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Association between screen time and depression among US adults

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ABSTRACT

Epidemiological surveys conducted in general populations have found that the prevalence of depression is about 9% in the United States. World Health Organization has projected that depression will be leading cause of disease burden by the year 2030. Growing evidence suggests that sedentary lifestyle is an important risk factor of depression among adults. The relationship between television watching/computer use and depression in US adults is still unknown. The objective of this study was to assess the relationship between television watching/computer use and depression. This is a cross-sectional study that used the secondary data from the National Health and Nutritional Examination Survey (NHANES) (2011/2012). Participants were 3201 US adults who were 20 years or more. Self-reported Patient Health Questionnaire-9 [PHQ-9] was used to classify depression level; self-reported hours of watching TV and use of computer/day, and demographic information were obtained from NHANES data set. SAS®9.4was used to perform all statistical analyses and final model selection procedure. Depression was found to be significantly higher among female. Results showed that moderate or severe depression level was associated with higher time spent on TV watching and use of computer (> 6 h/day) (adjusted odds ratio: 2.3, 95% CI: 1.602–3.442). Duration of screen time was significantly associated when all covariates were adjusted. TV watching and computer use can predict the depression level among adults. Prospective studies and measurement of factors such as: work place sitting, social relationship, and family history of depression are warranted.

1. Introduction

Depression is one of the most common mental disorders and it is estimated that 350 million people of all ages suffer from depression globally (Marcus et al., 2016). World Health Organization predicts that depression will be the leading cause of disease burden worldwide by the year 2030 (World Health Organization, 2011). Data from the National Health and Nutrition Examination Survey, 2009–2012 has indicated that about 7.6% of people aged 12 and over had moderate or severe depression (Pratt and Brody, 2014). Studies have found that females are more likely to experience depressive symptoms than male (de Wit et al., 2011; Wang et al., 2016). Several researches have been conducted to seek the association between depression and individual characteristics such as: physical activity, socio-economic status and existing disease conditions, and reported that these factors are associated with depression (Freeman et al., 2016; Ma and Xiao, 2010; Vallance et al., 2011; Zhao et al., 2011). Research in sedentary behavior and health risk suggests that engaging in sedentary behavior is associated with depression and several chronic diseases such as: type 2 diabetes and cardiovascular diseases (de Wit et al., 2011; Megan et al., 2014; Teychenne et al., 2010).

Sedentary behavior can be defined as behavior characterized by a seated or reclining posture and low energy expenditure (≤ 1.5 Metabolic Equivalent Task) (Teychenne et al., 2010). TV watching and computer use are common sedentary activities in United States and elsewhere. People who spend > 4 h of screen time such as: TV watching and computer use, are at higher risk of developing depression (de Wit et al., 2011; Hamer et al., 2013). While, it is also reported that people with depressive symptoms spend significantly more hours in a day, watching TV and using computer (de Wit et al., 2011).

Most of the studies have focused towards the relation of physical activity with mental health. The role of physical activity in mental health is well established in several studies and it is proven that physically active individuals are less likely to suffer from depressive symptoms (Hamer et al., 2010). However, there are a limited number of studies done to assess screen time (TV watching and computer use) and depression, controlling major demographic and socio-economic factors. This study aims to assess the relationship between screen time and

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depression risk among U.S. adults and select the best model to predict depression.

2. Methodology

2.1. Study design and sample

This is a cross-sectional study, done using the 2011–2012 cycle of National Health and Nutrition Examination Survey (NHANES) data (Center for Disease Control and Prevention, 2012). NHANES is a cross-sectional survey, representing the no institutionalized civilian resident population of the United States. Individuals who were 20 years or more were included in this study (Center for Disease Control and Prevention, 2014). Participants who did not respond to the depression screener questionnaire (Patient Health Questionnaire-9) were excluded from the study (Loprinzi and Cardinal, 2012). Similarly, those who did not have complete data for demographic information and TV watching/computer use were also excluded. A total of 3201 adults from the United States were included in this study (Loprinzi and Cardinal, 2012).

2.2. Diagnosis and classification of depressive symptoms

Depressive symptoms were determined based on participant's responses to the PHQ-9 questionnaire in the NHANES 2011–2012 cycle. PHQ-9 is the 9-item self-report depression scale that asks questions about the frequency of symptoms of depression over the past 2 weeks (Kroenke et al., 2001; Moschos et al., 2016). Each item can be scored from 0 (not at all) to 3 (nearly every day) (Kroenke et al., 2001). The PHQ-9 score can range from 0 to 27 and thus, classified in two categories. Individual having PHQ-score < 9 were classified as “no or mild depression” and those with PHQ-score of 10 or more, were classified as “moderate to severe depression” (Rethorst et al., 2014; Wittayanukorn et al., 2014).

2.3. Screen time

Self-reported total hours per day spent on watching TV and use of computer, was calculated based on the responses on two questions: 1). “Over the past 30 days, on average how many hours per day did you sit and watch TV or video”, 2). “Over the past 30 days, on average how many hours per day did you use a computer or play computer games outside of work or school”. “Average number of hours per day watching TV or video” and “average number of hours per day using computer or playing computer games outside of work” were summed and called as “screen time”. Participants screen time was classified into two categories (Breland et al., 2013; Grontved et al., 2015). Those with > 4 h per day of screen time are categorized as high screen time and those with < 4 h per day of screen time are categorized as low screen time (Duncan et al., 2012; Shiue, 2015).

2.4. Body mass index (BMI)

Self-reported body weight and height of participants were used to determine Body Mass Index (BMI) and classified into 4 categories: 1) Underweight (< 18.5 kg/m^2), 2) Normal weight (18.5 to 24.9 kg/m^2), 3) Overweight (25 to 29.9 kg/m^2) and 4) Obese (> 30 kg/m^2) (Duncan et al., 2012).

2.5. Covariates

Based on existing literatures on screen time and depression; age, gender, sex, race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic and Other race) and education were included in this study as confounding variables (Gardner et al., 2014; Owens et al., 2014; Weaver et al., 2015). Education was categorized into 2 levels: 1) Less than high school/general education development (GED) and 2) High school graduate/GED or equivalent or more. Similarly, age was categorized into four groups: 1) 20 to 35 years, 2) 36 to 50 years, 3) 51 to 65 years, and 4) > 65 years. Since depression is more common in adult group (≥ 20 years), participants who were < 20 years were excluded for this study.

Socioeconomic status (SES) was determined based on income to poverty ratio, which was obtained from NHANES data set. Income-to-poverty ratios represent the ratio of family or unrelated individual income to their appropriate poverty threshold (Loprinzi et al., 2013). In this study, a ratio below 1.00 was categorized as below poverty threshold, while a ratio 1.00 or greater was categorized as income above the poverty threshold.

2.6. Statistical analysis

All statistical analysis was performed in SAS®9.4 software (SAS Institute Inc., 2013). Frequency and percentage of study variables were calculated. In order to observe the relationship between dependent (depression level) and independent variables (screen time including age, sex, gender, race, poverty level, education level) univariate and multivariate modeling were used.

All potential covariates were identified a priori, and a backward elimination ($p < 0.05$ for variable retention in model) procedure was performed, which removed the interaction term (BMI*screen time) and age category in step 1. Multiple logistic regression models were used to examine the associations between screen time and depression level adjusting potential confounders. Four different models were developed between screen time and depression. Model 1 was adjusted for all potential confounders: age, education, race, gender, BMI, and poverty, Model 2 was adjusted for race, gender, BMI, and poverty, and Model 3 was adjusted for gender, education, BMI, and poverty. Finally, Model 4 was adjusted for minimal set of covariates including: gender, education and poverty. Model 4 was selected to assess and predict the relationship between screen time and depression.

The model fit (covariate p-values) was tested using manual backward elimination regression methods, where all potentially confounding covariates were removed one at a time by analyzing the model fit criteria. Covariates with p-value > 0.05 were removed one by one when value of Akaike Information Criteria (Tomaic et al., 2013) and Schwarz Criterion (SC) was significantly smaller than the values as compared to the previous model. This procedure was repeated until the most parsimonious regression model was reached. Furthermore, the likelihood-ratio statistic was performed, $\Delta G^2 = (-2 \log L$ from reduced model$) - (-2 \log L$ from current model). Smaller value of ΔG^2 (-2 Log L) of the model with $p > 0.005$, which shows the insignificant result against the full model was also used as criteria for model selection.

Interaction between BMI and screen time was included in the saturated model; however, it was not significant. Thus, interaction term was deleted from the backward elimination. Statistical significance was set at $p < 0.05$ for the main effects and for the interaction term.

3. Results

The results of this study are based on the responses of 3201 US adults who participated in NHANES 2011–2012. Descriptive analyses of main exposure and study co-variates were performed.

3.1. Demographic characteristics of study population

The frequency and percentage of main exposure of interest i.e. screen time and co-variates by outcome status are presented in Table 1. Of the total respondents male and female participants were equally distributed gender wise. Majority of respondents were non-Hispanic white (42.17%), whereas Hispanic respondents were accounted for 14.50% of total respondents. About 87% of respondent had completed