services were sedentary approximately 40 min more per day than men who did not use mental health services (Table 2).

Overall, there was no significant difference in the activity patterns for women who did and did not see a mental health professional during the previous year. The differences in total physical activity were smaller (<10 min) between those women who did and did not use mental health services compared to the men who did and did not use mental health services (approximately 40 min). In the univariate models, total activity (approximately 15,000 counts, $p = 0.08$) and minutes in moderate/vigorous activities (approximately 5 min, $p = 0.05$) were higher in those women who used mental health services compared to those who did not (Fig. 1 and Table 2). These differences were not statistically significant in the multivariate models. The gender differences persisted in subsequent models after controlling for confounders and excluding

participants with possible physical limitations (Table 2). Similar results were obtained if the lower cutpoint was used for the moderate/vigorous activity level (data not shown).

CIDI diagnoses of major depressive disorder, GAD, and panic disorder were available in 319 men and 372 women between the ages of 20 and 39 years. Overall, 27 men and 38 women were diagnosed with at least one of three mental health disorders. Major depressive disorder was diagnosed in 18 men and 32 women; GAD was diagnosed in 4 men and 8 women; and panic disorders in 7 men and 9 women. Approximately 25% of individuals with a diagnosed mental health disorder used mental health services ($n = 7, 1$, and 2 for men and $6, 1$, and 3 for women diagnosed with depression, GAD, and panic disorders, respectively). Accelerometry data were available in too few of the diagnosed cases ($n = 15$ for men and $n = 20$ for women) for statistical analysis.

5. Discussion

Physical activity levels were lower in men who used mental health services compared to men who did not use mental health services. Average activity levels for women regardless of whether or not they use mental health services were less than the low activity levels of men who use mental health services. Consistently, population studies have shown that adults diagnosed with depression, severe mental illness (schizophrenia, major depression, or bipolar disorder), or experiencing depressive symptoms have lower physical activity levels than the general population (Abu-Omar et al., 2004; Daumit et al., 2005; Farmer et al., 1988; Kritz-Silverstein et al., 2001; Stephens, 1988). Our results extend these findings by studying individuals who use mental health services, a population that is defined by their behavior of seeking mental health treatment rather than their diagnosis and/or symptoms. By studying this population, we establish that individuals who use mental services are sedentary and may not fully derive the mental and physical benefits associated with physical activity. In addition, it clearly defines a population that is readily accessible via mental health professionals to target for physical activity interventions.

Richardson et al. (2005) have proposed that physical activity interventions should be integrated into mental health services for those with serious mental illness. Our findings suggest expanding the proposal to include all individuals using mental health services, not just those with serious mental illness. Advantages of implementing or integrating physical activity interventions at mental health settings include tailoring the program to the specific needs and concerns of individuals who use mental health services, and the opportunity for ongoing reinforcement for adopting and maintaining regular physical activity due to the frequent contacts with mental health care providers (Richardson et al., 2005). Although limited, existing literature suggests that individuals who use mental health services are receptive to physical activity interventions. Individuals with serious and persistent mental illness perceived physical activity positively and as benefiting both mental and physical health (McDevitt, Snyder, Miller, & Wilbur, 2006; Ussher, Stanbury, Cheeseman, & Faulkner, 2007). Furthermore, the majority of participants with severe mental illness in a smoking cessation program were interested in assistance in becoming more physically active (Faulkner et al., 2007).

To the best of our knowledge, this is the first population study to use an objective measure of physical activity to investigate the relationship between use of mental health services and physical activity. In contrast to self-reported measures of physical activity, objective monitoring provides a reliable and valid estimate of light physical activities. This is relevant in the present study since light but not moderate-vigorous physical activity primarily accounted for the differences in physical activity levels in men who do and do not use mental health services.

Previous population studies using self-reported measures of physical activity have reported differences in moderate-vigorous physical activities between individuals with depression or depressive symptoms and the general population (Abu-Omar et al., 2004; Farmer et al., 1988; Goodwin, 2003; Kritz-Silverstein et al., 2001; Stephens, 1988). The discrepancies between these studies and the present study may be due to differences in the measurement of physical activity. With self-reported measures, respondents tend to overestimate the intensity of their physical activities. In both psychiatric and adult general populations, physical activity levels are consistently lower for objective than self-reported measures of physical activity (Hagstromer et al., 2007). Hence, the differences in moderate-vigorous intensity physical activity based on self-reported measures may actually reflect differences in light physical activities that have been misclassified as moderate-vigorous physical activities.

A limitation of accelerometry is that it monitors the intensity and duration but not the type of physical activity performed. Additional research is necessary to determine what type of light physical activities accounts for the observed differences in men who do and do not use mental health services. Although speculative, nonstructured and low-intensity walking and not brisk walking may explain the observed differences in light physical activities between men who do and do not use mental health services. These differences in light physical activities may be attributed to employment, household activities, transportation and/or leisure activities. Identifying the type and reason for the differences in light physical activity may guide physical activity recommendations and interventions for men who use mental health services.

As suggested in a recent commentary by Troiano (2007), objective monitoring may redefine the duration and intensity of physical activities recommended to promote and maintain health. Only moderate and vigorous intensity physical activities are currently recommended in the national guidelines by the American College of Sports Medicine and the American Health Association (Haskell et al., 2007). However, these recommendations are based on studies using self-reported measures of physical activity (Haskell et al., 2007). If the self-reported measures misclassify light as moderate-vigorous intensity then light physical activity as defined by objective monitoring may confer mental and physical health benefits. If future studies using objectively measured physical activity substantiate a relationship between light physical activity and mental health then modifications to the national guidelines may include separate recommendations for light physical activities or combining recommendations for light and moderate physical activities. Individuals who use mental health services may be more likely to increase their physical activity levels and perceive fewer barriers to initiating and maintaining physical activity if mental and physical health benefits were derived from light physical activities.

Previous studies based on self-reported physical activity have consistently shown that men are more active than women (Goodwin, 2003; Trost et al., 2002). The present study extends this gender difference in physical activity to individuals who use mental health services, and compares favorably to the finding that men (69%) report a higher prevalence of walking than women among adults with severe mental illness (49%) (Daumit et al., 2005). Unfortunately, comparisons with other population studies are not possible since physical activity levels of men and women with depression were not reported (Abu-Omar et al., 2004; Farmer et al., 1988; Goodwin, 2003; Kritz-Silverstein et al., 2001; Stephens, 1988). Hence, the present findings are novel and establish the physical activity levels of men and women who used mental health services by objective monitoring.

Few population-based studies have measured physical activity objectively. Other than NHANES 2003–2004, only Hagstromer et al. (2007) have reported objectively measured physical activity in an adult Swedish population. The US and Swedish populations differed in total activity counts and minutes of moderate-vigorous activity. Overall, the Swedish

population was more active than the US population (difference was approximately 45,000 counts/day for men and 92,000 counts per day for women). In both populations, total activity counts were higher in men than women but the gender difference was smaller in the Swedish (approximately 17,000 counts per day) than US (approximately 64,000 counts per day) population. On average, the Swedish population engaged in 8–13 min per day more of moderate-vigorous activity (Hagstromer et al., 2007). While the daily difference may seem modest, this difference in moderate-vigorous physical activity is substantial over a week, approximately 60–90 min. In both populations, daily minutes of moderate-vigorous activity was greater in men than women. Again, the gender difference was smaller in the Swedish than the US population (approximately 4 versus 13 min, respectively). Direct comparisons for average minutes in sedentary and inactivity are not possible since the studies used different definitions (inactivity defined as <100 counts/min in the Swedish study and sedentary defined as <260 counts/min in NHANES study). Although not provided, minutes in light physical activity can be estimated from the tables for the Swedish population. On average, light physical activity was higher in men than women in the US population and lower in men than women in the Swedish population. Interestingly, the magnitude of the gender difference for light physical activity (10–13 min/day) was similar for the Swedish and US population even though the definitions of light physical activity differed. In general, the proportion of time spent in sedentary, light and moderate-vigorous activities were comparable for the Swedish and US population. The actual time differences in the activity patterns and activity counts of the populations seemed plausible and may be attributed to true activity differences in Swedish and US populations and/or an artifact of the different cutpoints used to define inactivity and sedentary.

Although there was no validation of mental health utilization among the respondents in NHANES 2003–2004, self-reported use and administrative records have been shown to provide equivalent estimates of mental health service use (Golding et al., 1988; Rhodes et al., 2002). Seven to eight percent of the NHANES participants reported using mental health services from mental health professionals which is comparable to estimates (5–11%) from previous studies that have used self-reports (Barker et al., 2004; Bland, Newman, & Orn, 1997; Elhai & Ford, 2007; Kessler et al., 1999; Regier et al., 1993; Wang et al., 2006) or administrative records (Diehr, Price, Williams, & Martin, 1986; Simon, Grothaus, Durham, VonKorff, & Pabiniak, 1996). Higher estimates of mental health utilization (8–20%) have been reported in studies that used a broader definition of mental health services that included general practitioners or family physicians, religious or spiritual advisors, or any other healers (chiropractor, herbalist, or spiritualist) as well as psychiatrists, psychologists, social workers, counselors, or mental health professionals (Barker et al., 2004; Bland et al., 1997; Kessler et al., 2005; Lin, Goering, Offord, Campbell, & Boyle, 1996; Regier et al., 1993; Rhodes et al., 2002; Uebelacker, Wang, Berglund, & Kessler, 2006; Wang et al., 2005). Our results as well as the majority of population studies suggest no gender differences in the use of specialty mental health services (Albizu-Garcia, Alegria, Freeman, & Vera, 2001; Kessler et al., 2005; Leaf & Bruce, 1987; Mojtabai, 2005; Uebelacker et al., 2006). Taken together, these findings suggest that the measurement of mental health utilization in NHANES 2003–2004 was valid, comparable to other national surveys, and reflective of national trends in use of mental health services.

A limitation of this investigation is that homeless individuals were not included in the sampling frame. Folsom et al. (2005) estimate that 15% of patients treated for serious mental illness were homeless during a one year period in San Diego County, CA, USA. Estimates of homelessness are not available for individuals with no or less severe psychiatric diagnoses who use mental health services (Folsom et al., 2005). It should be noted that the present study does not represent homeless or institutionalized individuals who use mental health services. The NHANES survey only asked respondents if they used mental health services during the past 12 months (yes or

no) thus preventing examination of (1) the dose–response relationship between physical activity and number of mental health visits or period of treatment, (2) physical activity levels of current versus past users of mental health services, (3) the relationship between type of mental health care provider and physical activity levels, and (4) the relationship between diagnosis and physical activity levels.

A strength of this study is that it is a large sample, representative of the adult US population. Utilization of mental health services was assessed in all participants except three. A majority of the participants (68%, or 3809 out of 5620) provided reliable and valid accelerometry data. No differences in use of mental health services were noted between those who did and did not provide valid and reliable accelerometry data suggesting that the subsample was representative of the entire sample with respect to utilization of mental health services.

Collectively, the population studies suggest that physical activity levels are low not only in individuals with depression and depressive symptoms, but also in individuals using mental health services. Due to the cross-sectional designs of these studies, causality cannot be determined; low physical activity may contribute to the mental disorder or symptoms, low physical activity may be a side effect or symptom of the mental disorder or symptoms, or physical activity may not have a temporal relationship with mental health. Randomized control trials are necessary to determine the following: (1) does physical activity at low-intensity confer mental and physical health benefits? (2) What are the optimal frequency, intensity and duration of physical activities to confer mental health benefits? Do these physical activity recommendations apply regardless of diagnoses or severity of symptoms? (3) Are physical activity interventions that are integrated or implemented at mental health services efficacious and effective? (4) Does adoption and maintenance of a physical activity program reduce the frequency of mental health visits, the need for mental health services, or the medical costs of individuals who use mental health services?

In summary, men who used mental health services were less physically active than men who did not use mental health services. There was no difference in activity levels between women who use mental health services and those who do not, but physical activity levels in both groups of women were low and justify physical activity interventions. This study establishes that individuals who use mental health services are relatively sedentary. Physical activity interventions may improve mental and physical health outcomes among individuals who use mental health services. Additional research is warranted to determine if increasing physical activity levels results in improved mental health in individuals who use mental health services.

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Fig. 1.

Average daily physical activity (light minutes, moderate/vigorous minutes, or total activity counts) or sedentary minutes by use of mental health services (MHS) during the past 12 months for men and women, NHANES 2003–2004.

Table 1

Demographic and health information for men and women by whether or not they reported using mental health services (MHS) during the past 12 months, NHANES 2003–2004

Variable	Men (n = 1846)		Women (n = 1963)	
	Used MHS (n = 115)	Did not use MHS (n = 1731)	Used MHS (n = 138)	Did not use MHS (n = 1825)
Age (years) ^a	47 (36, 54)	45 (33, 58)	43 (32, 52)	47 (34, 61)
BMI (kg/m ²) ^a	27.4 (23.8, 29.8)	27.5 (24.5, 31.0)	26.0 (22.9, 34.7)	26.9 (23.2, 31.6)
Race (%)				
White	75.8	74.0	82.5	72.9
Hispanic	9.1	11.5	7.9	11.3
Black	11.6	9.1	4.9	10.7
Other	3.5	5.4	4.7	5.1
Education (%)				
<High school	15.5	17.5	7.9	18.3
High school graduate	28.2	26.5	24.7	26.1
College-educated	55.3	56.0	67.4	55.6
Smoker (%)	47.7	33.1	27.7	19.1
Health status (%)				
Poor	5.6	2.2	5.4	3.5
Fair	12.7	12.1	18.1	14.0
Good	40.1	35.7	34.6	34.3
Very good	33.7	36.2	30.8	35.6
Excellent	8.0	13.8	11.1	12.7
Chronic health conditions ^b (%)	58.3	40.2	51.5	48.7
Potentially mobility limiting chronic health conditions ^c (%)	18.8	11.5	14.4	14.6
Accelerometry measurements ^a				
Sedentary (min/day)	1233 (1164, 1282)	1190 (1122, 1256)	1219 (1167, 1292)	1218 (1163, 1271)
Light (min/day)	182 (143, 228)	218 (165, 285)	196 (163, 252)	205 (156, 255)
Moderate/vigorous (min/day)	24 (10, 40)	25 (11, 44)	15 (7, 34)	12 (5, 24)
Total activity (counts/day)	227,700 (165,300, 342,200)	276,900 (193,300, 376,500)	232,300 (168,000, 301,300)	212,800 (153,700, 278,800)

^aMedian (25th and 75th percentile).

^a Self-reported cardiovascular disease, chronic lung disease, diabetes, cancer, dialysis, liver disease, musculoskeletal disease, stroke, congestive heart failure, angina, emphysema, chronic bronchitis, or dialysis.

^c Self-reported stroke, congestive heart failure, angina, emphysema, chronic bronchitis, or dialysis.

Table 2

Prediction of physical activity (light, moderate/vigorous, or total activity) or sedentary minutes by use of mental health services during the past 12 months for men and women in NHANES 2003–2004 using linear regression

Independent Variable	Dependent variable			
	Sedentary (min/day)	Light (min/day)	Moderate/vigorous (min/day) ^a	Total activity (counts/day)
Use of mental health services (0 = no, 1 = yes)				
Men	$\beta^b \pm SE$ p -Value R^2 (%)	$\beta^b \pm SE$ p -Value R^2 (%)	$\beta^b \pm SE$ p -Value R^2 (%)	$\beta^b \pm SE$ p -Value R^2 (%)
Univariate model ($n = 1846$)	37.6 ± 10.0 0.002 0.9	-32.9 ± 9.0 0.002 1.0	-4.7 ± 2.3 0.06 0.2	$-42052 \pm 12,984$ 0.006 0.5
Multivariate model 1 ^c ($n = 1690$)	42.7 ± 8.4 <0.001 26	-37.4 ± 7.6 <0.001 21	-5.2 ± 2.5 0.05 25	$-47216 \pm 12,057$ 0.001 29
Multivariate Model 2 ^d ($n = 1441$)	32.9 ± 8.6 0.002 21	-29.9 ± 8.5 0.003 16	-3.0 ± 2.5 0.03 22	$-31875 \pm 11,225$ 0.01 25
Women				
Univariate model ($n = 1963$)	-1.3 ± 6.0 0.83 0.0	-3.5 ± 6.5 0.60 0.0	4.8 ± 2.2 0.05 0.6	15158 ± 8067 0.08 0.2
Multivariate model 1 ^c ($n = 1741$)	5.7 ± 6.2 0.37 19	-9.6 ± 6.6 0.17 16	4.0 ± 2.3 0.10 20	6827 ± 8491 0.43 24
Multivariate model 2 ^d ($n = 1478$)	2.7 ± 7.0 0.70 15	-6.3 ± 7.2 0.40 12	3.6 ± 2.6 0.20 17	8539 ± 1086 0.41 19

^a Defined as ≥ 1952 counts.

^b β represents the difference in minutes or counts between those who use mental health services and those who did not. For example, males who use mental health services were sedentary 38 min/day longer than those who did not use mental health services in the univariate model.

^c Adjusted for age, race, education, BMI, smoking status, and health status.

^d Adjusted for age, race, education, BMI, smoking status, health status, and chronic health conditions in the model and excluded participants who self-reported potentially mobility limiting chronic health conditions (stroke, congestive heart failure, angina, emphysema, chronic bronchitis, or dialysis).