



Physical Activity is Related to Mental Health and Sexual Orientation Among Women in College

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ABSTRACT

International Journal of Exercise Science 15(5): 1347-1356, 2022. Non-heterosexual women tend to report lower physical activity and poorer mental health than their heterosexual counterparts. The purpose of this study was to examine differences in mental health (stress and depression) and physical activity among female college students by sexual orientation. Students self-reported socio-demographic characteristics, physical activity, perceived stress, and depressive symptoms via an online survey. Correlations, independent samples t-tests, and multiple regression analyses were used to examine relationships between perceived stress, depressive symptoms, physical activity, and sexual orientation. Most participants ($n = 1072$, 20.0 ± 1.5 years) identified as heterosexual (90.1%), non-Hispanic White (73%), and in their fourth semester or higher. Perceived stress and depressive symptoms differed significantly between heterosexual and non-heterosexual women, but physical activity participation did not. Higher participation in vigorous physical activity and strength training predicted both lower depressive symptoms and lower perceived stress while controlling for sexual orientation. For both heterosexual and non-heterosexual sexual women, depressive symptoms had a positive relationship with perceived stress, and a negative relationship to strength training. Depressive symptoms also had negative correlations with vigorous physical activity among heterosexual women. Findings indicate non-heterosexual women experience greater perceived stress and depressive symptoms, and these mental health issues can have multi-level implications. Greater vigorous physical activity and strength training were associated with lower perceived stress and depression regardless of sexual orientation. Administrators and health promoters should consider ways to promote these forms of physical activity among non-heterosexual women. Further research is needed on the potential barriers impacting engagement in physical activity.

KEY WORDS: Depression, anxiety, gender

INTRODUCTION

Mental health is defined as biological, psychological, and social factors that influence an individual's functioning and adapting in an environment (29). Among diagnosed mental health disorders, depression is one of the most prevalent conditions in the general population (6).

Depression and stress are among the four most commonly reported top concerns among college students, and the prevalence of both have increased in the past decade along with rates of mental health counseling and prescription of related medications (18). Data from Fall 2021 from the National College Health Association noted that approximately 80% of US college students report moderate to high levels of stress and 21.5% report having been diagnosed with depression (3). This is similar to a recent meta-analysis which indicated that the pooled prevalence of depression and anxiety among college students was 33.6% (27).

Though mental illnesses afflict some parts of the population more than others, often mental illness goes undiagnosed and untreated (32). Disparities in the prevalence of mental disorders are evident based on a range of socio-demographic characteristics, including gender and sexual orientation. The prevalence of both depression and daily and chronic stress are higher among women than men (24, 31). In fact, evidence suggests that the prevalence of depression and reported stress among female college students is more than that of their male peers (22). In general, studies have consistently shown that sexual minorities have an increased risk of developing mental health disorders compared to their heterosexual peers (3, 8, 23, 39, 40). Bisexual women have been found to have fewer protective factors and may experience double discrimination, which could explain their increased risk for common mental health disorders (8, 26, 36). Protective factors are experiences or circumstances that increase confidence and competence among adolescents to protect them from negative developmental risks and health outcomes (36), while double discrimination is the combination of homophobia and biphobia (8). Lesbians are more likely to report sexual identity issues, suicidal feelings, and sexual abuse as reasons for seeking counseling, and as many begin to “come out” in their teens or 20s, they are especially at risk for depression and mental health issues (30). Factors relating to why students may not make use of university mental health services, and therefore remaining undiagnosed and untreated, include a lack of time, inadequate knowledge regarding the services, and feelings of embarrassment (43).

Significant evidence has documented the relationship between physical activity and mental health. The 2018 Physical Activity Guidelines Advisory Committee Scientific Report indicates that there is strong evidence to show that regular exercise improves affect, helps to stress management, reduces the risk of experiencing depression and depressive symptoms among adults (34). Physical activity is inversely related to depression, with an increasing amount of physical activity corresponding to less frequent, or a lower likelihood of experiencing depressive symptoms (7, 11, 14, 21). Adults who spend greater or equal to 50% of their leisure time being sedentary are at risk of having more frequent depressive symptoms (17), and individuals not performing regular physical activity risk higher perceived stress (28). The positive relationship between physical activity and mental health outcomes is related to activity intensity levels (5, 15). Moderate physical activity, vigorous physical activity, and strength training are associated with an increase in perceived health and a decrease in depression, while strength training was also found to be associated with a decrease in anxiety (2). Female college students in the US are less likely to meet aerobic and muscle-strengthening recommendations than male peers. Though women appear less likely to meet these recommendations, disparities based on sexual

orientation among non-heterosexual female college students vary based on orientation (42, 19). This may explain the conflicting evidence regarding physical activities based on sexual orientation among women in the wider population (9), with inconsistencies potentially due to variations in grouping of sexual minority women.

The association between physical activity and mental health, as well as disparities in mental health based on gender and sexual orientation are well established. Disparities in physical activity based on gender are also well documented, while evidence regarding physical activities based on sexual orientation among women is growing. However, the relationship between physical activity and mental health among women whilst accounting for sexual orientation remains largely unexplored, let alone among college students. Thus, the purpose of this study was three-fold, 1) to examine disparities in physical activity and mental health outcomes (depression and stress) between straight and non-heterosexual college females, 2) to examine the bivariate relationships between different intensities and modes of physical activity and mental health outcomes for straight and non-heterosexual college females, and 3) examine the overall relationships between different intensities and modes of physical activity and mental health outcomes for college females.

METHODS

Participants

This study reports the findings of analyses of a sub-sample focusing exclusively on women. . The wider study collected data from students of all genders. The current study focused exclusively on the 1072 cis-gender women who provided complete responses to all items aged 19-25 years.

Protocol

Data were collected as a part of a cross-sectional study conducted at a large, northeastern United States university between August 2018 and February 2020 using an online survey (Qualtrics, Provo, UT). The Pennsylvania State University Institutional Review Board approved this study which adhered to standard ethical practices (33). Students enrolled in general health and wellness classes were recruited via direct email at the beginning of the semester. Participants were sent one reminder email following the initial recruitment email. Participation was voluntary and did not impact students' grades, though instructors were requested to encourage participation. Survey completers had the chance to enter a random drawing for a \$50 gift card as an incentive, of which one was awarded each semester. Drawing entries, which required collection of contact information, were collected separately from survey data to protect participant identity. An informed consent statement was presented to students upon opening the survey link. Survey questions were aggregated from previously validated measures as described below.

Demographics: Participants self-reported their age, gender identity (options: man, woman, and various non-binary identities), race/ethnicity, sexual orientation (straight/heterosexual,

asexual, bisexual, gay, lesbian, pansexual, queer, questioning/unsure, same-gender loving, other identity, prefer not to disclose), and year of study (1st year (1-2 semesters), 2nd year (3-4 semesters), 3rd year (5-6 semesters), 4th year (7-8 semesters), 5th+ year (9+ semesters)). Sexual orientation was dichotomized into heterosexual (straight) or non-heterosexual (all other sexual orientations).

Physical activity behaviors: The Global Physical Activity Questionnaire (GPAQ), a reliable and valid measure (10, 20) assessed minutes per week of moderate and vigorous leisure time physical activity (4). Muscle-strengthening activity was measured in a similar manner to the GPAQ, with participants asked if they engage in the behavior (yes/no), and if so to report the weekly frequency (1-7 days) of participation in moderate or high intensity muscle-strengthening activities with an example informed by the current Physical Activity guidelines (34), for at least ten minutes continuously in a typical week. The number of days per week engaging in strength training behavior was used for analysis.

Depression: Depression was assessed using the Center for Epidemiology Studies-Depression Scale 7 (CESD-7), a seven-item version of the original version (36, 39) that measures depressive symptoms. Respondents rated how often they experienced different symptoms on a four-point scale ranging from (zero) rarely or none of the time (less than one day a week) to (three) most or all of the time (5-7 days a week). The CESD-7 includes items pertaining the following: poor appetite, trouble keeping one's mind on task, feeling depressed, restless sleep, feeling sad, and inability to 'get going'. Items were summed for a range of 0-21. It has demonstrated acceptable psychometric properties, in previous studies and the current study (25). The CESD-7 demonstrated good internal consistency in this study ($\alpha = 0.814$).

Stress: Stress was assessed using the Perceived Stress Scale 4 (PSS-4; 12), which measures perceived stress on a five-point scale ranging from never (zero) to very often (four). Participants rated how often they have felt the following in the past month: unable to control the important things in your life; confident about your ability to handle your personal problems; that things were going your way; and, difficulties were piling up so high that you could not overcome them. Items were summed for a range of 0-16. The PSS-4 demonstrated acceptable internal consistency in this study ($\alpha = 0.659$).

Statistical analyses

Descriptive statistics were computed to characterize the sample. Independent samples t-tests were used to examine differences in physical activity, perceived stress, and depressive symptoms based on sexual orientation. Pearson's correlations were used to examine the relationship between perceived stress, depressive symptoms, moderate physical activity, vigorous physical activity, and strength training separated by sexual orientation. Multiple regression analyses were used to examine the associations between different forms of physical activity with perceived stress and depressive symptoms while controlling for sexual orientation. All analyses were run using SPSS 26.0 (IBM, Armonk, NY), with significance levels set at $p <$

0.05 for t-tests and chi-square analyses, and $p < 0.025$ for regression analyses, resulting in adequate power (>0.80) for these analyses.

RESULTS

The mean age of participants ($n = 1072$) was 20.0 ± 1.5 years, and the majority identified as heterosexual, non-Hispanic White, and were in the junior (third) year of study or more (Table 1).

Table 1. Characteristics of participants ($n = 1072$)

	<i>n</i>	%
Sexual Orientation		
Heterosexual	966	90.1
Non-Heterosexual	106	9.9
Race		
NH White	778	73.0
NH Asian American	82	7.7
NH Multiracial	62	5.8
Hispanic or Latino	59	5.5
NH Other	54	5.1
NH African American	31	2.9
Year of study		
Freshmen (first year)	164	15.3
Sophomore (second year)	170	15.9
Junior (third year)	224	20.9
Senior (fourth year)	421	39.3
Fifth Year Senior (> fourth year)	87	8.1
Graduate Student	5	0.5

Table 2. Differences in physical activity and mental health between heterosexual and non-heterosexual women

	Heterosexual ($n = 966$)		Non-Heterosexual ($n = 106$)		<i>p</i>	η^2
	M	SD	M	SD		
MPA (min/week)	201.9	221.1	201.6	237.9	0.08	0.00
VPA (min/week)	141.8	157.2	123.7	166.3	0.99	0.00
ST (days/week)	1.5	1.7	1.2	1.7	0.26	0.00
Depressive symptoms	6.0	4.1	9.1	4.9	< 0.001	0.01
Perceived stress	7.3	3.1	8.5	3.2	< 0.001	0.03

Notes. MPA= Moderate Physical Activity, VPA= Vigorous Physical Activity, ST= Strength Training

Differences in Physical Activity and Mental Health Between Heterosexual and Non-Heterosexual Women: Though moderate physical activity, vigorous physical activity, and strength training did not differ significantly based on sexual orientation, non-heterosexual

women reported higher depressive symptoms and perceived stress than heterosexual women (Table 2).

Correlations of Mental Health and Physical Activity Separated by Sexual Orientation Among College Women: Among women in general, and regardless of sexual orientation, there was a positive correlation between depressive symptoms and perceived stress. Among women in general, and regardless of sexual orientation, there was no correlation between moderate physical activity and depressive symptoms or perceived stress. Among women in general, and heterosexual women, vigorous physical activity and strength training were both negatively correlated with both depressive symptoms or perceived stress. Among non-heterosexual women vigorous physical activity was not correlated with depressive symptoms or perceived stress, nor was strength training correlated with perceived stress though it was associated with depressive symptoms. Correlations are noted in Table 3.

Table 3. Correlations of mental health and physical activity separated by sexual orientation among college women

	Perceived stress	MPA (min/week)	VPA (min/week)	ST (days/week)
Entire Sample (n = 1072)				
Depressive symptoms	0.531**	-0.003	-0.111**	-.0106**
Perceived stress		-0.038	-0.066*	-0.083**
MPA (min/week)			0.254**	0.191**
VPA (min/week)				0.447**
Non-heterosexual (n = 106)				
Depressive symptoms	0.594**	0.109	-0.073	-0.138**
Perceived stress		0.043	-0.033	-0.038
MPA (min/week)			0.366**	0.172
VPA (min/week)				0.611**
Heterosexual (n = 966)				
Depressive symptoms	0.513**	-0.012	-0.111**	-0.091*
Perceived stress		-0.048	-0.066*	-0.082*
MPA (min/week)			0.240**	0.194**
VPA (min/week)				0.426**

Notes. * $p < 0.05$; ** $p < 0.01$; MPA= Moderate Physical Activity, VPA= Vigorous Physical Activity, ST= Strength Training

Regression Analyses: Depression: Higher moderate physical activity (min/week, $\beta = 0.003$, $p = 0.92$) did not predict depressive symptoms, while higher vigorous physical activity (min/week, $\beta = -0.10$, $p = 0.001$) and strength training (days/week, $\beta = -0.10$, $p = 0.002$) both predicted lower depressive symptoms while controlling for sexual orientation. The adjusted R^2 values for moderate physical activity, vigorous physical activity, and strength training were 0.04, 0.06, and 0.05 respectively.

Stress: Higher moderate physical activity (min/week, $\beta = -0.04$, $p = 0.21$) was not found to predict perceived stress, however, vigorous physical activity (min/week, $\beta = -0.06$, $p = 0.04$) and strength training (days/week, $\beta = -0.08$, $p = 0.01$) both predicted lower perceived stress while

controlling for sexual orientation. The adjusted R^2 values for moderate physical activity, vigorous physical activity, and strength training were 0.01, 0.02, and 0.02 respectively.

DISCUSSION

Though physical activity did not differ based on sexual orientation, non-heterosexual women reported greater perceived stress and depressive symptoms and both greater vigorous physical activity and strength training were associated with lower perceived stress and depressive symptoms. Our finding that non-heterosexual women experience greater perceived stress and depressive symptoms compared to heterosexual women aligns with differences reported in previous research (8, 23, 39, 40). While the mental health among college students in general is of concern (18), findings suggest the mental health of non-heterosexual women even more concerning. The absence of a difference in physical activity participation between heterosexual and non-heterosexual women is not surprising given non-heterosexual orientations were consolidated into a single group. Though differences in physical activity participation among both college students (42) and other populations (9) are evident when sexual orientations are disaggregated, previous research that consolidated non-heterosexual orientations also reported no differences in physical activity participation.

The inverse association found between vigorous physical activity and strength training participation with perceived stress and depressive symptoms is consistent with previous research (19). While the cross-sectional nature of this study does not allow conclusions to be drawn as to whether physical activity improves mental health, or mental health allows greater physical activity participation, findings do suggest that the higher intensity physical activity participation may be beneficial for mental health. The finding that intensity may be important is worth noting, as compared to fewer meet aerobic physical activity or strength training recommendations (13, 16, 42). Consequently, fewer women can realize the benefits of physical activity for various aspects of health and wellbeing compared to men.

Limitations of this cross-sectional study include grouping non-heterosexual women together due to the small sample size, and participants self-reporting physical activity which can lead to bias (1). The measure of strength training added to the PA assessment had also not been previously validated. Most participants were non-Hispanic White, indicating results may not be generalizable to more diverse populations. To mitigate these limitations, future research should attempt to differentiate between sexual minority groups, which could be achieved by implementing targeted or purposive sampling techniques as well as increasing the sample size. Additionally, we did not attempt to address any influences on PA behavior, which limits the interpretation of results and further implications. Finally, future studies could implement experimental or longitudinal study designs, and should consider device-based measurement of physical activity (37).

In summary, findings of the current study have a variety of practical implications that are of direct relevance to college administrators and health promoters. For one, greater attention to the

mental wellbeing of young non-heterosexual women is warranted. Facilitating greater participation in physical activity among female college students, particularly vigorous intensity aerobic physical activity and strength training activities, may help improve and protect their mental health. Conversely, improving the mental health of female college students may help increase their physical activity participation. The U.S. Department of Education has urged colleges to ramp up mental health supports for students (41), including strengthening resources, connecting students to care, and creating long-lasting support, which the current study indicates that PA could play a role in these efforts. Given the physical inequities evident in previous research (42) and the well-established association between physical activity supported by the results of this study, colleges may want to consider partnering with the sexual minority community promote physical activity and mental health simultaneously through systematic changes to existing health promotion efforts. Higher education needs to be on the forefront of preventive efforts and can serve as a leader in addressing the disparities in health among young adults.

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