World Journal of Preventive Medicine, 2015, Vol. 3, No. 2, 24-27
Available online at http://pubs.sciepub.com/jpm/3/2/2

DOI:10.12691/jpm-3-2-2

Muscle Strengthening Activity in Addition to Physical Activity and Health-Related Quality of Life in Adults

Peter D. Hart*

Health Promotion Program, Montana State University - Northern,& Health Demographics, Havre, MT 59501,USA
*Corresponding author: peter.hart@msun.edu

Received March 31, 2015; Revised April 14, 2015; Accepted April 16, 2015

Abstract Muscle strengthening activity (MSA) is known to have positive physical health benefits. Less is known about MSA and perceived health such as health-related quality of life (HRQOL). The purpose of this study was to investigate the relationship between MSA and HRQOL among adults who are physically active. This study was a cross-sectional survey analysis using HRQOL as the dependent variable, MSA as the independent variable and age, sex, & education as control variables. A total of 523 adults who indicated participating in physical activity (PA) were included in the analysis. HRQOL was assessed using four different measures: 1) CDC's single general health item, 2) CDC's Healthy Days Index, 3) SF-36 physical component score (PCS), and 4) SF-36 mental component score (MCS). Data were analyzed by chi-square tests of independence, t-tests, and multiple logistic regression. Adults who participated in both MSA and PA were significantly more likely to report good HRQOL for general health (OR=3.39; CI: 1.66-6.93), unhealthy days (OR=1.62; CI: 1.07-2.47), and PCS (OR=1.99; CI: 1.23-3.22) as compared to adults who participated in PA alone. No significance was seen for MCS. This study found that participation in MSA in addition to PA increases the likelihood of reporting good HRQOL.

Keywords: *muscle strengthening activity, physical activity, health-related quality of life, population health*

Cite This Article: Peter D. Hart, "Muscle Strengthening Activity in Addition to Physical Activity and Health-Related Quality of Life in Adults." *World Journal of Preventive Medicine*, vol. 3, no. 2 (2015): 24-27. doi: 10.12691/jpm-3-2-2.

1. Introduction

Muscle strengthening activity (MSA) is the working of major muscle groups and can include resistance training with weights, elastic band exercises, and body weight activities such as calisthenics and rock climbing [1]. MSA is known to increase muscle mass & bone density, improve metabolic rate, and enhance physical functioning [2]. Physical activity (PA) is an uncontested behavior linked to positive health benefits including health-related quality of life (HRQOL) [3]. However, less is known about MSA and HRQOL and no studies to date have examined the influence of MSA in addition to PA in relation to HRQOL. Therefore, the purpose of this study was to investigate therelationship between MSA and HRQOL amongadults who are physically active.

2. Materials and Methods

2.1. Participants

Data for this study came from a survey administered to adults in and around a large southeastern U.S. university community. Participants were recruited via public advertisement and announcements to local social group networks. Participants were allowed to complete the survey if they were 18 years of age or older. Human subject clearance was obtained before conducting research from the campus Institutional Review Board. Each HRQOL assessment was converted to electronic form for web-based administration and the ordering of HRQOL assessments was counterbalanced. The online survey took approximately 15 minutes to complete. Participants completed the survey during the months of January-February, 2012.

2.2. Muscle Strengthening Activity Status

MSA status was assessed by the answer to the question "Do you do any physical activities specifically designed to strengthen your muscles such as lifting weights, push-ups or sit-ups?". Those respondents answering "yes" were considered to be participating in MSA. PA was assessed with two modified National Health and Nutrition Examination Survey (NHANES) questions [4]. These questions asked respondents if they participated in vigorous and/or moderate recreational activities for at least 10 minutes. Those respondents answering "yes" to either question were considered physically active and included in the study.

2.3. Health-Related Quality of Life

The CDC's Healthy Days core was used for the first two measures of HRQOL [5]. The first was a single item measure and asked about general health. Those responding

as “fair” or “poor” were considered to have poor HRQOL and those responding “excellent”, “very good”, or “good” were considered to have good HRQOL. General health was also used as a quantitative measure ranging from 1 to 5, where lower values represented better HRQOL. The second measure was a computed index that was constructed from the physical and mental health questionsregarding the previous 30 days. This measure was used to assess the overall number of unhealthy days due to physical and/or mental health, not to exceed 30 days. Those responding 14 days or more were considered to have poor HRQOL and those less than 14 days considered to have good HRQOL. Unhealthy days was also used as a quantitative measure ranging from 0 to 30, where lower values represented better HRQOL The last two measures of HRQOL came from the SF-36 physical component score (PCS) and mental component score (MCS)[6]. Both SF-36 scores were dichotomized and good HRQOL was defined as component scores greater than the third quartile [7]. Both the PCS and MCS were also used as quantitative measures computed as T scores, where larger values represented better HRQOL. The PCS and MCS scales of the SF-36 have both been shown to be reliable in PA research [8].

2.4. Other Variables

Body Mass Index (BMI) was calculated using self-report measures of height (in inches) and weight (in pounds). BMI was categorized as either underweight (< 18.8), normal (18.5-24.9), overweight (25-29.9), or obese (>= 30).Age (in years and in groups), gender (male, female), race (Caucasian, Non-Caucasian), college education (college educated, non-college educated), and marital status (single, non-single) were used for descriptive purposes and as demographic control variables.

2.5. Statistical Analysis

Prevalence estimates of MSA were computed by demographic characteristic and chi-square tests used to determine significance. Independent t and Mann-Whitney tests were used to determine mean differences in HRQOL scores across MSA status. Logistic regression was used to calculate the unadjusted odds ratios (ORs) and 95% confidence intervals (CIs) of MSA for eachHRQOL variable. Multiple logistic regression was finally used to predict each of the five HRQOL variables separately, using MSA as the independent variable while controlling for demographic variables (age, gender, and education). All analyses were performed using the SAS system version 9.2. All p-values are reported as 2-sided and statistical significance level was set at .05.

3. Results

A total of 523 participants (Mean [SD] age = 30.8 [13.8] years)completed both HRQOL assessments and indicated being physically active. Of which 69.4% participated in MSA (see Table 1). For age, 67.9%, 74.7%, 76.3%, 68.4%, 51.1%, and 60.0% of adults participated in MSAin the 18-24, 35-44, 45-54, 55-64, and 65-78 year age groups, respectively (p = .065). Males (67.9%) and females (72.8%) had similar rates of MSA (p = .025). MSA rates were also similar between the college educated (71.9%) and non-college educated (66.9%, p = .214) as well as between Caucasian (68.7%) and Non-Caucasian (74.7%). Finally, significant differences (p= .032) in MSA prevalence was seen across BMI categories, with the highest rate seen in the normal weight group (74.7%).

Table 1. MSA status among physically active adults by demographics

	Participates in MSA				
	Yes		No		
Characteristic	*%*	*N*	*%*	*N*	*p*[a]
Overall	69.4	363	30.6	160	< .001
Gender					
Male	67.9	248	32.1	117	.270
Female	72.8	115	27.2	43	
Age Group					
18-24	69.7	193	30.3	84	.065
25-34	74.7	68	25.3	23	
35-44	76.3	45	23.7	14	
45-54	68.4	26	31.6	12	
55-64	51.1	24	48.9	23	
65-78	60.0	6	40.0	4	
College Educated					
Yes	71.9	182	28.1	71	.214
No	66.9	180	33.1	89	
Race					
Caucasion	68.7	307	31.3	140	.297
Non-Caucasion	74.7	56	25.3	19	
Marital Status					
Single	70.8	221	29.2	91	.351
Non-Single	67.0	140	33.0	69	
BMI Category					
Underweight	66.7	12	33.3	6	.032
Normal	74.7	198	25.3	67	
Overweight	69.4	100	30.6	44	
Obese	57.8	48	42.2	35	

[a]Indicates *p*-value of the Pearson Chi-Square Test.

Adults participating in both MSA and PA had significantly greater HRQOL as compared to those participating in PA alone, as measured by mean general health (2.18 vs. 2.57, p < .001), unhealthy days (9.05 vs. 10.94, p = .033), and PCS (55.44 vs. 53.99, p = .020). However, HRQOL was not significantly different when using MCS (46.25 vs. 44.76, p = .171) as a measure (see Table 2).

Adults who participated in both MSA and PA were significantly more likely to report good HRQOL for general health (OR=3.31; CI: 1.65-6.65), unhealthy days (OR=1.59; CI: 1.06-2.37), and PCS (OR=2.10; CI: 1.30-3.38) as compared to adults who participated in PA alone (see Table 3). No significance was seen for MCS (OR=1.05; CI: 0.68-1.62).

While controlling for covariates (age, gender, education), adults who participated in both MSA and PA were significantly more likely to report good HRQOL for general health (OR=3.39; CI: 1.66-6.93), unhealthy days

(OR=1.62; CI: 1.07-2.47), and PCS (OR=1.99; CI: 1.23-3.22) as compared to adults who participated in PA alone. As well, no significance was seen for MCS(OR=1.05; CI: 0.68-1.62).

Table 2. Descriptive statistics for quantitative HRQOL variables by MSA status

	Participates in MSA				
	Yes		No		
HRQOL	*M*	*SD*	*M*	*SD*	*p*[a]
General Health[c]	2.18	0.795	2.57	0.798	< .001[b]
Unhealthy Days[c]	9.05	9.269	10.94	9.519	.033
PCS[d]	55.44	6.418	53.99	6.876	.020
MCS[d]	46.25	11.177	44.76	11.905	.171

[a]Indicates*p*-value of the independent t test.
[b]*p*-value is the same using the Mann-Whitney test.
[c]Lower values indicate better HRQOL.
[d]Higher values indicate better HRQOL.

Table 3. Odds of good HRQOL among adults who are PA and participate in MSA[a]

	Does participate in MSA[a]			
	Unadjusted		Adjusted[b]	
Good HRQOL	*OR*	*95% CI*	*OR*	*95% CI*
General Health	3.31	1.65, 6.65	3.39	1.66, 6.93
Unhealthy Days	1.59	1.06, 2.37	1.62	1.07, 2.47
PCS	2.10	1.30, 3.38	1.99	1.23, 3.22
MCS	1.05	0.68, 1.62	1.14	0.72, 1.80

[a]Comparison group are those who are PA but do not participate in MSA.
[b]Logistic regression models adjusted for age, sex, and education level.

4. Discussion

The purpose of this study was to investigate the relationship between MSA and HRQOL among adults who are physically active. Results found that a large percentage (almost 70%) of adults who are physically active also engage in MSA. This prevalence is much larger than the national average prevalence of MSA among adults, approximated as just under 30% by the Centers for Disease Control and Prevention [9]. Results also showed that prevalence of MSA was not significantly different across many of the demographic characteristics. The exceptions where significance was seen was BMI categorywhere the highest prevalence of MSA was seen in the normal weight group and lowest prevalence in the obese group. These differences in MSA prevalence are consistent with national estimates drawn from representative samples of adults, where heavier BMI groups had the lowest prevalence of MSA [9].

The results of this study also clearly showed that among adults who are physically active, those who also participate in MSA, had markedly better HRQOL. These results are consistent with current findings on the muscle strengthening and HRQOL relationship. In a cross-sectional study of older adults, it was shown that muscle strengthening activities with either equipment or the body was associated it increased HRQOL [10]. In a randomized controlled trial (RCT), subjects with type II diabetes assigned to both aerobic exercise and resistance training for 12 weeks, showed larger improvements in HRQOL as compared to controls [11].

There are many strengths associated with the results of this study. First, this study analyzed the relationship between MSA and HRQOL using four very reliable measures of HRQOL. The fact that this study showed favorable results with three of these four measures of HRQOL, and suggestive evidence with the fourth, contributes to the robustness of these generalizations. Second, this study is unique in that it allowed for examination of the MSA and HRQOL relationship while strictly controlling for PA. This was accomplished by the inclusion of only adults who participate in PA. This design component allowed for the analysis of MSA's association above that of PA alone.

This study is not without its limitations. One limitation is the lack of a representative sample of U.S. adults regarding the prevalence estimates. The effects of this limitation were considered during the study's design and recruitment of a wide-range of adults across various demographic groups were sought. A second limitation to these findings is the self-report nature of the activity and HRQOL measures. To minimize the effects of this limitation, only questionnaire items with the most convincing psychometric properties (validity and reliability) were included in the assessment of these measures.

5. Conclusion

This study found that participation in MSA in addition to PA increases the likelihood of reporting good HRQOL in adults as compared to PA alone. These results should be used to promote MSA programs along with PA for improved HRQOL.

References

[1] United States Department of Health and Human Services. (2008). 2008 Physical Activity Guidelines for Americans. Washington, DC: Available online at: http://www.health.gov/paguidelines/.

[2] Seguin, R., and Nelson, M. E. (2003). The benefits of strength training for older adults. American World Journal of Preventive Medicine, 25(3, Supp 2), 141-149.

[3] Heath, G. W., & Brown, D. W. (2009). Recommended levels of physical activity and health-related quality of life among overweight and obese adults in the United States, 2005. Journal of Physical Activity and Health, 6(4), 403-411.

[4] Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). (2007). *National Health and Nutrition Examination Survey Questionnaire*. Hyattsville, MD: Available online at: www.cdc.gov/nchs/nhanes.htm.

[5] Centers for Disease Control and Prevention. Measuring healthy days: Population assessment of health-related quality of life. Centers for Disease Control and Prevention, Atlanta, Georgia 2000.

[6] Ware, J.E. (2004). SF-36 Health Survey Update. Retrieved August 15, 2011, from http://www.sf-36.org/announcements/Updated_SF36_bookChapter_Sept04.pdf.

[7] Azarkeivan A, Hajibeig B, Alavian SM, Moghani Lankarani M, Assari S. Associates of poor physical and mental health-related

quality of life in beta thalassemia-major/intermedia. JRMS. 2009; 14:349-355.

[8] Hart, Peter D., and Minsoo Kang. "Reliability of the Short-Form Health Survey (SF-36) in Physical Activity Research Using Meta-Analysis." World Journal of Preventive Medicine 3.2 (2015): 17-23.

[9] Centers for Disease Control and Prevention (CDC). Adult Participation in Aerobic and Muscle-Strengthening Physical Activities — United States, 2011. MMWR Morb Mortal Wkly Rep. 2013; 62(17): 326.

[10] Harada, K., Shibata, A., Oka, K., & Nakamura, Y. (2015). Association of muscle-strengthening activity with knee and low back pain, falls, and health-related quality of life among Japanese older adults: a cross-sectional survey. [Research Support, Non-U.S. Gov't]. J Aging Phys Act, 23(1), 1-8.

[11] Tomas-Carus, P., Ortega-Alonso, A., Pietilainen, K. H., Santos, V., Goncalves, G., H, H., Ramos, J., Raimundo, A. (2015). A randomized controlled trial on the effects of combined aerobic-resistance exercise on muscle strength and fatigue, glycemic control and health-related quality of life of type 2 diabetes patients. J Sports Med Phys Fitness, Feb 12. [Epub ahead of print].