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Exercise as a Mitigator of Poor Mental Health Among Lesbian, Gay, and Bisexual Adults

Abstract

Introduction: There is a positive association between exercise and improved mental health in the general population. Although there is a greater burden of psychological distress among lesbian, gay, and bisexual (LGB) people, little is known about the association between exercise and mental health in this population. We explored the association between exercise and poor mental health reported by LGB adults in the U.S.

Methods: Our analyses used data from the 2017 Behavioral Risk Factor Surveillance System survey. Multiple regression analyses were used to determine the association between exercising and mental health days adjusting for sociodemographic characteristics.

Results: Data were available for 6,371 LGB participants. LGB adults who participated in any exercise reported almost 1.0 day less of poor mental health in the past 30 days compared to LGB adults who did not exercise (p-value \leq 0.01). LGB adults who met one or both of the physical activity guidelines had between 1.2-1.7 days less of poor mental health compared to those who did not meet the guidelines (p-value \leq 0.01).

Conclusion: Fewer days of poor mental health were reported by LGB adults who exercised. Determining whether physical activity interventions, including aerobic and strengthening exercises, could improve mental health outcomes in LGB adults should be studied.

Key Words: Physical activity; mental health; Lesbian, gay, and bisexual adults; United States

Introduction

Mental illness is a public health concern in the United States (U.S.) with half of all people experiencing mental illness at some point in their life.^{1,2} Lesbian, gay, and bisexual (LGB) people are more likely to experience poor mental health when compared to their heterosexual peers.³⁻⁸ A longitudinal study found that bisexual participants had higher odds of major depression, anxiety, and suicidal ideation (2.1, 1.9, and 3.9, respectively) compared to heterosexual participants.⁴ Gay men and lesbian women were 1.5 times more likely to report major depression and three times more likely to report anxiety and suicidal ideation than their heterosexual peers.⁴ Other researchers have also found worse mental health outcomes among LGB participants, including psychological distress, mental disorders, anxiety and depression, or low well-being scores.^{5-7,9-11}

The Minority Stress Theory explains how stigma and discrimination are linked to the higher prevalence of physical health problems and mental distress among the LGB population.^{12,13} According to the theory, LGB people experience excess social stressors as a result of recurrent stigma, discrimination, victimization, identity concealment, and internalized homophobia, which eventually increase the risk of mental health problems.^{12,13} Research has linked experiences of minority stress with depression, greater depressive symptoms, anxiety, suicidal ideation, and substance use.¹⁴⁻¹⁷ However, some members of the LGB community may not only be able to cope with these challenges but thrive despite experiencing minority stress. This ability, known as resilience or a positive adaptation to minority stress, has been shown to attenuate the negative health impacts of stress.¹⁸ Resilience can be individual or community based. Individual resilience

includes the qualities that people possess that help in coping with stress (e.g. internal locus of control) while community resilience is more ecological and includes community norms and values, shared cultural identities, social support, community resources such as an LGBTQ community center, advocacy and LGBTQ affirming laws and policies.¹⁸

There is a positive association between physical activity or exercise and improved mental health. Exercise has been found to reduce psychological distress, including depression, stress, anxiety, and poor mental health, while improving a sense of well-being and quality of life.¹⁹⁻²⁵ Although most studies have focused on the mental health benefits of aerobic exercise, muscular strengthening exercise or a combination of aerobic and strengthening exercise are associated with improved mental health.¹⁹⁻²⁵ There are several mechanisms, including physiological, psychological, and inflammatory by which exercise is thought to improve mental health outcomes.¹⁹

According to the physical activity guidelines revised by the U.S. Department of Health and Human Services, adults are recommended to get 150 to 300 minutes of moderate-intensity aerobic exercise or 75 to 150 minutes of vigorous-intensity aerobic exercise per week.²⁶

Additionally, it is recommended that adults do muscular strengthening exercise two or more days per week. Research in the general population has found that people who met physical activity guidelines were three times more likely to report positive mental health compared to those who do not meet these guidelines.²²

A paucity of research has explored the relationship between physical activity/exercise and mental health outcomes among the LGB population. Previous research regarding exercise and mental health of LGB people has been disease-focused, with great emphasis on HIV and cancer.²⁷⁻³⁰ The purpose of this study was to determine whether exercise was associated with fewer days of poor mental health reported by LGB adults in the U.S. The research questions included: Does participating in any exercise or physical activity in the past month result in reporting fewer days of poor mental health during that month? Did those who met aerobic physical activity and/or muscular strengthening exercise guidelines in a month report fewer days of poor mental health in that month? The goal of this study is to determine if doing any exercise is associated with fewer days of poor mental health among LGB adults or if meeting exercise guidelines is required.

Methods

Study Design, Data Collection, and Participants

This study was a secondary data analysis of data from the 2017 U.S. Behavioral Risk Factor Surveillance System (BRFSS) cross-sectional survey. BRFSS is a random-digit dial (landline and cell phone), health-related telephone survey of over 400,000 non-institutionalized adults aged 18 years and older.³¹ It is a collaboration between the Centers for Disease Control and Prevention (CDC) and U.S. states and territories. In 2014, the BRFSS included a sexual orientation question as an optional module. In 2017, 28 states included this question.

Measures

Detailed exercise and physical activity questions are asked in the core component of the BRFSS survey in odd years only.³² Thus, we used the 2017 BRFSS data since the 2019 survey data were not yet available at the time of the data analyses, and these questions were not asked in 2018. The exercise module includes questions on both aerobic and muscle strengthening exercise. To determine aerobic exercise amounts, participants were asked the following questions: “During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?”.³² Participants who responded “yes” were then asked about the type of physical activity or exercise. The surveyor conducting the survey used the Physical Activity Coding List, which includes 76 different physical activities or exercises, to confirm the type of physical activity or exercise with the participant.³² Participants were then asked “How many times per week or per month did you take part in this activity during the past month?” and “And when you took part in this activity, for how many minutes or hours did you usually keep at it?”.³² The participants were then asked the same series of questions for the next most frequent physical activity or exercise.³² Each of the 76 types of physical activity had an assigned intensity or metabolic equivalent (MET) value based on values from Compendium of Physical Activities. To determine if participants had met the U.S. Department of Health and Human Services’ guidelines for aerobic physical activity, an algorithm was applied using intensity, time, and frequency, and the results were coded into a new variable within the data set.^{25,32} Those who accumulated 150+ minutes of moderate or 75+ minutes of vigorous aerobic physical activity weekly were considered to have met the recommended guidelines for aerobic physical activity. All others were considered to not meet these guidelines.³³

For strengthening exercise, participants were asked the number of times that they did exercise to strengthen their muscles such as yoga, sit-ups or push-ups, weight machines, or free weights.³² Based on the answer to this question, a variable was created to indicate whether or not participants met the muscle strengthening guidelines: performing muscular strengthening exercise two or more times per week. A new variable was calculated to identify participants who met both guidelines (aerobic physical activity and muscle strengthening guidelines), met only the aerobic physical activity guideline, met only the muscle strengthening guideline, or did not meet either guideline.³³ To answer the first research question, we used the initial question asking about any physical activity or exercise in the past month. To answer the second research question, we used the aerobic and strengthening exercise guideline variable that indicated whether participants met both guidelines, one guideline, or neither guidelines.

Participants in the BRFSS were also asked demographic questions, disability questions, a sexual orientation question, and a mental health question. For this analysis, we used the demographic data for age, race/ethnicity, education, income, and employment. The disability question was related to mobility: “Do you have serious difficulty walking or climbing stairs?”.³² The sexual orientation question was “Do you consider yourself to be: straight, lesbian or gay, bisexual, or other”.³² Participants who identified as lesbian or gay and indicated that their sex was female were recoded as lesbian women while those who indicated their sex was male were recoded as gay men. Participants who identified as bisexual and indicated that their sex was female were recoded as bisexual women while those who indicated their sex was male were recoded as bisexual men. Participants who identified as straight, other, or refused to answer were omitted from this analysis.

Participants were also asked about mental health days using the following question, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?”.³² This answer was treated as a continuous variable ranging from 0 to 30. Participants were also asked if they had ever been told that they have a depressive disorder including depression, major depression, dysthymia, or minor depression.

Statistical Analysis

Descriptive statistics were calculated to address the data profile, and chi-square (χ^2) tests were used to determine significant differences in demographic characteristics between (1) those who exercised any and those who did not and (2) those who met the physical activity guidelines and those who did not. Weighted data were used for these analyses. Multivariate regression analyses were performed to determine the differences in the number of poor mental health days (dependent variable) between (1) those who exercised any and those who did not (independent variable) and (2) those who met both guidelines, one guideline, or neither guidelines (independent variable). Covariates included the following sociodemographics: educational attainment, age, race/ethnicity, income, employment status, and mobility disability, which have been found to influence mental health.³⁴⁻³⁹ Multicollinearity did not exist among the sociodemographics as all tolerances were greater than 0.1. We conducted a sensitivity analysis to determine whether having a depressive disorder might explain why LGB adults were less likely to exercise or meet the physical activity guidelines than those without a depressive disorder because of the potential for reverse causation between mental health and exercise (i.e. people

who are depressed being less likely to exercise). SAS 9.3 complex survey procedures were used for the statistical analyses. Significance was set at $p\text{-value} < 0.05$.

Results

Descriptive Characteristics

Complete data on all variables of interest were available for 6,371 out of 6,414 participants that identified as LGB in the 2017 BRFSS. Twenty-six percent identified as gay men, 16% as lesbian women, 20% as bisexual men, and 38% as bisexual women. Descriptive characteristics of the participants are provided in Tables 1 and 2. Seventy-five percent of participants reported doing some exercise in the past month. Although doing any exercise did not differ by sexual orientation, participants who reported doing any exercise were more likely to (1) have a college degree, (2) identify as White, (3) make more than \$75,000, (4) be able to work, and (5) not have a mobility disability (Table 1). Forty percent of participants did not meet either exercise guidelines, while about 25% either met both guidelines or the aerobic guideline only. There were significant differences by sexual orientation and each of the sociodemographic characteristics for participants meeting both, one, or neither of the guidelines (Table 2).

The mean number of poor mental health days per month for the LGB participants in total was 6.9 (Standard deviation [SD] = 10.1). People who reported any exercise during the past month had a mean of 6.2 days (SD = 9.4) compared to those who did not report any exercise who had a mean of 9.0 days (SD = 11.5). Those who met both the aerobic activity and muscular strength guidelines had a mean of 5.4 poor mental health days (SD = 9.0) compared to those who only

met the aerobic activity guideline with 6.0 (SD = 9.4), those who only met the muscular strength guideline with 7.1 (SD = 9.9), and those who did not meet either guideline with 8.4 (SD = 10.9).

Multiple Regression Analysis

After accounting for sociodemographics in the multivariate analysis, participants who did any exercise in the past month reported fewer poor mental health days with a significant reduction by -0.89 (95% CI = -1.34, -0.50; p-value < 0.01), shown in Table 3. Participants who met aerobic or strength guidelines had a significantly lower number of poor mental health days by -1.22 days (95% CI = -1.75, -0.69; p-value < 0.01) and -1.72 days (95% CI = -2.47, -0.97; p-value < 0.01), respectively. Moreover, when meeting both guidelines, the number of poor mental health days significantly reduced by -1.29 days (95% CI = -2.14, -0.45; p-value < 0.01).

Table 3 also shows consistent significant findings among sociodemographics. The number of self-reported poor mental health days was lower among older age groups compared to the youngest (18-24) and among Black and Hispanic participants compared to White participants (p-value \leq 0.01). Bisexual women self-reported more days of poor mental health (p-value < 0.01) compared to gay men and lesbian women, as did participants who did not graduate from high school or had some college compared to those who were college graduates (p-value < 0.01). More days of poor mental health was also found among those who were unable to work or were unemployed compared to those who were currently employed (p-value < 0.01) and among participants in lower (\$10-25K, \$25-50K, \$50-75K) income brackets compared to the highest (\$75K+) income bracket (p-value \leq 0.01).

For the sensitivity analyses, doing any exercise (p-value=0.16) or meeting both or one of the physical activity guidelines (p-value=0.51) was not significantly associated with being told whether or not they had a depressive disorder. This suggests that having a diagnosis of a depressive disorder did not fully explain the associations found between exercise and meeting physical activity guidelines and poor mental health days for LGB participants.

Discussion

LGB adults who participated in any exercise reported almost 1.0 day less of poor mental health compared to LGB adults who did not exercise. In addition, LGB adults who met one or both of the physical activity guidelines had between 1.2-1.7 days less of poor mental health in the past 30 days compared to those who did not meet the guidelines after adjusting for several sociodemographic characteristics. These findings are consistent with a previous study among the general population, which found a reduced mental health burden regardless of the forms of exercise.⁴⁰

Less is known about the potential mechanisms (e.g., psychological, physiological, or inflammatory) that may explain our findings. Psychological mechanisms, including stress relief such as distraction from problems or worries, and self-efficacy, may be a possible mechanism by which physical activity reduces the psychological distress due to minority stress among LGB people. For example, physical activity is a method for escaping from daily stress or worries.

Through escapism, a person is able to cope with emotional distress by suppressing acknowledgment of the stressor.^{41,42} For LGB people, physical activity may be a way to escape, even if for only a short time, from the stigma and discrimination experienced in daily life. However, there is a need to acknowledge that the physical activity contexts (e.g. fitness facilities) might in themselves be a source of stress rather than an escape for some LGB people resulting from discrimination, stereotypes, and homophobia within the physical activity contexts.⁴³⁻⁴⁵ Self-efficacy has been shown to boost mental health via exercise, which may increase self-efficacy through the skill mastery to improve mental health outcomes.⁴² For LGB people, skill mastery attained through physical activity may lead to improved mental health. For example, the mastery of riding a bicycle could translate to improved self-efficacy and mental health.

Research on physical activity within LGB populations finds similar rates of participation among lesbian and bisexual women and their heterosexual peers or even higher rates among lesbians.⁴⁶ For men, the result is mixed with some studies finding similar rates of physical activity between gay men and heterosexual men and others finding lower rates of physical activity among gay men.^{47,48} Barriers to physical activity among LGB adults include phobias (homophobia, transphobia, biphobia); fear of bullying, violence, discrimination, rejection, harassment, or being misgendered; fitness facilities that are unwelcoming (e.g. a lack of same-sex couple memberships or universal/gender-neutral change rooms); gender binary activities (e.g. women's tennis); and a lack of sensitivity among fitness professionals.^{44,45,49} Because of the numerous health benefits associated with physical activity including the mental health benefit found in our study, it is important to make physical activity and exercise programs, policies, and practices accessible to all LGB adults. Strategies for overcoming barriers may include making fitness

facilities safe and inclusive spaces, diversity and sensitivity training for fitness professionals, and programs that are non-binary.

Consistent with previous research, lower income and unemployment were associated with more days of poor mental health among LGB participants. The stress and anxiety associated with unemployment, under employment, and the inability to pay bills or afford essentials such as food, rent, or medicine are well documented contributors to poor mental health.^{34,35,38,50,51}

Greater job security, reduced unemployment, and a livable minimum wage are upstream factors that have positive impacts on mental health.^{50,51} LGB populations may be particularly vulnerable to poor mental health associated with employment due to workplace discrimination.⁵²

There is currently no federal law to prohibit workplace discrimination based on sexual orientation, and only 22 states have laws prohibiting workplace discrimination of all employees based on sexual orientation and gender identity, with an additional six states prohibiting discrimination against public employees only.⁵³ Without legal protections, LGB employees experience anxiety about disclosure, which in turn increases psychological distress.^{54,55}

Research has also shown that LGB adults experience discrimination in hiring practices and compensation leading to higher unemployment and lower income, despite high rates of higher education.^{56,57} These multiple layers of discrimination in employment and compensation may contribute to psychological distress among LGB people as postulated in the Minority Stress Theory.

We found fewer days of self-reported poor mental health among Black and Hispanic participants. This finding was not expected given concerns for greater experiences of discrimination and minority stress based on intersecting identities.^{59,60} However, the prevalence of any mental illness within the general adult population in 2017 reflects similar trends for minorities.¹ This may also be due to measurement error or potential concerns with the cultural validity of the mental health questions.⁶¹ Or there may be elements of either individual or community resilience within these populations which may buffer against minority stress and bolster mental health. Researchers have found that belonging to multiple stigmatized groups may increase the mental health changes associated with minority stress for some. However, for others multiple identities may increase resilience through positive cultural identity, community and cultural connectedness, social support, and cultural resources.^{62,63} Further research is needed to better understand how both mental health and physical activity behaviors may differ for LGB adults who identify as racial/ethnic minorities and how these may be impacted by individual and/or community resilience. We also found that participants aged 50+ reported fewer days of poor mental health compared to adults 18-24 years old. This finding may support the socioemotional selectivity theory that posits that as people age they become more focused on emotional health and social relationships.⁶⁴

Limitations

Causation cannot be determined because this study used data from a cross-sectional survey. Physical activity may have resulted in fewer days of poor mental health, or poor mental health days may have resulted in lower amounts of monthly physical activity among participants. We

attempted to address the concern of reverse causation by examining the relationship between depression and physical activity outcomes, and we found no significant relationship between depression and exercise or meeting the physical activity guidelines. However, further research is needed to determine the potential explanatory mechanisms and directionality of these associations. Physical activity amount, type, duration, and frequency were self-reported and subject to self-report bias. Additional limitations include self-selection bias, social desirability bias, and recall bias. Finally, mental health was assessed based on participant perception and self-report and was not evaluated using a standardized, validated questionnaire, such as the Patient Health Questionnaire.

Conclusion

Exercising and meeting physical activity guidelines resulted in fewer days poor mental health being reported by LGB adults in the U.S. This is an important finding because LGB people have a greater mental health burden thought to be exasperated by minority stress. More research is needed to understand the correlates, moderators, and mediators of physical activity among the LGB population in order to ensure that physical activity programs are accessible for LGB adult. Determining whether physical activity interventions, including aerobic and muscle strengthening exercises, could improve mental health outcomes in LGB adults should be considered.

Author Disclosure Statement

No competing financial interests exist.

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Table 1: Demographic Characteristics of Exercised Any in the Past Month by Sexual Orientation

Variable	Exercised Any		Total	
	Yes	No		
	N (weighted %)	N (weighted %)	N (weighted %)	
All	4706 (74.67)	1708 (25.33)	6414	
	Mean (SD)	Mean (SD)	Mean (SD)	
Days of Poor Mental Health	6.18 (9.38)	8.99 (11.46)	6.93 (10.06)	
	N (weighted %)	N (weighted %)	N (weighted %)	χ^2 , p-value
Sexual Orientation				3.96, 0.27
Lesbian	914 (15.76)	354 (18.85)	1268 (16.54)	
Bisexual Male	863 (19.07)	342 (21.03)	1205 (19.57)	
Bisexual Female	1628 (38.68)	563 (35.28)	2191 (37.81)	
Gay male	1301 (26.49)	449 (24.85)	1750 (26.08)	
Educational Attainment				34.42, <0.01
Did not graduate high school	214 (8.73)	153 (15.27)	367 (10.38)	
High school graduate	890 (25.39)	477 (26.72)	1367 (25.73)	
Some college	1321 (34.53)	536 (37.95)	1857 (35.40)	
College graduate	2273 (31.19)	535 (19.83)	2808 (28.31)	
Not reported	8 (0.16)	7 (0.23)	15 (0.18)	
Age				15.77, <0.01
25-34	973 (25.13)	296 (22.37)	1269 (24.43)	
35-44	594 (13.45)	223 (14.56)	817 (13.73)	
45-54	760 (13.18)	290 (14.31)	1050 (13.46)	
55-64	817 (9.98)	334 (13.30)	1151 (10.82)	
65+	740 (7.35)	322 (10.78)	1062 (8.22)	
18-24	822 (30.91)	243 (24.67)	1065 (29.33)	
Race / ethnicity				20.98, <0.01
Black	315 (10.35)	185 (17.26)	500 (12.10)	
Other	260 (7.22)	103 (5.28)	363 (6.73)	
Multi	211 (3.01)	69 (2.36)	280 (2.85)	
Hispanic	443 (16.59)	183 (18.93)	626 (17.18)	
White	3406 (61.45)	1136 (54.78)	4542 (59.76)	
Not reported	71 (1.38)	32 (1.40)	103 (1.38)	
Income				53.83, <0.01
<10K	228 (6.10)	118 (6.63)	346 (6.23)	
10-25K	880 (18.73)	515 (30.92)	1395 (21.82)	
25-50K	1057 (21.41)	380 (24.18)	1437 (22.11)	
50-75K	648 (12.25)	195 (10.25)	843 (11.74)	
>75k	1386 (28.13)	274 (14.88)	1660 (24.78)	
Not reported	507 (13.38)	226 (13.14)	733 (13.32)	
Employment				17.66, <0.01
Unemployed	316 (9.12)	121 (8.90)	437 (9.07)	
Out of Labor Force (e.g. retired)	1262 (25.09)	419 (22.48)	1681 (24.43)	
Unable to work	302 (5.83)	277 (11.96)	579 (7.38)	
Employed	2803 (58.83)	876 (55.61)	3679 (58.02)	
Not Reported	23 (1.12)	15 (1.06)	38 (1.10)	
Mobility Disability				54.50, <0.01
Yes	496 (9.25)	479 (22.84)	975 (12.69)	
No	4199 (90.63)	1223 (76.80)	5422 (87.13)	
Not Reported	11 (0.12)	6 (0.36)	17 (0.18)	

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χ^2 = Rao-Scott chi-square statistic; Bold χ^2 and p-value = significant at p-value ≤ 0.05 ; SD = Standard deviation

Table 2: Demographic Characteristics of Health by Meeting Physical Activity Guidelines (Met Both, Met Aerobic, Met Strength, Met Neither)

Variable	Met Both	Met Aerobic	Met Strength	Met Neither	
	N (weighted %)	N (weighted %)	N (weighted %)	N (weighted %)	
All	1339 (22.31)	1935 (27.93)	615 (10.68)	2482 (39.08)	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Days of Poor Mental Health	5.41 (8.97)	6.01 (9.37)	7.08 (9.88)	8.43 (10.93)	
	N (weighted %)	N (weighted %)	N (weighted %)	N (weighted %)	χ^2 , p-value
Sexual Orientation					19.12, 0.02
Lesbian	252 (11.79)	404 (17.72)	105 (16.70)	497 (18.37)	
Bisexual Male	270 (21.44)	342 (19.47)	101 (16.47)	486 (19.49)	
Bisexual Female	432 (36.29)	645 (39.61)	239 (34.25)	866 (38.52)	
Gay male	385 (30.48)	544 (23.20)	170 (32.580)	633 (23.63)	
Educational Attainment					23.86, 0.02
Did not graduate high school	47 (8.39)	97 (10.10)	29 (8.27)	192 (12.42)	
High school graduate	213 (21.16)	385 (26.27)	117 (27.93)	636 (27.26)	
Some college	378 (37.27)	549 (35.09)	169 (29.23)	749 (36.10)	
College graduate	699 (33.12)	901 (28.38)	298 (34.36)	898 (23.99)	
Not reported	2 (0.06)	3 (0.16)	2 (0.20)	7 (0.23)	
Age					29.98, 0.01
25-34	307 (26.81)	333 (23.97)	168 (31.47)	451 (21.47)	
35-44	153 (11.62)	235 (13.00)	80 (12.75)	343 (15.63)	
45-54	216 (12.27)	318 (14.08)	86 (13.08)	425 (13.90)	
55-64	225 (10.37)	396 (12.24)	66 (4.68)	457 (11.73)	
65+	202 (6.54)	373 (9.54)	76 (6.04)	401 (8.77)	
18-24	236 (32.39)	280 (27.16)	139 (31.98)	405 (28.50)	
Race / ethnicity					44.27, <0.01
Black	83 (11.38)	107 (7.60)	50 (10.44)	255 (16.14)	
Other	80 (6.04)	96 (5.67)	33 (6.39)	153 (7.98)	
Multi	68 (4.05)	88 (3.39)	24 (1.81)	99 (2.09)	
Hispanic	132 (20.08)	155 (14.33)	87 (21.98)	242 (16.16)	
White	955 (57.08)	1460 (67.46)	414 (59.00)	1687 (56.06)	
Not reported	21 (1.37)	29 (1.55)	7 (0.38)	46 (1.57)	
Income					36.94, <0.01
<10K	51 (6.20)	95 (5.75)	28 (5.79)	170 (6.78)	
10-25K	229 (17.89)	362 (20.51)	132 (20.20)	667 (25.62)	
25-50K	279 (21.87)	464 (19.57)	142 (22.91)	540 (23.98)	
50-75K	218 (12.95)	237 (11.24)	73 (8.95)	311 (12.22)	

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>75k	433 (29.46)	567 (29.63)	176 (29.15)	479 (17.48)	
Not reported	129 (11.63)	210 (13.29)	64 (13.01)	315 (13.92)	
Employment					26.65, <0.01
Unemployed	78 (7.52)	140 (9.65)	31 (10.34)	187 (9.30)	
Out of labor force (e.g. retired)	346 (23.06)	581 (28.92)	159 (22.04)	586 (22.69)	
Unable to work	67 (4.32)	119 (5.78)	47 (5.04)	343 (10.82)	
Employed	841 (64.18)	1089 (54.65)	376 (62.11)	1344 (55.74)	
Not Reported	7 (0.93)	6 (1.00)	2 (0.48)	22 (1.45)	
Mobility Disability					38.23, <0.01
Yes	107 (6.33)	226 (9.65)	94 (12.30)	538 (18.39)	
No	1227 (93.36)	1707 (90.29)	521 (87.70)	1935 (81.57)	
Not Reported	5 (0.32)	2 (0.06)	0 (0.00)	9 (0.05)	

χ^2 = Rao-Scott chi-square statistic; Bold χ^2 and p-value = significant at p-value ≤ 0.05 ; SD = Standard deviation

Table 3: Multiple Regression Analyses - Number of Days of Poor Mental Health by Exercising Any in the Past Month and Meeting Physical Activity Guidelines

Variables	Exercised Any		Met PA Guidelines	
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Intercept	8.48 (7.60, 9.19)	<0.01	8.80 (7.94, 9.66)	<0.01
Exercise Any				
Yes	-0.89 (-1.34, -0.50)	<0.01		<0.01
No	REF	REF		REF
Met PA Guidelines				
Both			-1.29 (-2.14, -0.45)	
Aerobic			-1.22 (-1.75, -0.69)	
Strength			-1.72 (-2.47, -0.97)	
Neither			REF	REF
Sexual Orientation				
Lesbian	0.10 (-0.56, 0.73)	0.76	0.02 (-0.64, 0.68)	0.76
Bisexual Male	0.29 (-0.29, 0.88)	0.34	0.23 (-0.36, 0.83)	0.34
Bisexual Female	1.64 (0.79, 2.41)	<0.01	1.54 (0.70, 2.38)	<0.01
Gay male	REF	REF	REF	REF
Educational Attainment				
Did not graduate high school	4.22 (3.00, 4.72)	<0.01	4.16 (3.24, 5.08)	<0.01
High school graduate	0.63 (-0.03, 1.43)	0.09	0.64 (-0.12, 1.40)	0.09
Some college	1.09 (0.29, 1.89)	<0.01	1.07 (0.25, 1.89)	<0.01
College graduate	REF	REF	REF	REF
Age				
18-24	REF	REF	REF	REF
25-34	-1.86 (-2.72, -1.21)	<0.01	-1.86 (-2.62, -1.10)	<0.01
35-44	-2.67 (-3.31, -2.05)	<0.01	-2.74 (-3.39, -2.09)	<0.01
45-54	-4.91 (-6.07, -3.60)	<0.01	-4.98 (-6.30, -3.66)	<0.01
55-64	-6.77 (-7.24, -5.87)	<0.01	-6.91 (-7.63, -6.18)	<0.01
65+	-8.68 (-9.40, -7.92)	<0.01	-8.72 (-9.51, -7.94)	<0.01
Race / ethnicity				
Black	-3.51 (-3.87, -3.03)	<0.01	-3.55 (-3.99, -3.10)	<0.01
Other	-0.90 (-2.64, 0.27)	0.23	-0.96 (-2.45, 0.53)	0.23
Multi	0.82 (-0.70, 2.44)	0.30	0.90 (-0.67, 2.47)	0.30
Hispanic	-1.95 (-2.63, -1.21)	<0.01	-1.87 (-2.60, -1.15)	<0.01
White	REF	REF	REF	REF
Income				
<10K	-0.06 (-1.03, 1.63)	0.93	-0.15 (-1.53, 1.22)	0.93
10-25K	1.41 (0.71, 2.45)	<0.01	1.39 (0.51, 2.27)	<0.01
25-50K	0.84 (0.19, 1.67)	0.03	0.77 (0.01, 1.53)	0.03
50-75K	1.17 (0.38, 2.20)	0.01	1.11 (0.17, 2.04)	0.01
>75k	REF	REF	REF	REF
Employment				
Unemployed	4.86 (4.02, 5.78)	<0.01	4.78 (3.91, 5.64)	<0.01
Out of labor force (e.g. retired)	0.39 (-0.06, 1.04)	0.17	0.38 (-0.17, 0.93)	0.17
Unable to work	8.07 (6.51, 9.00)	<0.01	7.91 (6.58, 9.24)	<0.01
Employed	REF	REF	REF	REF
Mobility Disability				

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Yes	3.01 (2.38, 3.68)	<0.01	3.15 (2.45, 3.84)	<0.01
No	REF	REF	REF	REF

REF = Reference category, CI = Confidence interval, Bold = significant at $p\text{-value} \leq 0.05$