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Health Status of USMS Swimmers Compared With a Representative Sample of the General Population

Steven R. Erickson and Sally K. Guthrie

This study evaluates a group of master swimmers to determine their perceptions of their physical and mental health status. USMS swimmers were surveyed to determine overall perceptions of their physical and mental health. The responses were compared with responses to the same questions included in the 2007–2008 National Health and Nutrition Examination Survey (NHANES). Members responding to the USMS survey totaled 1,054, and 5,171 people in the NHANES dataset met inclusion criteria. The USMS sample reported fewer physically and mentally unhealthy days and fewer inactive days due to health. Over 95% of USMS respondents indicated excellent to good health compared with 75.4% of the NHANES sample. People engaged in physical activity, especially regular swimming, have higher odds of having better health status.

Keywords: health status, swimming, sports, inactivity, self-rated health

Athletic competition in sports at the Masters level, such as track, rowing, and swimming, has become popular worldwide. This is especially true in Western Hemisphere countries where adults have sufficient income and leisure time to devote to structured physical exercise regimens. Unfortunately, these same countries currently exhibit alarmingly high prevalence rates of diseases related to physical inactivity, such as obesity and diabetes, and the World Health Organization (WHO) has announced that physical inactivity is the fourth leading risk factor for global mortality (WHO 2011).

Older, former elite athletes who remain physically active are much healthier than their inactive counterparts (Bäckmand, Kujala, Sarna, & Kaprio, 2010). In addition, top level Masters athletes who compete at the national and international levels have provided a unique opportunity for scientists to study the effects of aging on performance decline over the years, since these athletes may continue strenuous physical workouts and competition up into their ninth decade of life (Baker & Tang, 2010; Fairbrother, 2007; Gatta, Benelli, & Ditroilo, 2006; Medic, Starkes, & Young, 2007; Medic, Starkes, Weir, Young, & Grove, 2009; Medic, Young, Medic, 2011;

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Tanaka & Seals, 1997, 2003); however, Masters athletic organizations include more than those individuals who compete at the national and international levels. There has been no evaluation of the overall general health of an all-inclusive group of Masters athletes.

The mission of United States Masters Swimming (USMS) is to provide organized workouts, competitions, clinics, and workshops for adults, ages 18 years and over. USMS programs are open to all adult swimmers whose level and intensity of physical activity is likely to vary considerably across the membership.

The benefits of any consistent physical activity to physical and mental health are well established in small prospective studies (Colado, Triplett, Tella, Saucedo, & Abellán, 2009; Hamer, Stamatakis, & Steptoe, 2009; Leis et al., 2010; Saavedra, De La Cruz, Escalante, & Rodríguez, 2007). To examine whether Masters swimmers demonstrate these health benefits, we have surveyed a sample of USMS swimmers to determine their overall perceptions of their physical and mental health. The results of the swimmer survey were then compared with responses to the same questions concerning physical and mental health that were included in the 2007–2008 National Health and Nutrition Examination Survey (NHANES), a nationwide survey of the general U.S. population conducted by National Center for Health Statistics (NCHS).

Method

Study Design and Sample

The study was a cross sectional, web-based survey of USMS registered swimmers, compared with data obtained from the NHANES 2007–2008 publically available dataset. Subject data were obtained from two separate sources. Data for swimmers were obtained from registered members of the USMS organization. All registered adult members of USMS were eligible for this study aged 21 years and older. In 2010, there were 54,949 registered USMS members. Swimmers were notified of the study by an announcement in the USMS electronic newsletter that is sent to all members who provide e-mail addresses upon annual registration. The newsletter was sent monthly and electronically, opened by approximately 21,000 members. The announcement in the October and November 2010 editions of the newsletter contained a web-link that, when clicked, took the potential subject to the study survey website. The first page of the survey website provided a detailed overview of the project, which included informed consent information. Swimmers willing to participate in the anonymous study could then click a link that took them to the first page of the survey.

Data from the NHANES survey is publically available and accessible through the Centers for Disease Control and Prevention website (NHANES 2007–2008 Questionnaire: <http://www.cdc.gov/nchs/nhanes>). All data in NHANES datasets are de-identified. All people aged 21 years and older who were not institutionalized and who provided responses for questions regarding physical activity and health status were included in the NHANES dataset derived for this study. Approval of the study protocol, which included the survey and use of the NHANES dataset, were

granted by the University of Michigan Investigational Review Board. All USMS subjects who completed the survey provided informed consent.

Data

Demographic data obtained from the USMS survey as well as the NHANES database included age, gender, marital status, race, education, and annual household income. Race was dichotomized as Caucasian and Minority; annual household income was dichotomized as less than \$75,000 and \$75,000 or more; and education was dichotomized as high school graduate or less education versus some college or more postsecondary education. The number of chronic illnesses were self-reported and standardized to the list in NHANES to derive a variable measuring the number of chronic illnesses.

The level of moderate and vigorous physical activity in the preceding 30 days before the survey (both for USMS and NHANES samples) was obtained using several questions that included the frequency of conducting physical activities and the number of minutes using standardized questions. Additional questions that assessed the number of days impacted by physical and mental health problems included the following: "Thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" (labeled as physically unhealthy days) and "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" (labeled as mentally unhealthy days). Lastly, the impact of either physical and/or mental health on daily functioning was assessed by the following question: "During the past 30 days, for about how many days did physical or mental health keep you from doing your usual activities, such as self-care, work, school, recreation?" (called activity limitation days).

Overall self-rated general health was assessed in both the USMS swimmer and the NHANES samples by a single item using a 5-point Likert scale "Would you say your health in general is (excellent/very good/good/fair, or/poor)?"

Analysis

Descriptive analysis included frequency and percent for categorical variables and means and standard deviations for continuous variables. Differences between the USMS and NHANES samples were analyzed using Students t tests for independent samples for continuous variables and Chi-squared test for categorical variables. Multivariate regression analyses were conducted to determine the relative association of demographics, illness, and activity variables with the dependent variables of health status. A logistic regression was used with dichotomized health status variable classified as excellent, very good, good versus fair or poor. A second model was run to determine if people in the NHANES group who engaged in physical activity, regardless of type of activity, had similar results to USMS respondents. The same predictors and dependent variable were used, but only subjects who reported engaging in physical activity of moderate or vigorous intensity for one or more minutes per month were included in the second model. Survey weights

were derived for the USMS sample due to variations in responses based on age and gender. NHANES provides similar weights to account for the complex survey design. Significance in all analyses was set with a p value of $< .05$.

Results

A total of 1,054 USMS members responded with complete survey data. USMS survey respondents were older and more were female compared with the general USMS membership. The USMS gender distribution is 53.8% male and 46.2% female, while 38.2% of respondents were male and 61.8% were female. Individuals responding to the USMS survey were older, with 59.0% of the respondents in the survey being age 50 and older, while 35.1% of the general USMS members are age 50 or older.

A total of 5,171 people in the NHANES dataset met inclusion criteria. Table 1 provides data comparing the USMS sample to the NHANES sample. The demographics of the two groups were similar only in age. The USMS sample exhibited higher education and income, were primarily Caucasian, and had a greater number of self-reported chronic diseases compared with the NHANES sample.

The USMS group was significantly more physically active in moderate and vigorous physical activity categories, as well as overall time involved in physical activity. The USMS sample reported fewer physically and mentally unhealthy days as well as fewer inactive days due to health. Over 95% of USMS respondents indicated that their health fell into a category that included excellent, very good, or good, whereas 75.4% of the NHANES sample indicated the same.

Table 2 provides the results of the multivariate logistic regression analysis. The overall HL Chi-square was 10.274, $p = .246$, indicating a relatively good model fit. The pseudo R-square (Nagelkerke R square) was 0.263, indicating a moderate correlation between the set of predictor variables and health status. The variable representing group differentiation (USMS versus NHANES) had the greatest odds of being associated with health status. Membership in the USMS group was associated with greater odds of having better health status. Other characteristics associated with greater odds of having better health status were Caucasian race, higher income, higher education, greater time engaged in physical activity, and fewer chronic diseases.

We then compared people who reported engaging in at least 1 or more minutes of either vigorous or moderate exercise over the previous 30 days, in either group. The average number of minutes exercising in the previous 30 days for people in the USMS exercise group was 1,867.1 ($\pm 1,782$) minutes and 1,138.4 ($\pm 1,285$) minutes for the NHANES group. The multivariable logistic regression model results showed that higher income, more education, fewer chronic illnesses, being Caucasian, and being a member of the USMS group were associated with better health status. Table 3 provides these results. Total exercise minutes was statistically significant, but the 95% CI showed no variation (1.0, 1.0) and the odds ratio equaled 1.0, making interpretation of this variable difficult. The independent variable with the greatest odds of association with better health status was membership in the USMS group.

Table 1 Characteristics of Study Subjects in USMS Versus NHANES

Variable	USMS (n = 1054)	NHANES (n = 5171)	p value
Age (years)			
Mean (SE)	51.9 (13.1)	51.1 (17.6)	.18
Gender			
Female	637 (61.8%)	2620 (50.7%)	< .001
Male	394 (38.2%)	2551 (49.3%)	
Race			
Caucasian	1004 (97.4%)	3914 (75.7%)	< .001
Minority	27 (2.6%)	1257 (24.3%)	
Yearly Income			
Less than \$75,000	348 (35.0%)	3890 (78.0%)	< .001
\$75,000 or more	646 (65.0%)	1095 (22.0%)	
Education			
High school graduate or less	6 (0.6%)	2857 (55.3%)	< .001
Some college or more	1028 (99.4%)	2310 (44.7%)	
Number of chronic diseases			
Mean (SE)	2.0 (1.8)	1.1 (1.4)	< .001
Minutes vigorous activity in past 30 days			
Mean (SE)	1257.2 (1415.7)	183.4 (590.7)	< .001
Minutes moderate activity past 30 days			
Mean (SE)	580.8 (874.4)	305.6 (735.6)	< .001
Total minutes activity past 30 days			
Mean (SE)	1837.9 (1808.9)	488.9 (1013.3)	< .001
Health status			
Excellent, Very Good, Good	1014 (96.2%)	3898 (75.4%)	< .001
Fair, Poor	40 (3.8%)	1273 (24.6%)	
Days where physical health not so good			
Mean (SE)	3.3 (0.2)	4.4 (0.1)	< .001
Days where mental health not so good			
Mean (SE)	3.0 (0.2)	4.1 (0.1)	< .001
Inactive days due to physical or mental health			
Mean (SE)	1.4 (0.1)	2.4 (0.1)	< .001

Table 2 Multivariate Logistic Regression Model: Association of Respondent Characteristics and Health Status of the USMS Group Versus NHANES Group

Variable	Beta	Odds Ratio	95% CI	p value
Age	0.002	1.002	0.998–1.007	.26
Gender	0.05	1.05	0.91–1.21	.49
Race	0.19	1.21	1.032–1.428	.02
Education	– .92	0.4	0.34–0.47	< .001
Income	– .94	0.39	0.31–0.49	< .001
Chronic disease	0.39	1.47	1.4–1.55	< .001
Total minutes exercise	0.001	1.0	0.999–1.0	< .001
Group (USMS vs NHANES)	1.22	3.4	2.3–5.1	< .001

Table 3 Multivariate Logistic Regression Model: Association of Respondent Characteristics and Health Status of Swimmer Group Versus NHANES Respondents Who Exercise

Variable	Beta	Odds Ratio	95% CI	p Value
Age	–.001	0.99	0.99–1.007	.79
Gender	0.13	1.13	0.88–1.46	.33
Race	0.33	1.39	1.03–1.90	.03
Education	–1.08	0.34	0.26–0.45	< .001
Income	–1.08	0.34	0.24–0.49	< .001
Chronic disease	0.39	1.47	1.34–1.61	< .001
Total minutes exercise	0.00	1.00	1.00–1.00	.003
Group (USMS vs NHANES)	0.93	2.53	1.58–4.04	< .001

Discussion

Our survey reveals that Masters swimmers' perceived overall health is better than the general U.S. population as represented by data from the NHANES 2007–2008 database. Swimmers in our group endorse greater physical activity than the control NHANES group and greater physical activity appears to be associated with better overall perceived health without regard to the specific type of physical activity. Other research has shown that good overall perceived health is correlated with

both decreased overall disease morbidity and decreased mortality (Emaus et al., 2010; Idler & Benyamini, 1997; Martikainen et al., 1999; Otero-Rodríguez et al., 2010; Saavedra et al., 2007).

Swimmers also indicated that they experienced fewer days of poor mental health in the previous month, including less stress, depression, or problems with emotions when compared with NHANES respondents. Data indicating that physical activity obviates the need for antidepressant medications in the severely depressed are not available but evidence does indicate that exercise improves mild to moderate depression and it may be beneficial as an adjunctive therapy combined with medication in the more severely depressed population (Daley, 2008; Hamer et al., 2009).

In addition, swimmers stated that they experienced significantly fewer activity limitation days in the last 30 days due to either poor physical or mental health when compared with the NHANES sample. This finding is not unexpected, since activity limitation days were related to general self-rated health in earlier NHANES analyses. This underscores the benefits of regular exercise for overall good functioning (Zahran, et al., 2005).

When assessing only people in both groups who indicated they engaged in at least 1 min of moderate and/or vigorous exercise per 30 days and controlling for other demographic and disease characteristics, the USMS group members had greater odds of having better health status. One reason for this difference may be that Masters swimming has the added advantage of combining a structured physical activity with social interactions when Masters swimmers consistently exercise as a group, which may confer an advantage when compared with solitary exercise. Unfortunately, there is no description of the type of exercise or physical activity that the NHANES subjects participated in to compare the benefits of different types of exercise on health status. These results indicate that the tremendous growth in Masters athletics over the last decade is one glimmer of hope in the overall fight against worldwide physical inactivity and its' associated adverse health consequences.

Limitations

One limitation of this study is that USMS members are different from the general population in terms of income and education, which are two factors independently associated with better health status. An additional limitation is the low response rate from USMS sample, with older people and females responding more, although we adjusted for this by deriving sample-specific weights to account for the differences.

Conclusion

People engaged in physical activity, especially regular swimming associated with registration and participation in United States Masters Swimming, have higher odds of having better self-reported health status.

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