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## RESEARCH ARTICLE

### GENDER AND RESIDENCE DIFFERENTIALS IN THE ASSOCIATION BETWEEN COMPOSITE PHYSICAL ACTIVITY AND ACADEMIC SUCCESS AMONG COLLEGE STUDENTS: POLICY IMPLICATIONS

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#### ABSTRACT

**Objective:** To examine gender and residence differentials in the association between physical activity (PA) and academic success among college students attending historically black colleges and universities (HBCU) in Mississippi. **Methods:** Participants were college students ( $n=285$ ) that attended a rural or urban HBCU in September 2017. Multivariate linear regression analysis was conducted to estimate the association between academic success and PA after controlling for the effects of gender, employment, chronic diseases, enrollment status, and residence. **Results:** While increased PA linked to decreased grade point average (GPA) among off campus residents, increased PA was associated with slightly increased GPA among on-campus residents. Whereas female students had increased GPA with increased PA, male students had decreased GPA with increased PA. **Conclusions:** Male students and off-campus residents who engaged in more PA are more likely to have a lower GPA. Policy recommendations will help optimize student's health outcomes and academic success.

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#### INTRODUCTION

Empirical research has established a correlation between physical activity and academic success. Physical activity reduce risk of chronic diseases, improve self-esteem, stress and anxiety (Anarsi et al., 2010; McKinney, 2013). A goal of *Healthy People 2020* is to improve the quality of life for individuals by reducing the prevalence of chronic diseases through an active lifestyle of physical. Physical inactivity can have an impact on obesity (Lee et al., 2012). African Americans are less active than that of Whites (Crespo et al., 2000). African Americans (46.8%) were more likely to be obese than whites (37.9%) (Hales et al., 2017). Research found that 56.5% of college students a week engage in moderate-intensity cardio or aerobic workouts 1-4 days for approximately 30 minutes and 30.6% do vigorous intensity cardio 1-2 days for approximately 20 minutes (ACHA-NCHA, 2019). Research also shows that in the United States 12.9% of men and 17.9% of women ages 18-29 who attend college have different chronic diseases including: asthma, cardiovascular disease, diabetes, cancer

and hypertension (CDC, 2009; COE, 2019). One study reported that males participated in leisure time physical activity (LTPA) at higher rates than females (Beville et al., 2014) which may be a solid evidence of gender difference in chronic disease among college students. Academic success of today's student can be linked to their physical well-being (CDC, 2015). A recent study reported that medical college students who averaged five days of physical activity for approximately 30 minutes per day achieve high grade point averages (Al-Drees et al., 2016). The World Health Organization recognized that insufficient physical activity causes chronic diseases such as cancer, diabetes, and cardiovascular diseases (WHO, 2018). Researchers acknowledged that increasing the study time and decreasing physical activity did not show a positive effect on the academic success of the student (Velou et al., 2014). An understanding of the association between physical activity and academic success is vital in exploring the well-being of college students. Previous studies have shown that healthy behaviors such as physical activity have some positive association on grades (Wald et al., 2013; Ghosh et al., 2013). It is imperative that public health experts assist in providing policies that will support college students by helping them

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understand the association between physical activity and academic success. While interventions are being continuously designed to improve college students' health, a gap exists in maintaining the student's overall health. Therefore, policies need to be developed to help college students become more physically active. Given the benefits of physical activities on health and school performance, policymakers should construct policies focused on the social, physical, and educational effect on individuals who lack physical activity (Dunton *et al.*, 2010). The 2008 *Physical Activity Guidelines for Americans* was published by the U.S. Department of Health and Human Services. These guidelines are intended to nudge Americans toward better health outcomes (ODPHP, 2008). Policymakers along with public health professionals are considered the most important audiences for these guidelines (ODPHP, 2008).

To enhance health, it is recommended that adults' ages' 18-64 do more than 'baseline activity' because individuals who only do 'baseline activity' are considered to have a sedentary lifestyle (ODPHP, 2008). These individuals are not meeting the recommended guidelines. However, to improve health, physical activity is critical. Examples of these activities including running, jumping rope, yoga, yoga, dancing and lifting weights (ODPHP, 2008). When engaging in physical activity adults should maintain 150 minutes of moderate-intensity levels of physical activity a week; and 300 minutes of moderate intensity aerobic physical activity, for a healthier lifestyle. Adults should do muscle-strengthening exercises that can be moderate or even high intensity (ODPHP, 2008). The aim of this study is to examine gender and residence differentials in the association between physical activity and academic success among college students attending Historically Black Colleges and Universities (HBCU) in Mississippi. A review of the literature, provided limited studies on college students' physical activity habits specifically at historically black colleges and universities. College students at HBCUs were assessed regarding their physical activity and its implications with students' academic success. The findings of this study will enable policymakers to design policies consistent with a view to enhancing the students' academic success.

## MATERIALS AND METHODS

This cross-sectional study was conducted on 285 college students at two HBCUs. A convenience sample of undergraduate students was recruited to participate in this study. The inclusion criteria of college students participating in this study were to be enrolled at an HBCU, eighteen (18) years and older and be an African American student. The survey content included an eight-predictor variable used as baseline (three are tested predictors and five additional predictors which was calculated using the G Power software). The alpha level for the analysis was  $p < .05$  and the effect size used was 0.15. Data were collected from college students during September and October of 2017. The Institutional Review Board at both institutions approved the study. The participants' information was kept anonymous and confidential. Signed and written consent forms were obtained from all participants. Each college student signed a written consent form that detailed the purpose of the study, the methods, and procedures, risks and benefits related to this study.

**Data Collection:** Data collection was completed between September to October 2017. The survey instrument was designed based on permission granted by a sister institution/university in utilizing their "Live Well: BUCS" survey (McKinney, 2013). The validity and reliability of the survey was tested based on the content and construct by clinical nutrition students. Five self-designed questions were integrated into the survey to target the HBCU college students. The other questions employed in the survey were tested for content validity by a panel of experts in health promotion and education, and health policy.

A composite average yielded a composite physical activity (PA) score. Questions were based on a Likert scale ranging from one to four with a composite score of two to four and a mean average of 3.15. The mean of activities helped to form a composite score deriving from the following items: (1) days exercised, (2) number of minutes exercised, (3) did not exercise, (4) level of physical activity, (5) too busy to exercise, (6) enjoy regular exercising, and (7) confident of exercising at least 30 minutes for 4-6 days per week. The grade point average for freshman students were self-reported based on their overall high school grade point average. The college sophomores, juniors and seniors grade point averages were self-reported based on current GPA averages. The age demographics of this research were defined as 18-19, 20-21, 22-24 and 25 and older.

**Statistical Analysis:** Descriptive statistics were conducted to describe the characteristics of the study population. Descriptive statistics consisted of frequency distribution and measure of central tendency such as mean and standard deviation. Linear regression analysis was used to determine if there was a linear relationship between GPA and PA.

Linear regression analysis was also conducted to determine if there was a linear relationship between GPA and covariates. Multivariate linear regression analysis was conducted to estimate the association between academic success and PA after controlling for the effects of gender, employment, chronic diseases, enrollment status, and residence. Statistical Package for the Social Sciences (SPSS) Version 21.0 was used to analyze the data.

## RESULTS

A total of 285 men and women who attended a rural or urban HBCU participated in this study. The demographic characteristics are presented in Table 1. The study population was comprised of 145 female (51%) and 140 male (49%) students. Based on the students' age, the majority were 18-19 (54.7%), 20-21 (25.6%), 22-24 (16.1%) and 25 and older (3.6%) (the average age:  $20 \pm 3.497$ ), median age: 22).

Freshmen (43%) constituted of most of the study participants, followed by sophomores (20%), juniors (19%) and seniors (19%). Of 40 different academic majors represented in the study, the top five were: biology (12%), social work (9%), mass communications (8%), business administration (7%) and health physical education, recreation

**Table 1. Demographic Characteristics**

Variables	Scale	Frequency	Percentage
Gender	Male	140	49.0
	Female	145	51.0
Age	18-19	156	55.0
	20-21	73	26.0
	22-24	46	16.0
	25 and older	10	3.0
Academic Class Standing	Freshman	121	42.0
	Sophomore	56	20.0
	Junior	54	19.0
	Senior	54	19.0
Academic Major	Biology	35	12.0
	Social Work	25	9.0
	Mass	22	8.0
	Health, PE, and Recreation	21	7.0
	Business	20	7.0
	Administration	162	57.0
	Other	162	57.0
Residence	On Campus	193	68.0
	Off Campus	92	32.0
Enrollment Status	Undergraduate part-time (less than 11 hours)	12	4.0
	Undergraduate full-time (12 hours or more)	273	96.0
Employment	Yes	76	27.0
	No	206	73.0

**Table 1a: Academic Success, Physical Activity and Employment Hours of Participants**

Variables	Mean±Std
Grade Point Average	3.03±.491
Composite of Physical Activity	3.15±.528
Average Hours Worked	25.78±11.081
Weight	174±49.3
Height	171±10.9

(7%) and other academic majors (57%). About 68% (193) of students lived on campus and 32% (92) lived off campus. The total enrollment status of students was as follows: 4% (12) were enrolled as undergraduate part-time (less than 11 hours) and 96% (273) were enrolled as undergraduate full-time (12 or more hours). Approximately 27% (76) of the students were employed and 73% (206) were unemployed. Table 1a calculates the mean and standard deviation that on average, student worked 26 hours per week (25.78±11.08 hours). Their GPA was 3.03 (3.03±.491), The average weight of the students were 174 pounds (174±49.3). The average height of the students were 171 centimeters (171±10.9). Composite PA for this study was 3.15 (3.15±.528) with a range of one to four with a composite score of two to four. A linear regression was conducted to determine the relationship between GPA based on PA (Table 2). There was no linear relationship between GPA and PA after controlling for residence or gender ( $p=0.215$  and  $p=0.88$ , respectively). Both residence and gender were significant predictors of GPA as shown in Model 1 and Model 3. Residence was a significant predictor of GPA with a p-value of .005 (Model 1), but had a negative  $\beta$ , indicating that off-campus residents had lower GPAs than on-campus residents after controlling for other independent variables. Gender was a

significant predictor of GPA with a p-value of .005 (Model 3), but had a positive  $\beta$ , indicating that female participants had higher grade point averages than males after controlling for other independent variables. As seen in Table 2, a significant interaction of residence ( $p=0.018$ ) and gender ( $p=0.015$ ) with PA was found, which implies that there was a significant difference in the PA-GPA relationship according to types of residence and gender group. Specifically, as depicted in the figures 1 and 2, while increased PA linked to decreased GPA among off campus residents, increased PA was associated with slightly increased GPA among on-campus residents. Whereas female students had increased GPA with increased PA, male students had decrease GPA with increased PA.

## DISCUSSION

Results indicated that residence and gender were significant predictors of academic success for PA. The students who lived off campus had lower GPAs than on-campus students. This also suggests that as off-campus students exercised their GPAs decreased; whereas, when on campus students exercised their GPAs increased. The study results indicated that female students had higher GPAs than their male counterparts. As female students exercised, their grade point averages increased; however, as male students exercised their GPAs were more likely to decrease. Although there was no direct relationship between GPA and PA, differential relationship between the two were found according to the types of residence and gender groups.

These findings may allow policymakers to maximize the effect of the PA programs to increase GPA by differentiating target groups. Students described their level of PA as being physically active for six months or more. Students also recognized that it is important to be physically active while others were confident of exercising at least 30 minutes for four to six days per week. A previous study highlighted that attending more physical activities per week (at least three or more) was associated with performing well in school (Kim *et al.*, 2012). Engaging in PA is important to academic success of college students after controlling for the effects of residence and gender based on the findings. Academically, this study suggests that students who have a higher GPA are more likely to be engaged in PA. The result of the multivariate regression found that the independent predictors of PA among students in this study were gender and residence. Future research aim to replicate a similar study at other universities with the same target population.

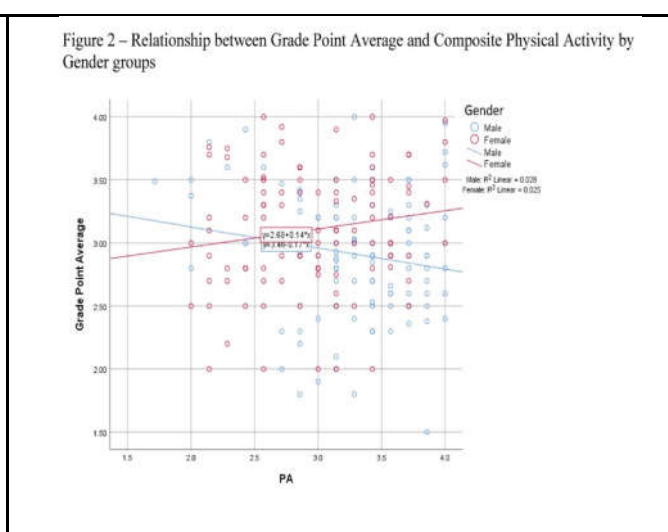
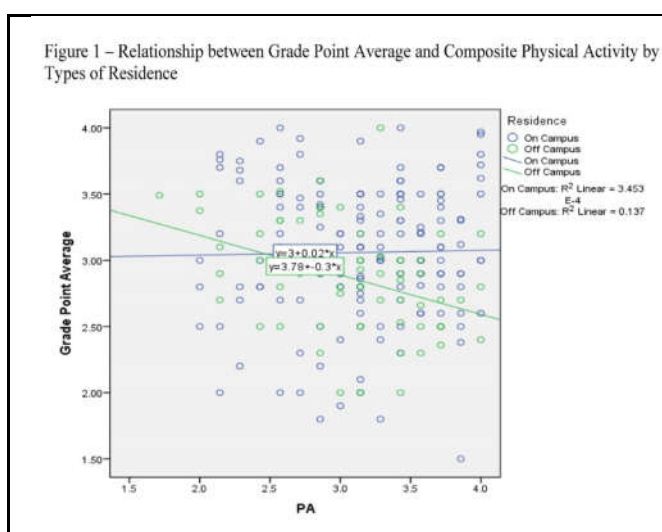
**Policy Implications:** Different types of organizations on university campuses can educate students about PA while at the same time helping the students to make better health choices such as eating habits and drinking water frequently. Researchers acknowledges that the assistance on making better health outcome choices can be done in many ways such as through policies, membership rules, and forums that can emphasize better behavioral choices (Brown, 2011). Another study reported that policies have been developed to increase PA in high schools as well as interventions and policies aimed at college students (Amis *et al.*, 2012; Martinez *et al.*, 2016). The goal is to continue this effort on the collegiate level. University campuses should create an environment that provides rules and regulations that encourage students to acquire positive lifestyle changes about their PA.

There are numerous policies that can be implemented as a result of this study. Policymakers have focused on physical education in high schools regardless of a student's athletic ability (Amis et al, 2012).

Motivational signs can be designed based on the target population of a particular building. Slogans and artwork can be developed that will stimulate patrons of that building. Metrics can be maintained with electronic readouts in stairwells and at elevators to count the number of people using the stairs over a given period of time.

**Table 2. Interaction effect of residence and gender with physical activities on predicting GPA**

Model	Variables	$\beta$	SE B	t	p-value
Model 1	PA	-.076	.061	-1.2430	.215
	Residence	-.203	.071	-2.847	.005
Model 2	PA	.018	.073	.246	.806
	Residence	.780	.420	1.858	.065
	PA*Residence	-.316	.133	-2.376	.018
Model 3	PA	-.010	.064	-.151	.880
	Gender	.194	.068	2.860	.005
Model 4	PA	-.167	.090	-1.846	.066
	Gender	-.779	.404	-1.929	.055
	PA*Gender	-.310	.127	2.443	.015



University administrators should implement a policy that requires all students regardless of their discipline to take a physical education activity course as a requirement before graduation. The institution can integrate PA with academia by implementing opportunities for students to be active through non-sedentary learning activities. University administrators can implement walking trails and biking trails for students to increase PA. According to an article published in Humana, 10,000 steps per day can be a great target for individuals who sit over 50% of their waking hours (Humana, 2014).

This is about 3,000 steps above the CDC recommended average of 7,000 to 8,000 steps per day (Humana, 2014). Researchers indicated that implementing walking and biking trails can be an important way to increase PA for students (Fino et al, 2010). Administrators can also offer free pedometers as an incentive to track daily steps. Therefore, implementing this policy to include these trails is a sure way of encouraging PA among students. Another important way to get students to increase PA is through motivational signage. University administrators can implement motivational signage at the elevators and stairs. A study completed by New York University indicated that motivational signage is a good strategy to encourage PA (NYU, 2012). Researchers found that participants were more likely to use stairs after exposure to motivational signs (Bauman et al, 2016).

This can be done by installing traffic-counting sensors. Therefore, utilizing signage at the elevators and stairs to encourage students to take the stairs will promote PA, weight reduction, and weight management. University administrators can make sure that access to exercise equipment and other physical fitness activities is available for on- and off-campus students. Offering access to a fitness trainer to recommend a fitness program will be beneficial to the students. Also, University administrators can provide access to student aerobic and swimming classes. These activities and exercise equipment can be an opportunity to help students to engage in PA.

**Study Limitations:** Several limitations existed in this study. It was difficult to make causal inferences because the study used a cross-sectional design. Therefore, further studies are needed by using a longitudinal design. A convenience sample was utilized for this study; consequently, some college students may not be efficiently represented.

The data were derived from self-reported information by college students. Experts reported that surveys that are self-reported can be biased and are limited (Stroebele et al, 2013). The study was not generalizable to other areas. Also, the study was conducted in an urban and a rural geographical area. The only outcome variable screened for was to determine the students' academic success.

## Conclusion

Insufficient PA cause chronic diseases such as cancer, diabetes, and cardiovascular diseases (CDC, 2019). This study found a limited number of college students that had different types of chronic diseases. Students who have a higher GPA are more likely to be engaged in PA after controlling for gender and residence. Although the sample is not generalizable to the overall population, the current data analysis presents factors that can inform policies at the university level because of the findings.

**Declaration of Interest:** The authors declare that there are no conflicts of interest.

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