



Colorado Department  
of Public Health  
and Environment

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Kirk Bol, M.S.P.H.

Christine Demont-Heinrich

Juanita Galvan

4300 Cherry Creek Drive South  
Denver, Colorado 80246-1530  
(303)692-2160  
(800)886-7689

health.statistics@state.co.us  
www.cdph.state.co.us/hs/

## The Association Between Physical Activity, Mental Health and Quality of Life: A Population-Based Study

*Christine Demont-Heinrich*

### Introduction

Physical activity offers numerous health benefits. Being physically active can help individuals maintain a healthy weight and therefore reduce the risk for obesity. Physical activity is also associated with a lowered risk for developing heart disease, type 2 diabetes, certain cancers, high blood pressure, and osteoporosis. It has also been suggested that physical activity may improve mental health and quality of life. Experimental studies have demonstrated that exercise interventions relieve symptoms of depression and anxiety.<sup>1,2</sup> Physical activity has also been used as a treatment for people with psychiatric diseases and as treatment to improve quality of life in both people with and without mental health disorders.<sup>3</sup> Faulkner and Taylor suggested that physical activity can improve quality of life in individuals who have mental health disorders and physical health problems.<sup>4</sup>

Does this association between physical activity and mental health translate to the general population? Epidemiologic studies have demonstrated associations between physical activity and mental health but these studies included only certain subpopulations.<sup>5</sup> Population-based studies that look at both sexes and include a wide age range are scarce.<sup>6</sup> The aim of this paper is to examine the association between physical activity and mental health and the association between physical activity and quality of life using a population-based surveillance system.

### Methodology

#### Study Population

The Behavioral Risk Factor Surveillance System (BRFSS), which was developed by the Centers for Disease Control and Prevention, is an ongoing population-based surveillance system that is used in all 50 states including Colorado. The Colorado BRFSS is administered by the Colorado Department of Public Health and Environment and is used to collect information on health status, prevalence of chronic conditions, and self-reported lifestyle behaviors of Colorado adults using a random-digit-dial telephone survey.

A cross-sectional study was designed using data from the Colorado BRFSS to study the associations between physical activity, mental health, and quality of life. In 2007, the Colorado

BRFSS questionnaire included questions related to mental illness in one half of the sample. 5,938 completed surveys contained information on physical activity, mental health, and quality of life. The data were weighted to represent the population of adults living in Colorado. Respondents who did not answer 'yes' or 'no' to having engaged in any leisure time physical activity were excluded resulting in 5,934 surveys that were included for this analysis.

### Mental Health and Quality of Life Measures

Mental health was measured using the Kessler 6, or K6 scale. The K6, comprised of six questions, is designed to measure serious psychological distress, an indicator of serious mental illness.<sup>7</sup> The K6 has been used in the National Survey on Drug Use and Health and was added to the Colorado BRFSS in 2007. Each question in the K6 scale is assigned a score from zero to four and then the scores from all six questions are summed together. If the survey respondent scored 13 or greater on the K6 scale, they were classified as having serious psychological distress.

The following five indicators were used to measure quality of life: 1) Self-rated poor health status was defined when the survey respondent rated their health status as poor or fair. 2) If the survey respondent reported that they were dissatisfied or very dissatisfied with life, then they were defined as being dissatisfied with life. 3) Mentally unhealthy days was defined as having five or more days in the past 30 days where mental health, including stress, depression, and problems with emotions, was not good. 4) Physically unhealthy days were defined as having five or more days in the past 30 days where physical health, including physical illness and injury, was not good. 5) Activity limitation days was defined as having five or more days in the past 30 days where poor physical or mental health prevented the survey respondent from doing their usual activities.

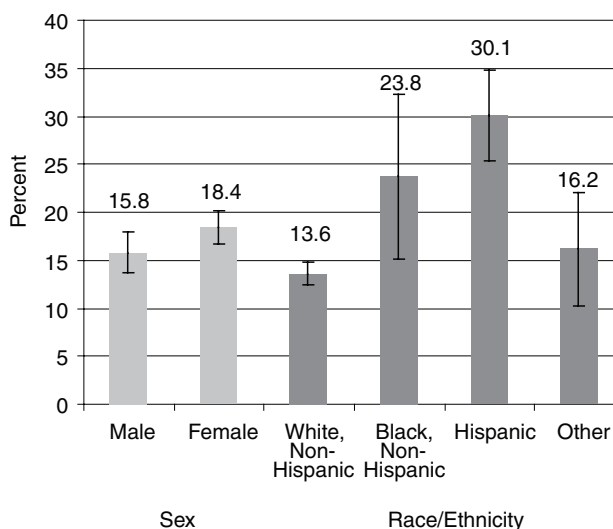
SAS v9.2 (Cary, NC) was used for all analyses. Logistic regression analyses for the survey data were used to test the association between physical inactivity and mental health and quality of life outcomes. Significance of the resultant odds ratios and prevalence estimates was accepted at the 0.05 alpha level.

## Results

### Physical Inactivity Prevalence

The overall percentage of adults in Colorado who reported no leisure time physical activity was 17.1 percent (95% CI 15.8-18.5). The prevalence of physical inactivity varied by race/ethnicity (Figure 1). Hispanic adults reported the highest percentage of no physical activity at 30.1 percent, whereas White, non-Hispanic adults reported the lowest percentage of no

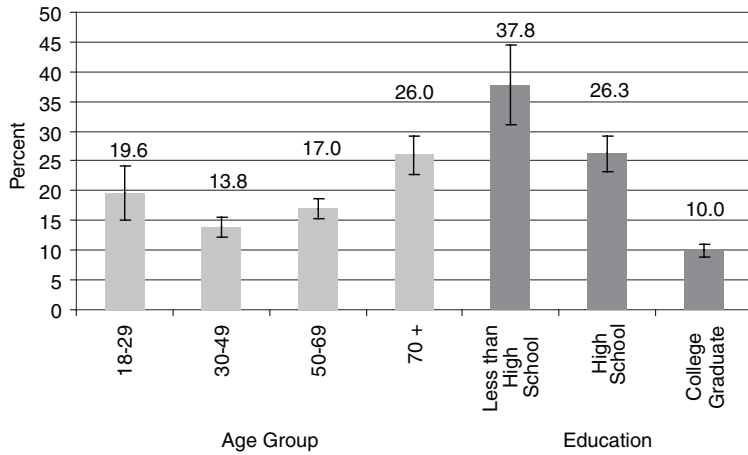
Figure 1. Self-reported physical inactivity by sex and race/ethnicity, Colorado BRFSS, 2007



Source: Colorado 2007 BRFSS, Health Statistics Section, Colorado Dept. of Public Health & Environment

physical activity at 13.6 percent. There was no significant difference in physical inactivity levels between males and females. The prevalence of physical inactivity differed by age group and education level (Figure 2). The least physically inactive group was the 30-49 age group (13.8%) and the most physically inactive group were the 70+ age group (26%). Colorado adults with less than a high school education had the highest percentage of physical inactivity (37.8 %). In contrast, Colorado adults with a college education had the lowest percentage of physical inactivity (10%).

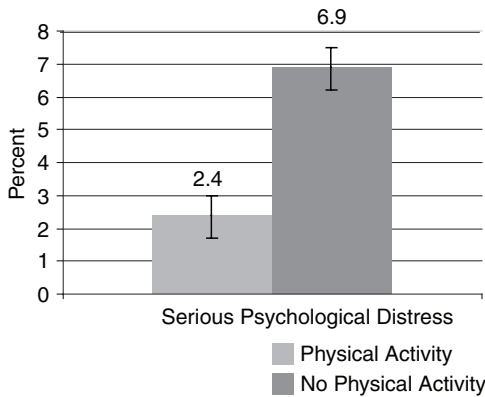
**Figure 2. Self-reported physical inactivity by age group and education level, Colorado BRFSS, 2007**



Source: Colorado 2007 BRFSS, Health Statistics Section, Colorado Dept. of Public Health & Environment

As shown in Figure 3, those who reported no leisure time physical activity were more likely to be classified as having serious psychological distress (6.9%) compared to than those who did report leisure time physical activity (2.4%). Adults who were physically inactive were also more likely to have diminished quality of life compared to adults who reported being

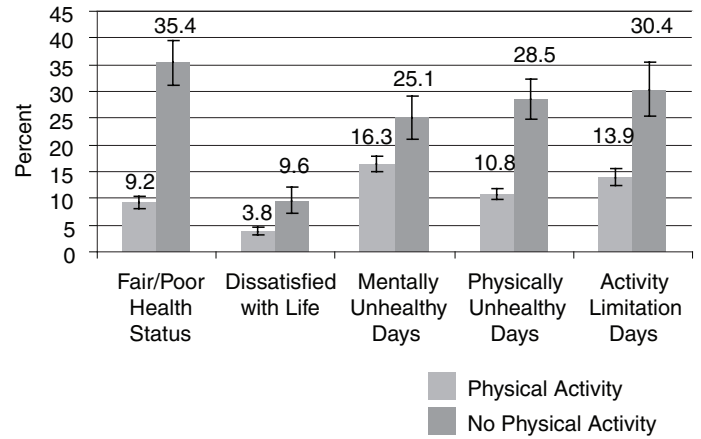
**Figure 3. Percentages of Mental Health Outcome by Physical Activity, Colorado BRFSS, 2007**



Source: Colorado 2007 BRFSS, Health Statistics Section, Colorado Dept. of Public Health & Environment

physically active (Figure 4). Those who reported no leisure time physical activity were more likely to self-report poor/fair health status, dissatisfaction with life, and five or more mentally unhealthy days, physically unhealthy days, and activity limitation days than those who reported leisure time physical activity.

**Figure 4. Percentages of Quality of Life Outcomes by Physical Activity, Colorado BRFSS, 2007**



Source: Colorado 2007 BRFSS, Health Statistics Section, Colorado Dept. of Public Health & Environment

### Mental Health Outcome

While controlling for age, race/ethnicity, and education level, Colorado adults who reported no leisure time physical activity were more than twice as likely to have been classified as having serious psychological distress compared to those who reported leisure time physical activity. (OR 2.31 95% CI 1.43-3.73) Unadjusted and adjusted odds ratios with 95% confidence intervals are displayed in Table 1.

**Table 1. Unadjusted and Adjusted Odds Ratios (with 95% Confidence Intervals) for Mental Health and Quality of Life Outcomes by Physical Inactivity**

	Unadjusted Odds Ratio	Adjusted Odds Ratio*
<b>Mental Health Outcomes</b>		
Serious Psychological Distress (≥13 Score on Kessler Scale)	3.06 (2.00, 4.67)	2.31 (1.43, 3.73)
<b>Quality of Life Outcomes</b>		
Self-Rated General Health Status (Fair or Poor)	5.39 (4.32, 6.73)	3.57 (2.81, 4.55)
Satisfaction with Life (Dissatisfied or Very Dissatisfied)	2.69 (1.90, 3.80)	2.51 (1.73, 3.64)
Mentally Unhealthy Days (5 Days or more in past 30 days)	1.72 (1.36, 2.17)	1.56 (1.21, 2.01)
Physically Unhealthy Days (5 Days or more in past 30 days)	3.29 (2.65, 4.08)	3.02 (2.42, 3.77)
Activity Limitation Days (5 Days or more in past 30 days)	2.70 (2.05, 3.57)	2.34 (1.77, 3.12)

Note: All results are statistically significant (< 0.05 alpha level).

\*Adjusted Odds Ratios are adjusted for age, race/ethnicity, and education level.

Source: Colorado 2007 BRFSS, Health Statistics Section, Colorado Dept. of Public Health & Environment

### **Quality of Life Outcomes**

Colorado adults who reported no leisure time physical activity were 3.6 times more likely to report fair or poor health compared to those who reported leisure time physical activity (OR 3.57, 95% CI 2.81-4.55). The odds of being dissatisfied or very dissatisfied with life was 2.5 times higher in adults who reported being physically inactive compared to adults who reported being physically active (OR 2.51, 95% CI 1.73-3.64). Those who reported no leisure time physical activity were more likely to report five or more mentally unhealthy days, physically unhealthy days, and activity limitation days compared to those who reported leisure time physical activity.

### **Discussion**

The results of this study demonstrate that there is an association between physical activity and mental health as well as an association between physical activity and quality of life. Specifically, Colorado adults who reported no leisure time physical activity also reported poorer mental and poorer quality of life compared to those who reported leisure time physical activity.

Public health programs should include physical activity in their promotion strategies not only to improve physical health but also because it may improve mental health and quality of life as well. Biddle and his colleagues describe several reasons for why physical activity should be used to promote mental health.<sup>8</sup> Physical activity is less expensive and has minimal side effects when compared to using pharmacological drugs as mental health treatment. Physical activity can be sustained long-term whereas drugs or therapy may only be short-term. Those who have challenges with access to care for receiving therapy, whether it's due to lack of insurance coverage or geographical constraints, would also benefit from incorporating physical activity as a means to improve mental health.

This study has a few limitations. Because this study is cross-sectional, causality between physical activity and mental health and quality of life cannot be inferred. Also the BRFSS is a self-reported questionnaire and is limited to those who are non-institutionalized and with a land line telephone. Although this study is cross-sectional, it does support the current research that physical activity is associated with mental health and quality of life.

Future research should continue to examine the physical activity and mental health association. Colorado added questions specific to depression and anxiety in their 2008 BRFSS. Data from this questionnaire could be analyzed to examine the physical activity and mental health association further.

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