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Association of Physical Activity with Alcohol Abuse and Dependence in a Nationally-Representative U.S. Sample

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Abstract

Background—Alcohol use is a pervasive and costly public health problem in the United States. Relapse rates from alcohol use disorders are high. Although exercise has been proposed as a strategy to prevent relapse, lifestyle modification is the least studied aspect of relapse prevention programs, especially among racial/ethnic minority populations.

Objective—The current study assessed whether being physically active was associated with remission from alcohol abuse or dependence among Black (African American and Afro Caribbean) adults in the U.S.

Method—We utilized data on Black adult participants ($n = 4,828$) from the nationally representative National Survey of American Life (NSAL) conducted in 2001–2003. Logistic regression models were estimated to assess the odds of being in 12-month remission or currently meeting DSM-IV criteria for alcohol abuse or dependence based on level of physical activity, adjusting for socio-demographic and neighborhood characteristics.

Results—People who endorsed being physically active had higher odds of being in 12-month remission from alcohol use problems (OR: 1.67, 95% CI: 1.28, 2.17) than people who were physically inactive, adjusting for individual- and neighborhood-level characteristics. People who were physically active did not differ significantly from those who were inactive with respect to odds of currently meeting DSM-IV criteria for alcohol abuse or dependence.

Conclusions/Importance—Physical activity was positively associated with being in 12-month remission from alcohol use problems. Longitudinal studies are needed to establish temporal ordering and to explore exercise as a potential relapse prevention strategy for alcohol use problems.

Keywords

Alcohol abuse; dependence relapse; prevention racial/ethnic; minorities

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Introduction

Alcohol use problems pose a major economic burden to society: excessive alcohol consumption cost the United States \$223.5 billion in 2006 (72.2% from lost productivity, 11.0% from healthcare costs, 9.4% from criminal justice costs, and 7.5% from other effects; Bouchery et al., 2011). Alcohol use problems are not just costly, but deadly: unhealthy use of alcohol is the third leading preventable cause of death in the U.S. and more than 85,000 deaths a year are directly attributable to alcohol (Harwood, 2000). Relapse rates are high not only for individuals who do not undergo treatment (Timko et al., 1999) but also for individuals who utilize treatment services, with relapse rates ranging from 60 to 90% within the first year following treatment (Brownell et al., 1986; Xie et al., 2005). Moreover, although Whites are more likely than Blacks to develop an alcohol use problem in their lifetime (Hasin et al., 2007), once an alcohol use problem occurs, Blacks have a higher likelihood of relapse (Dawson et al., 2005) and are less likely to both seek and complete treatment (Bluthenthal et al., 2007).

Several relapse prevention models (Tkachuk & Martin, 1999; Witkiewitz & Marlatt, 2004; Brown et al., 2009) have incorporated lifestyle-enhancing factors such as physical activity with the rationale that exercise may help affected individuals develop “positive addictions” (Larimer et al., 1999). For instance, lifestyle modifications such as exercise are one of the core components of Marlatt’s relapse prevention model (Marlatt & Witkiewitz, 2005). Lifestyle modification, however, is the least studied aspect of relapse prevention programs for alcohol use problems (Brown et al., 2010). While recent observational and experimental studies, including randomized controlled trials, provided evidence to support the positive effects of exercise as an adjunct intervention for promoting recovery from alcohol use problems (Sinyor et al., 1982; Brown et al., 2014), physical activity has not been extensively studied for potential to prevent alcohol use relapse (Brown et al., 2010). In addition, studies assessing the association between physical activity and alcohol use problems have reported conflicting findings. Physical activity was found to be significantly associated with declines in alcohol urges and improved control over alcohol consumption in some studies (Ussher et al., 2004; Zschucke et al., 2012; Karoly et al., 2013). However, conflicting evidence was suggested by other studies that found alcohol consumption and physical activity were positively correlated (Sher & Rutledge, 2007; French et al., 2009; Mays et al., 2010), and still others found levels of physical activity were not significantly associated with alcohol abuse and dependence (Read et al., 2001; Kendzor et al., 2008).

Prior studies had a number of methodological limitations. Association studies (e.g., Ussher et al., 2004; Weinstock et al., 2008) utilized convenience samples from outpatient treatment programs and had limited sample sizes. Intervention studies (e.g., Sinyor et al., 1982; Brown et al., 2010; Brown et al., 2014) suffered from similar limitations, and relied predominantly on White samples or samples for which race/ethnicity were not reported. In addition, prior studies controlled for only a few potential individual-level confounders such as gender and BMI. Studies have not accounted for neighborhood-level confounders such as neighborhood safety, availability of open spaces for exercise, and severity of drug problems in the neighborhood. Systematic reviews of the association between physical activity and alcohol use problems have acknowledged that inclusion of racial/ethnic minorities is a major gap in

the literature (Kwan et al., 2014; Vancampfort et al, 2015). Moreover, the heterogeneity within racial/ethnic minority populations remains largely unexplored. For example, although African-Americans and Afro-Caribbeans share a racial identity and African origin, they differ in their ethnicity, environmental exposures, educational attainment and economic status (Singh & Siahpush, 2002; Davis & Huffman, 2007; Gibbs et al., 2013), which subsequently, can contribute to differences in health outcomes. To address these gaps in prior literature, the current study tested the association between physical activity and odds of being in remission or currently meeting DSM-IV criteria for alcohol abuse or dependence. The study examined whether the association was independent of potential individual and neighborhood-level confounders. The study also explored whether the association between sports/exercise and alcohol use problems differed between African-American and Afro-Caribbean ethnic subgroups. While there is a dearth of literature exploring the differences in physical activity between African American and Afro Caribbean adults, one previous study exploring obesity using the same National Survey of American Life (NSAL) dataset included in this paper noted a significant difference in level of physical activity among the two groups in that among Afro Caribbean participants, 41.0% endorsed engaging in physical activity often whereas 33.8% of African American participants made the same endorsement (Sullivan, 2014). Thus, we hypothesize that Afro Caribbean adults would have a higher odds of being in 12-month remission relative to their African American counterparts given the difference in level of physical activity.

Methods

Sample

The NSAL is a cross-sectional survey based on a national probability sample (N = 6,082) of non-institutionalized English-speaking adults aged 18 years or older residing in households within the conterminous United States. Special emphasis in the study is given to the nature of race and ethnicity within the Black population by selecting and interviewing national samples of African-American (n=3,570) and Afro-Caribbean (n=1,621) populations. The interviews took place between early 2001 and the spring of 2003, with a 71.5% response rate. Most interviews were conducted using computer-assisted personal interview (CAPI) methods at the respondents' homes, and approximately 14% were conducted either partially or entirely by telephone. The primary goal of the NSAL was to examine racial and ethnic differences in mental disorders, psychological distress, and service use in the context of various risk and protective factors among African-American and Afro-Caribbean communities in the U.S.

Assessments of alcohol use problems and physical activity

Alcohol use problems, which consisted of alcohol abuse and dependence based on DSM-IV criteria, were measured using a modified version of the Composite International Diagnostic Interview of the World Mental Health (WMH) Survey Initiative (WMH-CIDI) through the World Health Organization (WHO; Kessler & Ustun, 2004). The sample was classified into three groups: 1) *Never* having met DSM-IV criteria for alcohol abuse or dependence; 2) *12-month remission* (having a history of alcohol abuse or dependence, but not within the past 12 months; and, 3) *Current* (meeting DSM-IV criteria for alcohol abuse or dependence).

Physical activity was assessed with one self-report item asking, “How often do you engage in sports/exercise?” Response choices were: often, sometimes, rarely, and never. Physical activity was then dichotomized into two categories: *physically active*, which consisted of participants endorsing “often” or “sometimes,” and *physically inactive*, which included individuals endorsing “rarely” or “never.” A number of prior longitudinal and intervention studies that have looked at the association between exercise and alcohol use problems have also treated exercise as a binary (yes/no) variable (Barber et al., 2001; Sher & Rutledge, 2007; Wichstrom & Wichstrom, 2009).

Potential confounding variables

The following individual-level self-report factors were reported as categorical variables in the original data, and included in the present study given prior studies noting an association with the main variables of interest: socio-demographic factors (i.e. age, race, gender), current employment status (employed/unemployed/not in labor force), and years of education (Read et al., 2001; Fite et al., 2009; Lisha et al., 2013); and body mass index (BMI) (Chwastiak et al., 2011), which was recorded as a categorical variable in the original dataset.

In addition, the following neighborhood-level variables were included as covariates based on prior literature suggesting their association with the primary variables of interest: frequency of neighborhood crime and seriousness of drug problems in neighborhood (Winstanley et al., 2008; Mrug & Windle, 2009) were self-reported on a Likert scale, whereas availability of clubs and associations (Fauth et al., 2007), self-help groups (Moos & Moos, 2006; Korcha et al., 2013), and parks and open spaces (Kaczynski et al., 2008; Lackhowycz et al., 2013) were collected in the original dataset as dichotomous variables (yes/no). Associations were reported using odds ratios with 95% confidence intervals.

Data analytic strategy

First, univariate analyses were conducted to explore variable distributions of both the main variables of interest, as well as potential confounding variables. Information on alcohol abuse/dependence and frequency of sports/exercise was missing for 4% of NSAL respondents identifying either as African-American or Afro-Caribbean. The present analysis was conducted among African-American and Afro-Caribbean NSAL participants for whom complete data were available ($n = 4,828$), given that the literature supports completecase analysis if the missingness rate is 5% or less (Schafer, 1999). Second, logistic regression models were used to estimate the association between physical activity frequency and alcohol use problems. Multinomial regression models were then estimated to test the main research question controlling for potential key confounding variables, including individual demographics, BMI, and neighborhood characteristics, and subsequently, stratified by ethnic subgroup. Analyses were conducted using STATA 13.0 (StataCorp, 2013).

Results

Table 1 shows the baseline characteristics of the analytic sample ($N=4,828$). A majority of the sample were women (63.4%); 71.0% self-reported as African-American, more than

twice the number of participants who self-identified as Afro-Caribbean (29.0%). A majority of the sample (92.1%) had never met DSM-IV criteria for alcohol use or dependence, and more than half (60.1%) of the sample endorsed being physically active.

Table 2 shows both the crude and adjusted associations between level of physical activity and alcohol use problems, stratified by Black ethnic subgroup. Those who endorsed being physically active had 1.54 (95% CI: 1.22, 1.95) greater odds of being in 12-month remission from an alcohol use problem compared to those who endorsed being physically inactive. The relationship remained significant after adjusting for individual-level variables, including sociodemographic factors and BMI (OR: 1.62, 95% CI: 1.26, 2.09), and further expanding the model to include neighborhood-level factors (OR: 1.67, 95% CI: 1.28, 2.17). No significant difference was detected in the odds of currently meeting DSM-IV criteria for an alcohol use problem based on level of physical activity.

Physically active Afro-Caribbeans had 1.90 (95% CI: 1.02, 3.55) greater odds of endorsing 12-month remission compared to Afro-Caribbeans who were physically inactive, after adjusting for both individual- and neighborhood-level factors. A similar relationship was observed with African-Americans wherein those who were physically active had 1.61 (95% CI: 1.19, 2.18) greater odds of being in 12-month remission compared to those who were physically inactive. Although the effect size of being in remission appeared to be higher for physically active versus inactive Afro-Caribbeans than that observed with African-Americans, the overlapping confidence intervals in the two racial/ethnic subgroups suggested that there was no difference based on ethnic subgroup. Odds for currently meeting DSM-IV criteria for an alcohol use problem did not vary significantly based on level of physical activity for either African-Americans or Afro-Caribbeans.

Discussion and conclusion

Individuals who endorsed being physically active had significantly greater odds of being in 12-month remission from an alcohol use problem compared to those who endorsed being physically inactive, even after controlling for several sociodemographic variables and neighborhood factors. The observed association is potentially promising from a prevention standpoint, as it is consistent with the hypothesis that physical activity may be related to maintenance of remission from alcohol use. The lack of a statistically significant difference in odds of currently meeting DSM-IV criteria for alcohol abuse or dependence based on level of physical activity is not consistent with an interpretation of exercise as a protective factor against alcohol use among individuals *without a history of alcohol problems* and warrants further investigation.

Our findings support prior studies that reported a positive association between being physically active and endorsing 12-month remission from alcohol abuse or dependence (Sinyor, 1982; Brown, 2014). Although the data presented here are relatively old (2001–2003), the current study adds to existing literature by examining the relationship between the level of physical activity and alcohol use problems with a large, nationally representative sample that permits rigorous assessment of individuals from two understudied populations, Afro-Americans and Afro-Caribbeans.

There are several additional limitations to the present study. First, a sample of non-Hispanic White individuals (n = 891) was also included in NSAL; we did not include this sample in the current study. Substance use questions, including questions related to alcohol use, were not administered to the non-Hispanic White sample given the high cost associated with interviewing nationally representative samples of African Americans and Caribbean Blacks (Broman et al., 2008). Thus, the current paper is unable to provide a direct comparison of potential differences in remission and diagnoses of an AUD, physical activity, as well as the relationship of these variables, with non-Hispanic Whites. Second, the low number of individuals (i.e., 7.9%) who ever had an AUD in the present sample as a limitation. Third, we cannot determine from this study whether physical activity plays a causal role in maintenance of remission given the cross sectional nature of the data. Another limitation is that the frequency of exercise was based on one self-report item, and thus may be influenced by reporting bias. In addition, we did not have data on factors such as type or intensity of exercise, which may be associated with alcohol use disorders. Additional studies—including longitudinal studies of physically active subjects that assess alcohol use problems as a dependent outcome—should be conducted to evaluate the temporality of the relationship between these two variables. Next steps in research should also incorporate more specific questions related to exercise, such as type, frequency, setting, as well as perceived barriers to exercise among affected individuals. In addition, the lack of any measure for mental health problems, which are known to be associated with both substance/alcohol misuse and poor physical health (Carrà et al., 2014; Carrà et al., 2015) is another limitation of this paper and should be addressed in future studies. A more nuanced understanding of exercise and its association with alcohol use problems can potentially inform our understanding of factors that protect against relapse, with implications for the development or tailoring of relapse prevention interventions.

Although the current paper focuses on the relationship between physical activity and 12-month remission from alcohol use problems, it is important to acknowledge the clinical implications of promoting physical activity among African American and Afro Caribbean adults. Previous studies on Black Americans (African Americans and Afro Caribbeans) have noted a disproportionately higher level of obesity in this population (Wang et al., 2008). More specifically, the prevalence of obesity among Black Americans is 50% compared to 35% of their Non-Hispanic White counterparts (Flegal, 2012). The health disparities facing Black Americans are well understood (Carrà et al., 2014; Carrà et al., 2015). Thus, clinical implementation of a physical activity component in addition to traditional treatment practices among this population could have positive implications for decreasing the high prevalence and associated healthcare expenditures associated with multiple physical and behavioral health problems in this population. Last, it is important to note that addressing a gap in the literature is not the sole reason why conducting research among understudied populations, including African Americans and Afro Caribbeans, is of importance. Other researchers (Wang, 2016) have described both the necessity and feasibility of conducting research among culturally diverse populations. More specifically, the inclusion of multicultural samples in research not only reveals differences and similarities in outcomes among groups; cultural research can shed light on the underlying processes leading to the observed outcomes and subsequently, help researchers make more informed decisions

regarding research design and public health practitioners develop more culturally appropriate interventions to address the health needs of diverse communities. Researchers and practitioners can recognize the importance of holistic approaches including exercise and relapse prevention that not only address alcohol use problems as described in this study, but other mental and physical health challenges that disproportionately affect Black minority groups.

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Table 1

Baseline characteristics of analytic sample (n = 4,828).

Characteristic	African-American n (%)	Afro-Caribbean n (%)
Age, in years		
18–34	1,205 (35.1)	537 (38.3)
35–44	814 (23.8)	365 (26.0)
45–64	986 (28.8)	369 (26.3)
65 and older	420 (12.3)	132 (9.4)
Gender		
Male	1,215 (35.5)	550 (39.2)
Female	2,210 (64.5)	853 (60.8)
Current Work Status		
Employed	2,248 (65.7)	1,042 (74.3)
Unemployed	357 (10.4)	131 (9.3)
Not in labor force	820 (23.9)	230 (16.4)
Highest Level of Education Completed		
Less than High School	882 (25.7)	262 (18.7)
High School Degree	1,296 (37.8)	412 (29.4)
Some College	783 (22.9)	378 (26.9)
College Degree or Higher	465 (13.6)	351 (25.0)
Alcohol Use Problem Subgroup		
Never	3,109 (90.8)	1,340 (95.5)
In Remission	232 (6.7)	55 (3.9)
Current	85 (2.5)	8 (0.6)
Frequency of Sports/Exercise		
Active	2,034 (59.4)	891 (63.6)
Inactive	1,392 (40.6)	511 (36.4)

Table 2

Associations between level of physical activity and alcohol use problems.

Physically Active	Odds Ratio					
	Never (ref group)			Current		
	African American	Afro Caribbean	Total	African American	Afro Caribbean	Total
Unadjusted	1.00	1.00	1.00	1.46 (1.12, 1.90)**	1.71 (1.00, 2.94)	1.54 (1.22, 1.95)***
Adjusted for sociodemographic factors	1.00	1.00	1.00	1.52 (1.14, 2.02)***	2.13 (1.19, 3.80)**	1.62 (1.26, 2.09)***
Adjusted for sociodemographic factors and BMI ^a	1.00	1.00	1.00	1.55 (1.16, 2.08)***	1.89 (1.04, 3.44)**	1.63 (1.27, 2.11)***
Adjusted for sociodemographic factors, ^b BMI, and neighborhood characteristics	1.00	1.00	1.00	1.61 (1.19, 2.18)***	1.90 (1.02, 3.55)**	1.67 (1.28, 2.17)***

^a $p < .10$;^{*} $p < .05$;^{**} $p < .01$;^{***} $p < .001$ ^a BMI = body mass index^b Socio-demographic factors included age, gender, race/ethnicity, work status, and years of education. Neighborhood characteristics included frequency of crime in neighborhood; seriousness of drug problems in neighborhood; availability of clubs, associations, self-help groups in neighborhood; and presence of parks, playgrounds, and/or open space in neighborhood.