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TRAIT ANXIETY AND NEGATIVE HEALTH RISK BEHAVIORS IN ADULTS

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ABSTRACT

Relatively little is known regarding trait anxiety and its relationship with negative health risk behaviors such as alcohol consumption and physical inactivity in adults. This study aimed to examine whether negative health risk behaviors differ by sex and whether trait anxiety is associated with the negative health risk behaviors above and beyond sociodemographic factors and depression. Data used in the present study came from a published dataset from the Midlife in the United States 2 (MIDUS 2) study and include a sample of 1,054 adults whose age range from 34 to 84 years. There were significant sex differences in alcohol consumption, but not in physical inactivity. Age, sex, BMI, and depression were significantly associated with alcohol consumption or physical inactivity, whereas trait anxiety was not. These results suggest that sociodemographic variables and depression should be taken into consideration when studying negative health risk behaviors.

Keywords: Trait anxiety, negative health risk behaviors, physical inactivity, alcohol consumption

ABSTRAKT

Det finns relativt lite kunskap om ångest och dess förhållande till negativa hälsobeteenden som alkoholkonsumtion och fysisk inaktivitet hos vuxna individer. Denna studie avsåg undersöka om negativa hälsobeteenden varierade beroende på kön och om ångest har en relation till negativa hälsobeteenden utöver sociodemografiska faktorer och depression. De data som användes i denna studie kommer från ett offentligt data-set från the Midlife in the United States 2-studien (MIDUS 2) som omfattar 1054 vuxna deltagare med en ålder mellan 34 och 84 år. Det påfanns signifikanta könsskillnader inom alkoholkonsumtion men inte inom fysisk inaktivitet. Variablerna ålder, kön, BMI och depression hade en signifikant koppling till alkoholkonsumtion och fysisk inaktivitet, men ett liknande samband kunde inte påfinnas mellan ångest och de två hälsobeteendena. Detta indikerar således att man bör studera sociodemografiska variabler och depression i relation till negativa hälsobeteenden då det verkar finnas en tydlig koppling.

Nyckelord: Ångestbenägenhet, negativa hälsobeteenden, fysisk inaktivitet, alkoholkonsumtion

Trait Anxiety and Negative Health Risk Behaviors in Adults: The Relationship between Trait Anxiety, Alcohol Consumption and Physical Inactivity.

In today's society where mental health issues such as anxiety and depression are becoming more and more common we need to broaden our knowledge about different psychological disorders in order to help individuals who may be suffering in silence or are wrongfully diagnosed or treated. Previous research has been able to establish a relationship between psychiatric disorders and negative health risk behaviors (e.g., Kim, 2011; Makino, Hashizume, Tsuboi, Yasushi, & Dennerstein, 2006; Weber, Blais & Betz, 2003; Ye et al., 2016). However, *psychological disorders* or *mental health issues* are broad concepts which do not bring much understanding to which specific disorders are influenced or affected by negative health risk behaviors or vice versa. Negative health risk behaviors have become quite common in today's society and these behaviors negatively affect many people's day-to-day lives and can bring about negative consequences later in life (e.g., Ye et al., 2016). This study aims to investigate the link between anxiety and negative health risk behaviors specifically. The study results are expected to shed some light on this relationship which will hopefully aid future research as well as practice.

Anxiety

Anxiety is defined as a feeling and emotion of uneasiness and tension accompanied by worry and oftentimes nervousness. Although anxiety is a common emotion in different individuals, it can also develop into an anxiety disorder. These anxiety disorders can have physical symptoms such as high blood pressure, sweating, changes in heartbeat frequency, and trembling/shaking among others (American Psychological Association, 2016). Anxiety disorders are characterized by different states of anxiety that are so frequent and intense that they dominate and heavily affect an individual's daily life (Raymond, Steele, & Serié, 2017). Generalized anxiety disorder (GAD) is explained as excessive worry about different aspects of everyday life. The excessive worry is uncontrollable and is oftentimes called pathological worry (American Psychological Association, 2016). In addition to this, a model by Wells (1995) explains this worry as a process that continually maintains the disorder.

According to Kessler et al. (2007, 2009), anxiety has been reported as the most common mental health problem in general. This disorder is normally measured through either state or trait anxiety, and oftentimes even both. The frequency with which an individual experiences anxiety symptoms (negative emotions such as worry and fear) in different situations is called trait anxiety. It also refers to how characteristic the perceived anxiety symptoms are on an individual level (Spielberger, Gorsuch, Lushene, Bagg, & Snaith, 1983; Taylor, 1953). Trait anxiety is a measure for anxiety symptoms and individual experiences, how characteristic these situations and experiences are and it also measures the frequency with which the symptoms are experienced (Spielberger et al., 1983; Taylor, 1953). People oftentimes mix trait anxiety together with state anxiety which is a different concept that measures the intensity of the perceived anxiety during shorter time periods (Hamilton, 1959; Spielberger et al., 1983; Zigmund, & Snaith, 1983). This study aims to investigate whether or not trait anxiety and negative health risk behaviors are associated with one another.

Negative health risk behaviors

Negative health risk behaviors refer to behaviors that jeopardize our health in some kind of way. This relates to behaviors such as smoking, alcohol use/abuse, drug use/abuse, medication abuse, sleep disturbance, frequent Internet-use, physical inactivity, risk-taking or risk-avoidance, poor dietary behaviors (e.g., caloric restriction or stress eating), and unsafe

sexual behaviors (Dey, Gmel, Studer, & Mohler-Kuo, 2013; Jones, Pezzi, Rodrigues-Lainz, & Whittle, 2016; Keller, Maddock, Hannover, Thyrian, & Basler, 2008; Ye, Wang, Qu, Yuan, Phongsavan, & He, 2016).

A study conducted in Korea examined psychological symptoms and their association with negative health risk behaviors in 885 adolescents at a Korean high school. The study found that psychological symptoms were in fact significantly correlated with health risk behaviors such as physical inactivity, eating problems, alcohol consumption, drug use, smoking, and unsafe sexual behaviors (Kim, 2011). In a similar vein, a study that was conducted in England examined psychological health/psychological distress and its possible relationship with negative health risk behaviors. The negative health risk behaviors examined in the study were smoking, alcohol use, obesity/overweight, physical inactivity, and drug use. The study documented that psychological distress was predicted by general health and also by engagement in negative health behaviors. Smoking, obesity/overweight, and physical activity were however not associated with psychological distress and depressive symptoms. Based on these findings the study concluded that there is a moderate relationship between the variables negative health risk behaviors and psychological health (Clark et al., 2006).

A study conducted in China examined college student's health risk behaviors and scores on standardized depression and anxiety scales. The study examined negative health risk behaviors such as smoking, frequent Internet use, physical inactivity, alcohol use, sleep disturbances, and poor dietary behavior. Most of the students who participated in the study reported at least one health risk behavior, only about 11.9% of the 2422 participants reported no health risk behaviors being present. The most common negative health behavior was physical inactivity while the least common one was smoking. The study came to the conclusion that the students who engaged in health risk behaviors all experienced mental health issues (e.g. depression and anxiety) to a greater extent than those who did not (Ye et al., 2016). The study found significant correlations between mental health issues and health risk behaviors, which leads to a hypothesis for the present study.

Generalized anxiety disorder (GAD) and similar psychopathological symptoms has been linked to adolescent engagement in negative health risk behaviors, and more specifically, to substance use in adolescence (Fröjd, Ranta, Kaltiala-Heino, & Marttunen, 2011; Leventhal et al., 2015; Pang, Farrahi, Glazier, Sussman, & Leventhal, 2014; Wolitzky-Taylor et al., 2015). A similar line of research has shown a close relationship between anxiety and the negative health risk behavior of physical inactivity (e.g., Ashdown-Franks, Sabiston, Solomon-Krakus, & O'Loughlin, 2017; Herring, Hallgren, & Campbell, 2017; Herring, Jacob, Suveg, & O'Connor, 2011). Despite these studies establishing a relationship between the variables negative health risk behaviors and anxiety, little research has been done on the underlying factors that make us engage in negative health behaviors. In addition, the previous research seems to show some disagreements regarding what particularly causes us to engage in negative health risk behaviors. Most of this research has been inclined into examining family relationships and environments and their impact on negative health risk behaviors (e.g., Chen & Paterson, 2006; Delva, O'Malley & Johnston, 2006; Lau, Quadrel, & Hartman, 1990; Repetti, Taylor, Seeman, 2002; Taylor & Repetti, 1997).

Physical inactivity

A study by Herring et al. (2011) set out to examine whether or not exercise training had a significant relationship with perceived anxiety in patients with GAD. The study aimed to investigate if exercise and increased physical activity during a time span of two weeks could bring about positive effects on the anxiety levels in the subjects. The results showed an improvement in the symptoms of GAD. The greatest improvements were seen in anxiety

symptoms such as worry, energy/fatigue and anxiety, which are all part of the criteria for GAD. Herring et al. (2017) conducted a study that examined the same relationship but with a single bout of aerobic exercise instead of continuous exercise during a specific time span. The study came to the conclusion that 30 minutes of aerobic exercise with a heart rate of at least 73%HRR (Heart Rate Reserve) showed significant improvements in anxiety, worry and feelings of energy/fatigue. They, however, saw that there was some variation in levels of improvement between the subjects. This study only examined the relationship between physical activity and GAD in a sample of young women. A study conducted in Canada, where anxiety is the most common mental health problem (Public Health Agency of Canada, 2015), examined associations between sports participation and anxiety in subjects who were followed from high school to young adulthood. The study came to the conclusion that the number of years the participants engaged in sports participation could act as a protective factor for different kinds of anxiety (Ashdown-Franks et al., 2017).

Previous studies on negative health risk behaviors have found physical inactivity to be the most common health risk behavior, especially among adolescents (e.g., Ye et al., 2016). These results can be helpful when clinicians look into treatment options for their patients as physical activity could be prescribed as a treatment. In conclusion to this information there seems to be a link between anxiety disorders and exercise or physical activity. However, there is no known research explaining how anxiety impacts engagement in this negative health risk behavior. Thus, the present study sought to examine how trait anxiety is associated with physical inactivity in adults.

Alcohol use

The consumption of alcohol could pose serious immediate and long-term health risks. Previous research has been able to link substance use, such as alcohol consumption, with psychopathology (Chen et al., 2002; Kedzior, & Laeber, 2014; Fröjd et al., 2011; Leventhal et al., 2015; Pang et al., 2014; Wolitzky-Taylor et al., 2015). There also seems to be a potential link between substance use and psychopathological disorders (e.g., GAD) as a result of shared genetic as well as psychosocial factors (Malone, Taylor, Marmorstein, McGue, & Iacono, 2004). A similar study, by Lovallo (2006) came to a slightly different conclusion as the study found the same link but regarded it as being dependent on individual psychological and physiological effects from the substances; one of these in particular being dysregulated stress reactivity. Brook, Zhang, Rubenstone, Primack and Brook (2016) examined the relationship between psychiatric disorders and substance use in a sample of families where the age span went from adolescents up to adults. In line with previously mentioned research on the area, the study evidenced that long-term substance use did have a significant relationship with the development of psychiatric disorders in adulthood. The study also found moderate drinking to have the strongest link with GAD. In view of these findings, it would be interesting to probe whether trait anxiety is associated with alcohol consumption in adults.

Depression

When discussing and looking into concepts such as *mental health issues*, *psychological distress*, *psychiatric disorders*, and *psychopathological problems* one can see a pattern in the literature of a diffuse distinction between anxiety and depression. The literature oftentimes generalizes one of the previously mentioned psychological concepts as either depression or anxiety which can be very unspecific and confusing (e.g., Clark et al., 2006). The term *depression* refers to Major Depressive Disorder (MDD) or clinical depression. The disorder is characterized by a persistent sad, anxious, and empty mood, a decrease in energy accompanied by a feeling of fatigue, sleeping problems, and a loss of interest in things that one previously used to enjoy (American Psychological Association, 2016). One probable

reason behind the confusion between the disorders could be that a feeling of anxiousness oftentimes is a part of depression and its symptoms.

Many previous studies have been able to link depression and physical activity/exercise. A study by Fiske, Wetherell, and Gatz (2009) found that depression is linked with cognitive decline and that the reduction in physical activity as well as social activities may play a role in the cognitive decline and to what extent different individuals experience it. Furthermore studies have been able to link physical activity and depression as physical activity seems to work as a treatment option and ease symptoms of depressive disorders (Roshanaei-Moghaddam, Katon, & Russo, 2009). Similarly, Cranford, Eisenberg, and Serras (2009) have been able to link major depressive disorder (MDD) with heavy episodic drinking (HED). No previous studies seem to have been able to establish causality but there seems to be a pattern of increase in alcohol consumption as depression increases or vice versa (e.g., Dvorak, Lamis, & Malone, 2013; Pedrelli et al., 2011; Valentiner, Mounts, & Deacon, 2004). Drawing from the previous results, it seems important to control for the effects of depression on negative health risk behaviors.

Age

Research has shown that age can affect our engagement in negative health risk behaviors (Ernst, 2014; Steinberg, 2008). Due to aging, our level of engagement in different negative health risk behaviors may change. This is more specifically believed to be due to the fact that adolescents shift towards independence during their adolescent years (Spear, 2000). Regarding alcohol use one could see that the initial age of introduction to alcohol is slowly moving down the ages. Among 14-17 year olds as much as 20.8% had reported binge drinking in the last 30 days. (US Centre for Disease Control and Prevention, 2015; US Centre for Disease Control and Prevention, 2017; US Centre for Disease Control and Prevention, 2018). The National Institute of Alcohol Abuse and Alcoholism reported that 56.0% of the participants in the 2015 National Survey on Drug Use and Health (NSDUH) had been consuming alcohol in the past month. However, 70.1% of the participants reported consuming alcohol in the past year and 86.4% reported ever consuming alcohol. Thus there seems to be age differences as the participants in the study were all aged above 18. Furthermore a study by Wilsnack, Vogeltanz and Wilsnack (2000) found that as we age we consume less alcohol and oftentimes cease alcohol consumption completely. A study by Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm, and Gmel (2009) examined alcohol consumption in 35 different countries between 1997 and 2007 using 3 different age groups (18-34, 35-49, and 50-65). The study results showed that alcohol consumption does not decrease consistently as we age in all countries, especially in Europe and English-speaking countries. Based on earlier findings that age was inversely associated with alcohol use, the present study controlled for the effects of age on alcohol consumption.

Previous research has shown that the level of physical activity seems to differ a lot between the ages. A recent study by Ashdown-Franks et al. (2017) found that exercise steadily decreases throughout our lives generally starting already during adolescence and young adulthood. In general, researchers have well documented the negative association between ages and physical activity in adulthood (e.g., Bauman et al., 2012). On the basis of findings from previous work showing that physical inactivity tends to decline with age, it is necessary to control for the effect of age to better account for physical inactivity in adulthood.

BMI and bodyweight

Having a high BMI and being physically inactive are two very prevalent health risks and both of these health risks often result in similar health conditions such as diabetes and

cardiovascular disease among others (Blair & Wei, 2000; Martinson, O'Connor, & Pronk, 2001; Tanasescu, Leitzmann, Rimm, & Hu, 2003). A study by Wang, McDonald, Reffitt, and Edington (2005) found that regardless of BMI-values (underweight, normal weight, overweight) individuals benefitted from physical activity. Generally, people with higher BMI values tended to be less physically active. The study found significant health improvements overall in individuals who introduced physical activity at least once a week regardless of their previous BMI quotients.

A study by Duncan, Grant, Bucholz, Madden, and Heath (2009) examined the relationship between BMI and alcohol use in a sample of female twins. The study reported that high BMI quotients (e.g., obesity) in the subjects acted as a protective factor against alcohol use. Furthermore, the study found that body weight and BMI values may affect women's drinking behaviors. A study conducted in Serbia examined the relationship between body mass index and health behaviors and found that physical activity and alcohol consumption among other negative health risk behaviors were related to BMI (Maksimovic, Gudelj Rakic, Vlajinac, Vasiljevic, & Marinkovic, 2016). Specifically, alcohol consumption was associated with underweight BMI-values in men but overweight BMI-values in women and physical activity. Regarding physical activity the study found that even 15 minutes of physical activity a day decreased the odds of being obese or overweight. With these findings in mind, it seems reasonable to take into account the effect of BMI on negative health risk behaviors.

Sex differences

Males and females seem to differ a lot regarding negative health risk behaviors and sex seems to influence which negative health risk behaviors individuals choose to engage in. Previous studies have shown significant sex differences regarding negative health risk behaviors (Makino et al., 2006; Weber et al., 2003). A study by Steptoe, Wardle, Cui, Bellisle, Zotti, Baranyai, and Sanderman (2002) longitudinally examined gender trends in different negative health risk behaviors across 13 different European countries. Not all of the negative health risk behaviors included in the study showed sex differences, however the researchers found that generally, physical exercise was more prevalent among men than among women. On the basis of these findings, it would be interesting to examine sex differences in physical activity.

There has been a preconception that males consume alcohol to a much greater extent than women do. Indeed, a study by Plant, Miller, and Thornton (2000) saw great sex differences in alcohol consequences between males and females. Similar results were seen in a study by Wilsnack, et al. (2000) where males consumed far more alcohol than women, both in frequency of alcohol intake and quantities. The study also showed that men experienced greater alcohol-related consequences than women. Another study, conducted by Wilsnack et al. (2009) also found great sex differences as men tended to consume more alcohol than women in general. Furthermore the study found that men were less likely to cease alcohol consumption completely and that men were less likely to have abstained from alcohol altogether through their lives. Previous research has however reported an increase in alcohol consumption in women and with it also an increase in alcohol disorders among the female part of the population (Leonard & Eiden, 2007; Wilsnack & Wilsnack, 1997). Given the well-documented association between sex and alcohol consumption, the present study controlled for sex effects.

To summarize then, previous studies have found evidence that points towards sex differences and in addition to this researchers have been able to establish a link between

psychopathology and negative health risk behaviors. It is furthermore important to check for effects of both sociodemographic and psychological variables as research has been able to link these variables to negative health risk behaviors. Earlier findings in research about alcohol consumption point towards sex differences in the sense that men consume far more alcohol than women do. Moreover, men seem to experience greater alcohol-related consequences as a result of this. In a similar vein, sex differences have been established in previous research regarding physical inactivity as men seem to be less inactive than women are. Researchers have been able to establish a relationship between psychopathology and negative health risk behaviors. However, little is known about the nature of the relationship. Alcohol consumption is strongly associated with mental health issues and so is physical inactivity. Earlier findings have all concluded that alcohol consumption may have an impact on the development of psychological disorders. Physical inactivity is a very common negative health risk behavior and has also been linked to the development of mental health issues. Therefore the question arises about trait anxiety and its specific associations with negative health risk behaviors.

Further, as age, BMI, and depression have been linked to engagement in these negative health risk behaviors it is important to test whether they are influencing the relationship between trait anxiety and negative health risk behaviors. As for anxiety, trait anxiety was used in the study as the mere existence of anxiety symptoms in different individuals was sufficient information in order to establish a possible relationship between negative health risk behaviors and anxiety. Therefore the intensity of the anxiety symptoms was redundant. Taken together then it seems relevant to investigate trait anxiety and its association with negative health risk behaviors in order to see possible connections that may have been disregarded or overlooked in previous research. It is also important to consider the sociodemographic and psychological variables in relation to the study's main focus as they have also been linked to negative health risk behaviors.

Objectives

Some empirical connections have emerged between trait anxiety and health risk behaviors (e.g., Ye et al., 2016). However, very little work has been done in this specific field and there is still much more information that has to be retrieved in order for us to benefit from all the research in the area. This study aims to investigate if there is a relationship between levels of trait anxiety and negative health risk behaviors in a nationally representative sample of US adults. The first hypothesis is that females will be less likely than males to drink and to be physically active. The second hypothesis is that higher levels of trait anxiety will bring about higher levels of negative health risk behaviors. Anxiety is thus expected to predict engagement in negative health risk behaviors and the relationship is expected to go above and beyond the effects of demographic (i.e., age, sex, and BMI) and psychological (i.e., depression) variables. The hypothesized model is presented in Figure 1.

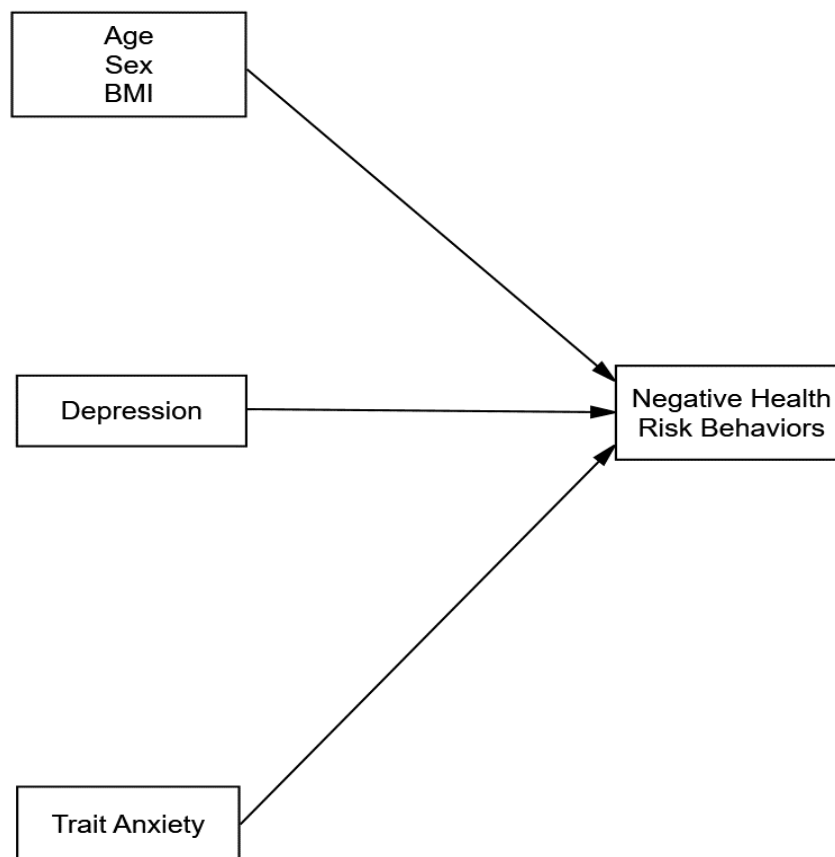


Figure 1. Hypothesized conceptual model.

METHODS

Design

The study used a cross-sectional design and the Midlife in United States (MIDUS 2) data-set was used to investigate the associations between trait anxiety and negative health risk behaviors.

Participants

Respondents were recruited through the Midlife in the United States 2 (MIDUS 2) study. The data used in the present study are publicly available. The initial study named Midlife in the United States (MIDUS) was conducted between 1995 and 1996 and consisted of a sample of $N = 7,108$ participants. Random digit dialing was used in order to recruit random households and siblings, as well as twins. The second wave of the study, called the MIDUS 2, used a longitudinal follow-up sample of $N = 4,963$ participants and was conducted in 2004 through 2006. The present study used a sample of $N = 1,054$ participants with no missing data on the study variables. The sample consisted of 45.3% males and 54.7% females between the ages of 34 - 84 years old ($M = 55.26$, $SD = 11.78$). The samples differed a lot in size between MIDUS and MIDUS 2 and this is due to the well-known drop-out rate that

comes with longitudinal studies as well as participants passing or becoming ill or otherwise being unable to participate in the second wave of the study.

Procedure

The present study obtained its data from a published data set, MIDUS 2. The MIDUS 2 collected baseline data measures for the study variables through self-administered questionnaires and telephone interviews along with cognitive telephone interviews (cognitive battery).

Measures

Alcohol consumption. Alcohol consumption was measured by how often the participants consumed alcohol in the past month (1 = *never drinking alcohol*, 2 = *less than one drink per week*, 3 = *drinking 1 or 2 days per week*, 4 = *drinking 3 or 4 days per week*, 5 = *drinking 5 or 6 days per week*, and 6 = *everyday*).

Physical inactivity. Physical inactivity was determined by having less than 3 weekly activity bouts of at least 20 minutes. Physical activity was coded as 0, and physical inactivity was coded as 1.

Sex. Being male was coded as 0, and being female was coded as 1.

BMI. Body mass index was measured through BMI calculations and quotients.

Depression. Depression was measured by whether or not the participants had suffered from depression previously (0 = *never having depression*, 1 = *having had depression*).

Trait anxiety. Participants' trait anxiety was assessed using the Spielberg's state-trait anxiety inventory which consists of 20 items (e.g., "*I am a steady person*") (State-Trait Anxiety Inventory, 1983). Responses were measured on a four point Likert scale ranging from 1 (*not at all*) to 4 (*very much*). This inventory yielded a Cronbach's alpha of 0.95.

Statistical analysis

First, an independent sample *t*-test was conducted in order to examine whether sex was associated with alcohol consumption. Second, a Pearson chi-square test was conducted to test sex differences in physical inactivity. Third, multiple linear regression was used to examine the relationship between trait anxiety and alcohol consumption after controlling for age, sex, BMI, and depression. Fourth and finally, a binary logistic regression analysis was performed to investigate whether trait anxiety was associated with physical inactivity above and beyond the effects of the control variables. All statistical analyses were performed using IBM SPSS 24.

Missing data was dealt with in such a way that cases that featured missing data were removed from the sample. This was done in order to not confound or skew the results.

Ethical considerations

The present study did not have any ethical concerns as it used publicly available data from the MIDUS 2 project. The MIDUS study gathered informed consent from the participants. Prior to signing the informed consent the participants were informed about their rights regarding anonymity, confidentiality and discontinuing their participation. The participants were also notified about the future use of the data and the study purpose. As none of the terms that the participants agreed upon in the informed consent were violated no further ethical considerations had to take place.

RESULTS

Descriptive statistics for all non-binary variables such as alcohol use, age, BMI, and trait anxiety are shown in Table 1.

TABLE 1. Descriptive Statistics of Study Variables

| Variable | <i>M</i> | <i>SD</i> | Range |
|---------------|----------|-----------|-------|
| Male | | | |
| Age | 56.00 | 11.99 | 34-83 |
| BMI | 28.35 | 4.83 | 14-51 |
| Trait anxiety | 32.59 | 8.30 | 20-69 |
| Alcohol use | 4.04 | 1.29 | 1-6 |
| Female | | | |
| Age | 54.64 | 11.58 | 34-84 |
| BMI | 27.59 | 6.09 | 16-58 |
| Trait anxiety | 34.40 | 9.15 | 20-68 |
| Alcohol use | 3.40 | 1.49 | 1-5 |

Note: Depression and physical inactivity were not included in these descriptive statistics as these were binary variables. BMI = body mass index.

An independent samples *t*-test was conducted in order to examine the first hypothesis regarding sex differences in alcohol consumption. Results showed significant sex differences, $t(707) = 6.14, p < 0.001, d = 0.46$, between males ($M = 3.60, SD = 1.49$) and females ($M = 2.96, SD = 1.29$). A chi-square was calculated to find out the association between sex and physical inactivity. The chi-square test result for physical inactivity by sex showed that the percentage of participants who were physically inactive did not differ by sex, $\chi^2(1, N = 1,054) = 0.10, ns$, Cramer's $V = 0.01$.

Table 2 shows the correlations among the study variables. Alcohol use was positively correlated with age, but negatively correlated with sex and BMI. Physical inactivity was positively correlated with BMI and depression. Furthermore, BMI was negatively correlated with sex. Depression was negatively correlated with age, but positively correlated with sex. Moreover, trait anxiety was only negatively correlated with age but was positively correlated with sex, BMI, and depression.

TABLE 2. Intercorrelations Among Study Variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------------|---------|---------|---------|--------|-------|-------|---|
| 1 Age | – | | | | | | |
| 2 Sex | -0.06 | – | | | | | |
| 3 BMI | -0.04 | -0.07* | – | | | | |
| 4 Depression | -0.13** | 0.13** | 0.09** | – | | | |
| 5 Trait anxiety | -0.13** | 0.10** | 0.08* | 0.36** | – | | |
| 6 Alcohol use | 0.14** | -0.23** | -0.13** | 0.00 | -0.03 | – | |
| 7 Physical inactivity | 0.06 | -0.01 | 0.14** | 0.06* | 0.06 | -0.06 | – |

Note: Sex, depression, and physical inactivity were coded as binary variables (male = 0, female = 1; no depression = 0, depression = 1; physical activity = 0, physical inactivity = 1).

Results presented are zero-order correlations. BMI = body mass index. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

In order to test the study's second hypothesis a hierarchical regression analysis and a binary logistic regression analysis had to be conducted.

Trait anxiety and alcohol use

In order to test whether levels of trait anxiety are associated with levels of alcohol use after controlling for age, sex, BMI, and depression, a hierarchical regression was run with alcohol use as the dependent variable as seen in Table 3. The predictors included age, sex, BMI, depression, and trait anxiety. These variables were entered into the regression equation in three steps. The first step included the sociodemographic variables such as age, sex, and BMI. The second step included the psychological variable depression. In the third and final step trait anxiety was added to the model. Model 1 was found to be significant, $R^2 = 0.09$, $F(3, 667) = 21.27$, $p < 0.001$. Model 1 indicated that age, sex, and BMI were predictors for alcohol use with all three of these variables being equally strong predictors. The Model 2 was significant, $\Delta R^2 = 0.01$, $F(4, 667) = 17.20$, $p < 0.05$, and depression was positively associated with alcohol use. However, Model 3 was only marginally significant, $\Delta R^2 = 0.00$, $F(5, 667) = 13.74$, $p < 0.10$ and trait anxiety emerged as a marginally significant predictor for alcohol use.

TABLE 3. Hierarchical Regressions Predicting Alcohol Consumption

| Predictors | β | B | SE | ΔR^2 | Total R^2 |
|---------------|--------------------|-------|------|-------------------|-------------------|
| Model 1 | | | | | |
| Age | 0.13*** | 0.02 | 0.01 | | |
| Sex | -0.24*** | -0.69 | 0.11 | | |
| BMI | -0.16*** | -0.05 | 0.01 | 0.09*** | 0.09*** |
| Model 2 | | | | | |
| Depression | 0.08* | 0.14 | 0.07 | 0.01* | 0.09* |
| Model 3 | | | | | |
| Trait anxiety | -0.01 [†] | -0.00 | 0.01 | 0.00 [†] | 0.09 [†] |

Note: Standardized and nonstandardized betas and estimated standard errors for the final steps are reported. BMI = body mass index. [†] $p < 0.10$. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. Binary variables were coded as; male = 0, female = 1; no depression = 0, depression = 1; physical activity = 0, physical inactivity = 1.

Trait anxiety and physical inactivity

To test whether levels of trait anxiety are related to physical inactivity, a binary logistic regression analysis was conducted and the results are shown in Table 4. Model 1 included three of the independent variables (i.e., age, sex, and BMI) and was significant, $\chi^2 = 23.58$, $df = 3$, $N = 998$, $p < 0.001$. Model 1 indicated that physical inactivity was predicted by BMI. Model 2 included the first three independent variables along with depression and was found to be significant, $\chi^2 = 28.69$, $df = 4$, $N = 998$, $p < 0.001$. Model 2 showed that physical inactivity was predicted by age and BMI. Model 3 was the full model that considered all five independent variables and was significant, $\chi^2 = 27.21$, $df = 5$, $N = 998$, $p < 0.001$. The value of $\text{Exp}(B)$ was 1.01 which implies that a one unit increase in age increased the odds that respondents were physically inactive by 1%. Similarly, the $\text{Exp}(B)$ value indicated that a one unit increase in BMI increased the odds that respondents were physically inactive by 6%.

TABLE 4. Summary of Binary Logistic Regression Analysis for Variables Predicting Physical Inactivity

| Predictor | B | SE B | e ^B |
|---------------|---------|----------|----------------|
| Age | 0.02* | 0.01 | 1.01 |
| Sex | 0.09 | 0.16 | 1.09 |
| BMI | 0.06*** | 0.01 | 1.06 |
| Depression | -0.21 | 0.19 | 0.81 |
| Trait anxiety | 0.01 | 0.01 | 1.01 |
| Constant | -4.05 | | |
| χ^2 | | 27.21*** | |
| df | | 5 | |

Note: Controls are age, sex, BMI, and depression. e^B = exponentiated B. BMI = body mass index. **p* < 0.05. ***p* < 0.01. ****p* < 0.001. Binary variables were coded as; male = 0, female = 1; no depression = 0, depression = 1; physical activity = 0, physical inactivity = 1.

DISCUSSION

The present study aimed to expand empirical research on trait anxiety and its relationship with negative health risk behaviors such as alcohol consumption and physical inactivity in US adults. The study revolved around two specific hypotheses. The first hypothesis aimed to answer whether sex has an effect on which negative health risk behaviors we engage in. The second hypothesis investigated whether higher levels of trait anxiety would be associated with higher levels of negative health risk behaviors. The analysis found significant support for sex differences in alcohol consumption but failed to find significant support for sex differences in physical inactivity. In addition, trait anxiety was not found to be significantly associated with alcohol consumption or physical inactivity.

The finding regarding sex difference in alcohol consumption are congruent with previous research that has frequently reported large sex differences in alcohol consumption, albeit the increase in female alcohol consumption (Leonard et al., 2007; Wilsnack et al., 1997). One can wonder why there are such great sex differences in alcohol use between males and females. Perhaps sex stereotypes could be one of the reasons behind the sex differences, and this might explain the rise in alcohol consumption among females as a large part of the world is working to become much more equal and to stop stereotyping by sex. Therefore, future research should aim to examine the underlying reasons behind sex differences in negative health risk behaviors as sex stereotypes and societal norms could play a significant role.

The findings regarding physical inactivity and sex differences were, however, incongruent with previous findings showing that males tend to be more physically active than females. This is contrary to the study findings as the results showed no significant sex differences in physical inactivity. These diverging results could be due to a series of different factors, such as the differences in ages between the samples in the present study and the study by Steptoe et al. (2002). The present study used a sample of adults in between the ages of 34 and 84 years old. The study by Steptoe et al., on the other hand, used a sample of university students, which means that the study employed a younger sample. These sample differences could likely account for the diverging results in the present study.

The present findings showed that trait anxiety was marginally negatively associated with alcohol consumption. In contrast, earlier studies showed strong positive associations between different psychopathological disorders, such as GAD and alcohol consumption (e.g.,

Brook et al., 2016; Fröjd et al., 2011; Malone et al., 2004; Pang et al., 2014; Wolitzky-Taylor et al., 2015). Although these findings are difficult to interpret, it is possible that the differences are due to different age ranges in the samples between the studies. Most of the earlier studies used much younger samples, such as adolescents and young adults (e.g., Fröjd et al., 2011; Malone et al., 2004; Pang et al., 2014), while the present study sampled older adults from a wide age range (34 to 84 years).

The sociodemographic variables and depression rose as stronger predictors for alcohol consumption. The results showed that as we age we consume more alcohol, which is congruent with the study by Wilsnack et al. (2009) where the results showed higher levels of alcohol consumption in the oldest age group (50-65 years). Being a male was also associated with greater alcohol consumption. This is congruent with previous research frequently reporting males as more inclined towards consuming alcohol both in frequency and quantity (Plant et al., 2000; Wilsnack et al., 2000; Wilsnack et al., 2009). These sex differences could be due to sex stereotypes. Researchers have been looking into different underlying factors and come to the conclusion that some of the reasons behind these differences could be due to social value, child-rearing patterns, and sex role expectations (Marks, Bun, & McHale, 2009). BMI was also strongly negatively associated with alcohol consumption which is in line with earlier studies as they have found that lower BMI-values are associated with higher levels of alcohol consumption and that having a higher BMI can act as a protective factor against alcohol consumption (Duncan et al., 2009; Maksimovic et al., 2016).

Apart from the sociodemographic variables and their association with alcohol consumption, depression was found to be significantly positively associated with alcohol consumption. These results are congruent with previous research as earlier findings have established a link between depression and increasing alcohol use. Seemingly, as the depression becomes more severe and the depression levels increase, alcohol consumption increases as well (Cranford et al., 2009; Dvorak et al., 2013; Pedrelli et al., 2011; Valentiner et al., 2004). One can thus conclude that sociodemographic factors and depression in particular seem to have a stronger association with alcohol use than trait anxiety.

The binary logistic regression analysis that aimed to answer the second hypothesis regarding physical inactivity and its relationship with trait anxiety failed to find any significant relationship between them. Research has previously found strong negative associations between exercise or physical activity and anxiety as increased physical activity has positive effects on perceived anxiety (e.g., Ashdown-Franks et al., 2017; Herring et al., 2011; Herring et al., 2017). These results are thus incongruent with earlier findings. This could be because of sample differences and also because of instrumental differences. For example, the study by Ashdown-Franks et al. (2017) examined young adults, where the mean age was around 20 years and the study by Herring et al. (2011) also used a sample of young adults. Herring et al. (2017) examined a sample where the participants were all aged between 18 and 37 years. In addition to this the study by Herring et al. (2011) and Herring et al. (2017) used only female samples and the sample sizes in both of these studies were under 50 participants. The present study used a sample of adults aged between 34 and 84 years and the sex composition consisted of 45.3% males and 54.7% females. One could therefore imagine that this may account for some of the inconsistencies as both sample sizes, sample compositions and sample ages differed between the previous studies and the present study. Another possible explanation for the nonsignificant association between trait anxiety and physical inactivity may be that physical inactivity in the present study was coded simply as a dichotomous variable (i.e., 0 vs 1), thereby restricting the range of possible variation. Therefore, firm conclusions should be reserved for future researchers using more sophisticated measures of physical inactivity.

Both age and BMI were found to be significantly associated with physical inactivity. Previous studies by Ashdown-Franks et al. (2017) and Bauman et al. (2012) have found that physical activity is inversely associated with age. These studies have documented a decrease in activity levels as we age and suggested that the decrease in physical activity and exercise starts as early as during adolescence and young adulthood. Although variations in activity levels of adults have been found in these studies, we seem to become more inactive as we grow older. Thus, the present findings highlight that physical activity tends to decrease as people get older. In addition, BMI was significantly positively associated with physical inactivity which means that having a higher BMI-value was associated with being less physically active. Previous research by Wang et al. (2005) found similar results as individuals with high BMI-values tended to be more inactive than those with lower BMI-values. Given that physical inactivity was associated with age and BMI, but not with trait anxiety or depression, these findings may suggest that mental health may not be as strongly associated with physical inactivity as sociodemographic variables are. Therefore, future research should continue to investigate these links further.

Some of the practical and theoretical implications with the study results include preventive measures and implementation. It would be highly beneficial for both future research and clinical treatment facilities to learn more about negative health risk behaviors and how we engage in them in order to better help clients and also to bring the research in the area forward. Families and people around those with mental health issues could also benefit from knowledge about the relationship between psychopathology and negative health risk behaviors, as would the individuals themselves. In addition to this, it could also work as a preventive measure as it could fend individuals from initially engaging in negative health risk behaviors if the risks would become more highlighted in society. The study results could thus increase awareness on an individual and a social level by clarifying the risks we are exposed to in our everyday lives regarding negative health risk behaviors. Another practical and theoretical implication is that sociodemographic variables such as age, sex, and BMI have a stronger association with psychological variables such as trait anxiety and depression than with negative health risk behaviors. Therefore, future research could benefit from taking these variables into account and trying to obtain a full picture of negative health risk behaviors.

Limitations

One of the largest limitations with the present study was that it solely relied on self-assessment questionnaires. Although self-rating scales are easy to administer, efficient and useful in collecting large amounts of data they are rather unreliable due to the subjective assessments as previously mentioned (Denscombe, 2016). Furthermore they do not allow for the participants to give detailed information which means that the participant might not fully identify with the answer they end up giving. Relatedly, depression and trait anxiety used in the current study were all coded as discrete binary instead of continuous variables, thereby limiting the variability of the measures. Therefore, future research should attempt to use different methods such as observational methods, interviews, and multiple informants as this could acquire more reliable information about negative health risk behaviors.

As the present study was cross sectional it could not establish causality. Therefore, there is no way of knowing whether trait anxiety prospectively impacts negative health risk behaviors or vice versa. We also have no way of knowing whether our variations depend on generational effects or life effects (Johannessen & Tufte, 2003). Life effects are not as important in the present study as it was not longitudinal but generational effects could account for some of the discrepancies from previous research, especially regarding physical

inactivity. As age increased, physical inactivity also did, this could then be due to a generational difference where older generations might not be as educated in the health benefits of exercise. Another limitation with the present study is that it might not be completely representative as the MIDUS data set used random digit dialing. This means that there is a possibility that there could be great differences in the sample regarding socioeconomic status, educational status, and demographic aspects.

Conclusions

The present study aimed to investigate whether there were sex differences in negative health risk behaviors and also to examine possible associations between trait anxiety and negative health risk behaviors. The present study found support for sex differences in alcohol consumption but not in physical inactivity in US adults. This was thought to be due to sex stereotypes regarding alcohol consumption and the rise in health concern may account for the lack of sex differences in physical inactivity as different forms of exercise have become much more common. The present study failed to find a significant association between trait anxiety and alcohol consumption or physical inactivity. However, the study results showed that other variables such as age, sex, BMI, and depression had strong relationships with alcohol use or physical inactivity. Thus, these findings highlight the importance of taking different sociodemographic and psychological variables into consideration when examining negative health risk behaviors in adults.

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