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Associations between college/university physical activity requirements and student physical activity

Caitlin P. Bailey[a], **Mark Lowry**[b], **Melissa A. Napolitano**[a], **Mary T Hoban**[c], **Christine Kukich**[c], **Frank M. Perna**[b]

[a]Department of Prevention and Community Health, The George Washington University Milken Institute School of Public Health, Washington, DC, USA

[b]Division of Cancer Control and Population Sciences, The National Cancer Institute, Rockville, Maryland, USA

[c]American College Health Association, Silver Spring, Maryland, USA

Abstract

Background: Most US college students do not meet physical activity guidelines. Physical activity requirements (PAR) are a proposed solution for increasing undergraduate physical activity.

Purpose: To determine whether college/university PAR are associated with undergraduates' self-reported physical activity.

Methods: Undergraduate students (N=383,632) attending colleges and universities taking part in the American College Health Association-National College Health Assessment II survey (2015-2019) self-reported physical activity and demographics. Using websites and course catalogues, researchers coded schools to indicate binary PAR status. Bayesian Hierarchical Logistic Regression was used to determine the percentage of students meeting physical activity guidelines; interactions between PAR status and student characteristics (sex, BMI) were examined.

Results: PAR status was positively associated with percent of students meeting physical activity guidelines (PAR: 43.3%, without: 40.5%; difference score 95% Highest Density Interval [HDI; 1.0, 4.5]). A greater percentage of students attending schools with PAR, versus without, met physical activity guidelines across all categories of sex and weight. However, the positive relationship between PAR status and physical activity was stronger among male students (PAR: 46.7%, without: 43.2%; 95% HDI [1.6, 5.4]) compared to female students (PAR: 39.9%, without: 37.9%; 95% HCI [0.2, 3.8]), and among students with underweight (PAR: 39.2%, without: 35.5%; 95% HDI [1.2, 6.3]) or obesity (PAR: 37.1%, without: 33.7%; 95% HDI [1.4, 5.3]) compared to normal weight (PAR: 49.3%, without: 47.4%; 95% HDI [0.1, 3.7]) or overweight (PAR: 47.5%, without: 45.5%; 95% HDI [0.1, 4.0]).

Corresponding author: Caitlin P. Bailey, cpbailey@gwu.edu.

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The authors declare no conflicts of interest. The opinions expressed herein are those of the authors and do not represent the position of NCI, the NIH, or ACHA.

Conclusions: PAR are associated with meeting physical activity guidelines, particularly among college/university students with underweight or obesity.

Keywords

Physical activity; requirement; college/university; student; policy

Introduction

Physical activity is associated with lower risk of several leading causes of morbidity and mortality in the US, including heart disease, diabetes, and thirteen unique cancers [1–4]. Chronic conditions, such as diabetes and cancer, are now occurring in younger populations as early as 20-39 years old [5–7], making such diseases no longer exclusively diseases of aging. This shift in chronic disease burden reflects the mounting importance of establishing and maintaining physically active lifestyles early in life.

Despite the importance of early and consistent physical activity, 54% of US college students do not report meeting physical activity guidelines [8]. The majority of the 19.7 million college students enrolled in the US are emerging adults [9, 10]. Emerging adulthood is a crucial developmental period, during which individuals are creating habits that may track into later adult life [11, 12]. As such, providing opportunities for college students to build and maintain active habits is an essential aspect of the postsecondary academic experience [13]. This is especially important for students at increased risk of being insufficiently active, including females and individuals with elevated BMIs, two groups identified as less likely to be sufficiently active compared to male and normal weight counterparts, respectively [14–20].

Physical activity requirements (PAR; i.e., courses required for graduation) have been proposed as one potential solution for increasing undergraduate physical activity, particularly among those students least likely to be sufficiently active [13, 21–25]. PAR consist of one or more physical education or physical activity course, lesson, or module required for all students as part of their undergraduate degree. PAR may be activity-based, conceptual, or a combination of the two [26]. Cross-sectional research found that students participating in PAR reported more amotivation for physical activity on the Behavioral Regulation in Exercise Questionnaire (BREQ-2) compared to students on a different campus participating in an elective course (1.59 vs. 1.46, $p < 0.001$) [23]. This suggests that PAR, as opposed to elective courses, reach students with less motivation to engage in physical activity, and thus less likelihood of being regularly active on their own. Alternatively, such results could indicate that PAR are negatively associated with students' motivation for physical activity, as would be supported by Self-Determination Theory, which posits that coercion (e.g., a course requirement) may promote reactance and lacks the autonomy-supportive characteristic that is important for promoting intrinsic motivation for a behavior [21, 27]. However, data from this cross-sectional study also indicated that seniors on a campus with PAR had less amotivation for physical activity than did first-year students (1.42 vs. 1.87, $p < 0.01$), furthering the hypothesis that exposure to PAR over time may improve motivation for physical activity rather than reduce it [23].

A second cross-sectional study of PAR and student motivations reported that female (but not male) students enrolled in PAR reported more intrinsic motivators for enrolling (e.g., “to have fun”) compared to females enrolled in an elective physical activity course [22]. Indeed, it is possible that PAR might produce greater campus-level motivation for physical activity because PAR provide all students with opportunities to identify specific physical activities that they enjoy and value along with the designated time, space, and professional instruction needed to become competent at performing the given activity.

Though small cross-sectional analyses support the hypothesis that PAR have beneficial effects on student motivation for physical activity [22, 23], few studies have been conducted that directly measure student physical activity as an outcome and no studies have utilized large multi-campus samples [28, 29]. To date, only one randomized controlled trial of a semester-long physical activity course for undergraduates has been conducted, which produced inconsistent results [25, 30]. Post intervention, female students reported greater leisure time physical activity, as well as increased strengthening and stretching exercises [25]. However, male students reported no difference from pre-intervention activity levels, and no impact on physical activity for either females or males was reported at two-year follow-up [25, 30]. Furthermore, the trial was performed at one medium-sized university in southern California, which may limit generalizability of results to other schools and US regions.

This study is the first to address the lack of data linking PAR with student physical activity using a large, diverse sample of US college and universities. Our aim is to test whether college/university PAR are associated with self-reported physical activity among all undergraduate students, and whether this association differs for at-risk students (i.e., female, BMI outside the normal range) vs. students not deemed at-risk (i.e., male, normal range BMI). It is hypothesized that 1) PAR will be associated with a greater percentage of students meeting physical activity guidelines, overall, and 2) PAR will be associated with a greater percentage of at-risk students meeting physical activity guidelines, compared to those not at-risk.

Methods

Data

Data from the American College Health Association-National College Health Assessment II (ACHA-NCHA II) survey (2015-2019) was merged with PAR status (researcher coded variable) to create a dataset describing campus- and student-level characteristics for a diverse sample of U.S. college and universities. The ACHA-NCHA II is a serial cross-sectional dataset of college/university students clustered by academic institution. At the campus-level, the data represent a diverse self-selected sample of colleges/universities from all 50 states and Washington, D.C. Within each college/university, students are sampled either randomly or via census [8]. The dataset was not designed to be nationally representative.

Measures

Outcome—The binary outcome variable for the analysis was aerobic physical activity guidelines met/not met as published by the American College of Sports Medicine and the American Heart Association in 2007 [31]. This variable was calculated, per the ACHA-NCHA II codebook, using student responses to the following two-part question from the ACHA-NCHA II survey: *"On how many of the past 7 days did you: 1) Do moderate-intensity cardio or aerobic exercise (caused a noticeable increase in heart rate, such as a brisk walk) for at least 30 minutes? 2) Do vigorous-intensity aerobic exercise (caused large increase in breathing or heart rate such as jogging) for at least 20 minutes?"* Students meeting the guidelines reported either 1) moderate-intensity aerobic exercise for at least 30 minutes on five or more days per week, 2) vigorous-intensity aerobic exercise for at least 20 minutes on three or more days per week, or 3) a combination of moderate-intensity and vigorous-intensity aerobic exercise where two moderate-intensity bouts is equal to one vigorous-intensity bout [8]. Inter-item correlations for the physical activity variables have been reported elsewhere [32]. Use of the physical activity variable as outlined above ensures comparability with other analyses conducted using NCHA data.

Predictors—The primary predictor variable, PAR, was defined as an institutional requirement stipulating that one or more physical education or physical activity course(s) must be completed by all students prior to attaining an undergraduate degree; these required courses may be activity-based, conceptual/classroom-based, or a combination. The PAR variable was coded by the research team as a binary variable (presence or absence). Using a codebook informed by the literature on college physical education programming [26, 33–35], two authors coded campus PAR status and related variables by reviewing school websites and archived course catalogues. Search terms identified in the physical education literature were used to guide all searches [33, 34]. Coding discrepancies (n=2) were reviewed and adjudicated by rerunning conflicting searches.

Student-level predictor variables were sex and BMI category provided by the ACHA-NCHA II survey data. Student sex was self-reported as the sex given at birth. Student BMI was calculated from self-reported height and weight (kg/m^2) and used to create a categorical variable representing underweight (BMI < 18.5), normal weight (BMI 18.5 – 24.9), overweight (BMI 25 – 29.9), and obese (BMI ≥ 30).

Covariates—Model covariates included race, US region, school type (i.e., two-year/four-year, public/private), an anonymized campus ID number, and ACHA-NCHA II survey wave (fall or spring semester for each survey year, 2015-2019). Covariates were selected using auxiliary regression models to test for significant confounders. Campus ID and survey wave were entered into the model as random effects to account for the complex nature of the survey.

Analysis

A Bayesian Hierarchical Logistic Regression Model was used to determine the percentage of students meeting physical activity guidelines. The model was run in RStudio [36, 37] using the R2jags package [38]. PAR status, sex of the student, and BMI were input as predictors. The model also examined the interaction between PAR status and BMI as well as the interaction between PAR status and sex. The model adjusted for race, US region, and school type (i.e., two-year/four-year, public/private), and accounted for clustering within an educational institution using an anonymized campus identification number (campus ID) as well as within each survey timepoint (survey wave).

The interpretation of the Bayesian model is somewhat different from traditional approaches. Here, we briefly outline the main differences. First, the model estimates the intercept (β_0) as a posterior distribution, which represents the percentage of students who meet physical activity guidelines (after controlling for campus ID and survey wave). Second, each predictor variable (or interaction) estimates posterior distributions for how much its levels "deflect" from the overall intercept after controlling for the other variables in the model. Deflections (β) are mean centered and sum to zero. In order to estimate the percentage of students meeting physical activity guidelines for a given predictor, one simply adds all the relevant deflections to the intercept. Therefore, the baseline for each predictor variable is the overall intercept of the model. Third, confidence intervals are determined from the model's posterior distributions. If 95% of the densest portion of the distribution (i.e., the 95% Highest Density Interval [HDI]) does not contain zero, the effect is deemed credible (i.e., "significant"). This is analogous to finding confidence intervals in traditional statistical approaches. Mean differences can be estimated by subtracting one level's posterior distribution from another. Fourth, unlike traditional approaches, the model gives the probability of a hypothesis (e.g., PAR is related to the dependent variable) given the data, not the probability of the data, given the (null) hypothesis.

Results

The analytic sample consisted of 383,632 students from 379 unique colleges and universities. Approximately 47% of the sample reported physical activity levels that met physical activity guidelines. Fifteen percent (15%) of students were attending schools with PAR. The sample was predominantly female (69%), white (61%), public school students (67%) with a BMI in the normal weight range (58%). Forty percent (40%) of students were attending schools in the West. See Table 1 for a full list of descriptive statistics. Stratified raw and adjusted percentages, deflection estimates, and 95% HDIs are given in Table 2. Results in text provide adjusted percentages. Additionally, odds ratios can be found in the supplementary materials.

PAR Status

There was a small, but credible, main effect of PAR status. A greater percentage of students in PAR universities (43.3%) met physical activity guidelines compared to without (40.5%), 2.8% mean difference, 95% HDI [1.0, 4.5].

BMI

There was a credible main effect of BMI. Students with normal weight (48.4%) and with overweight (46.5%) were more likely to report meeting physical activity guidelines. However, students with underweight (37.3%) or with obesity (35.4%) were less likely to report meeting physical activity guidelines. All four BMI group differences were credibly different than the intercept; see Table 2 for deflection estimates and HDIs.

Sex

There was a credible main effect of sex. Males (45.0%) were more likely to report meeting physical activity guidelines than females (38.9%), 6.0% mean difference, 95% HDI [5.4, 6.6].

PAR x BMI Interaction

There was a small, but credible, interaction between PAR and BMI status according to the Bayesian model. Though all BMI groups had a greater percentage of students meeting guidelines when exposed to PAR, the interaction suggests that having normal weight or overweight slightly attenuates the positive relationship between PAR status and meeting physical activity guidelines, as demonstrated by smaller mean difference scores for students with normal weight and overweight versus underweight or obese. Among students with normal weight, 49.3% of those exposed to PAR met guidelines, compared to 47.4% of those not exposed, 1.9% mean difference, 95% HDI [0.1, 3.7]. Among those with overweight, 47.5% of those exposed to PAR met guidelines, compared to 45.5% of those not exposed, 2.0% mean difference, 95% HDI [0.1, 4.0]. In contrast, among those with underweight, 39.2% of those exposed to PAR met guidelines, compared to 35.5% of those not exposed, 3.7% mean difference, 95% HDI [1.2, 6.3]. Finally, among students with obesity, 37.1% of those exposed to PAR met guidelines, compared to 33.7% of those not exposed, 3.4% mean difference, 95% HDI [1.4, 5.3]. See Figure 1 for a graph of the interaction.

PAR x Sex Interaction

There was a small, but credible, interaction between PAR and student sex according to the Bayesian model. The interaction suggests that the relationship between PAR status and meeting physical activity guidelines is smaller for female students (2.0% mean difference, 95% HDI [0.2, 3.8]) compared to male students (3.5% mean difference, 95% HDI [1.6, 5.4]). See Figure 2 for a graph of the interaction.

Discussion

This study is the first to assess the association between campus PAR status and student physical activity using a diverse sample of 379 campuses across the US. We found that having PAR, compared to without, was associated with a modest, but significantly higher probability of meeting physical activity guidelines. The cross-sectional nature of the data makes conclusions of causality unable to be made. However, if PAR were causally linked to greater student physical activity, we would see an association between PAR and student physical activity, as we do here. Thus, our findings indicate that this is a promising hypothesis for future study, with the potential for population-level impact. Though the associations reported here are small, they are practically significant at a population level. With 19.7 million students estimated to be enrolled in college in 2020 [10], roughly 10.6 million (54% [8]) did not meet physical activity guidelines. Therefore, a 1.4% increase in the number of students meeting physical activity guidelines would equate to almost 150 thousand additional students meeting guidelines in one year.

Notably, we also found that BMI group and PAR status interacted such that students with normal weight or overweight exhibited a slightly attenuated relationship between PAR status and percent meeting guidelines, while students with underweight or obesity demonstrated a stronger association. Similarly, the interaction between student sex and PAR status indicated that female students had an attenuated relationship between PAR status and percent meeting guidelines, while males exhibited a stronger association. It is worth noting that female students are substantially less likely to meet physical activity guidelines compared to males regardless of PAR status (38.9% vs. 45.0%), indicating that any increase in the proportion of females meeting guidelines has promising public health implications.

Our findings are in-line with previous research indicating that females and individuals with overweight/obesity are less likely to be sufficiently physically active. Globally, almost 32% of women are insufficiently active, compared to only 23% of men [16]. In the US, this trend begins in elementary school, with female students exhibiting fewer minutes of moderate-to-vigorous physical activity as early as first grade [17]. The gap continues with age as female adolescents also consistently demonstrate less physical activity than their male counterparts regardless of race or income [14, 15]. By the time of college attendance, only 44% of female students are meeting physical activity guidelines compared to 50% of males [8]. However, physical education requirements for school children have been consistently associated with greater amounts of physical activity, especially for girls [39], and the data in this study is consistent with the idea that a physical activity requirement policy approach may be a viable lever to address physical activity on college campuses. Similarly, individuals with overweight/obesity are less likely than their normal weight counterparts to be physically active [19, 20] and yet these individuals may benefit the most from maintaining active lifestyles beginning at an early age [19, 40]. As such, our findings among college students with overweight and obesity are particularly promising, as meeting physical activity guidelines is protective against a host of chronic diseases, including type II diabetes, cardiovascular disease, and several cancers, independent of body weight [4, 31, 40, 41].

Although the data presented here suggest PAR have a modest, positive association with the percent of students meeting physical activity guidelines, this study was observational and cross-sectional in nature, preventing us from drawing strong conclusions about the relationship between PAR and student physical activity. Our results indicate that PAR alone are not enough to close the physical activity gap for at-risk students, such as females and those with BMIs outside the normal weight range. The heterogeneity of PAR policies across campuses may have led to a reduction in the strength of association between PAR and physical activity in this study, potentially explaining the modest effect size observed. Among schools in our sample with PAR, some campuses required more than one course prior to graduation; some prescribed conceptual coursework in a classroom setting (e.g., “Lifelong Fitness”) as opposed to activity-based courses (e.g., soccer, running) or a mix of both. Similarly, Cardinal et al. [26] reported that campuses with PAR in 2010 varied in the number of credits required to fulfill the requirement, and that activity-based and combination course requirements were most common. Although our analyses were limited by how the data were linked (i.e., to protect the anonymity of the schools, only the binary PAR status variable and no additional course information was linked to the analytical dataset), future studies can build on the evidence presented here by conducting analyses to determine the importance of specific elements of PAR (e.g., number of credit hours, time spent being physically active). Qualitative explorations of student experiences with varying PAR types would also be informative, as research indicates students exhibit differential preferences for course content across demographic factors [28].

Though PAR policies present promising avenues for promoting college student physical activity, it is important to consider the acceptability of such policies to students. Several studies support the hypothesis that PAR promote students' motivation for physical activity [22, 23]. Our findings are the first to evidence that PAR promote student physical activity behaviors across multiple college/university settings, as well. Yet, behavioral theories (e.g., Self-Determination Theory [27]) posit that external regulators (e.g., course requirements) may negatively impact students' intrinsic motivation, which can lead students to discontinue physical activity in the long-term once the required coursework is concluded [21]. Furthermore, Lee and colleagues posited that a negative affective response to exercise occurs when exercise is perceived as "unnecessary or of low utility" [42]. It may be that students who are already active (and have the requisite skills to be active) perceive required physical activity coursework to be of low utility, causing such students to develop negative affective associations with physical activity during course meetings. In contrast, students who would otherwise not be active perceive required physical activity coursework to be of use (e.g., as a needed cue to action, as an opportunity to learn new skills), resulting in their developing positive affective associations with physical activity during course meetings. Affective associations contribute to positive or negative feedback loops that promote or inhibit continuation of physical activity, respectively [43]. Affective associations, and other potential theoretical mechanisms, should be further explored in the context of PAR to understand what aspects of PAR work particularly well, as well as how to tailor PAR policies to benefit diverse student subgroups.

Alternatively, due to the cross-sectional nature of the study, findings presented here may simply indicate that campuses with students at greater risk of being insufficiently active are also less likely to have PAR. Randomized controlled trials are needed to test causal relationships between PAR and student physical activity. Future work can also explore the reasons why campuses choose (or choose not) to establish PAR and whether campus administrators view such policies as effective/feasible. Such studies may provide insights regarding the aspects of PAR that are cost-effective for campuses to implement and maintain long-term.

Finally, PAR may have greater impact when nested within a multi-level, whole-of-community approach to student health promotion, such as has been demonstrated in the childhood obesity prevention literature [44–46]. For example, in addition to PAR policies, campuses might provide environments that promote physical activity, such as "Healthy Active Living" themes in residence halls or standing desks in classrooms and study spaces [29, 47, 48]. App-based physical activity education modules (e.g., [49]), which can be tailored to individual student needs, may be a viable tool for campuses that do not have the space or resources to provide in-person coursework for all students and could even allow for programming that is accessible to students in distance learning programs. Finally, defaults that automatically enroll students in physical activity coursework and require them to opt out are another promising option for promoting student physical activity [50]. This may be a viable alternative to PAR or an adjunct policy to encourage course physical activity enrollment even after required coursework is completed.

Strengths and Limitations

This article has several strengths. It is the first study to examine the association between college PAR and student physical activity behaviors in a large, diverse sample of students from 379 unique schools. Previous studies examining PAR have used small samples that represent students from one or two campuses [22, 23, 25, 28, 30]. Not only do our data represent hundreds of schools across the US, we also explicitly include students attending two-year schools and Minority Serving Institutions, two understudied populations in the college physical activity/weight maintenance literature [29]. Furthermore, PAR status was researcher coded using school websites and course catalogues, removing the potential for reporting bias.

Limitations of this work include the non-nationally representative nature of the school sample. Though college/university students from all US regions are represented by this data, the campuses that participate in the ACHA-NCHA II survey are volunteers interested in surveilling student health trends and may not represent the average US college/university. Second, the physical activity guidelines met/not met variable was 1) based on guidelines set forth by the American College of Sports Medicine and the American Heart Association in 2007 [31], 2) was based on self-reported thresholds of activity, and 3) did not include a measurement of strengthening activities, which the 2018 Physical Activity Guidelines for Americans report indicates should be engaged in 2 or more times per week [40]. Future work should consider measuring the impact of PAR using accelerometer technology and/or questionnaires that better reflect all aspects of the current national guidelines.

Third, the PAR variable was a binary measure indicating existence of one or more course requirements. We do not know if, at the time of response, the student was presently enrolled in the required course(s), had previously taken the required course(s), had not yet taken the required course(s), or how long it was since they completed the requirement. If the student was enrolled in the PAR course at the time of response, we do not know what proportion of the physical activity they reported was directly a result of the class. Such questions are important to consider for future studies. Finally, our survey sample, though large and diverse in terms of representation by US region and campus type, is majority white, female, and four-year, indicating that additional work is needed to understand the impact of PAR in more diverse and non-traditional student populations.

Conclusion

This study is the first to examine associations between college PAR and student physical activity in a large sample of students from multiple diverse schools. Our data indicate that

PAR are associated with a modest, but significantly higher probability of meeting physical activity guidelines for all students. Notably, male students and students with underweight or obesity exhibit the strongest association between PAR and physical activity. While PAR does improve the probability of meeting physical activity guidelines for at-risk groups (i.e., female students and students with underweight, overweight, or obesity), these groups may require additional approaches and/or more targeted programs to promote sufficient physical activity. Future work is needed to identify causal pathways between PAR and student physical activity, as well as the most effective aspects of PAR policies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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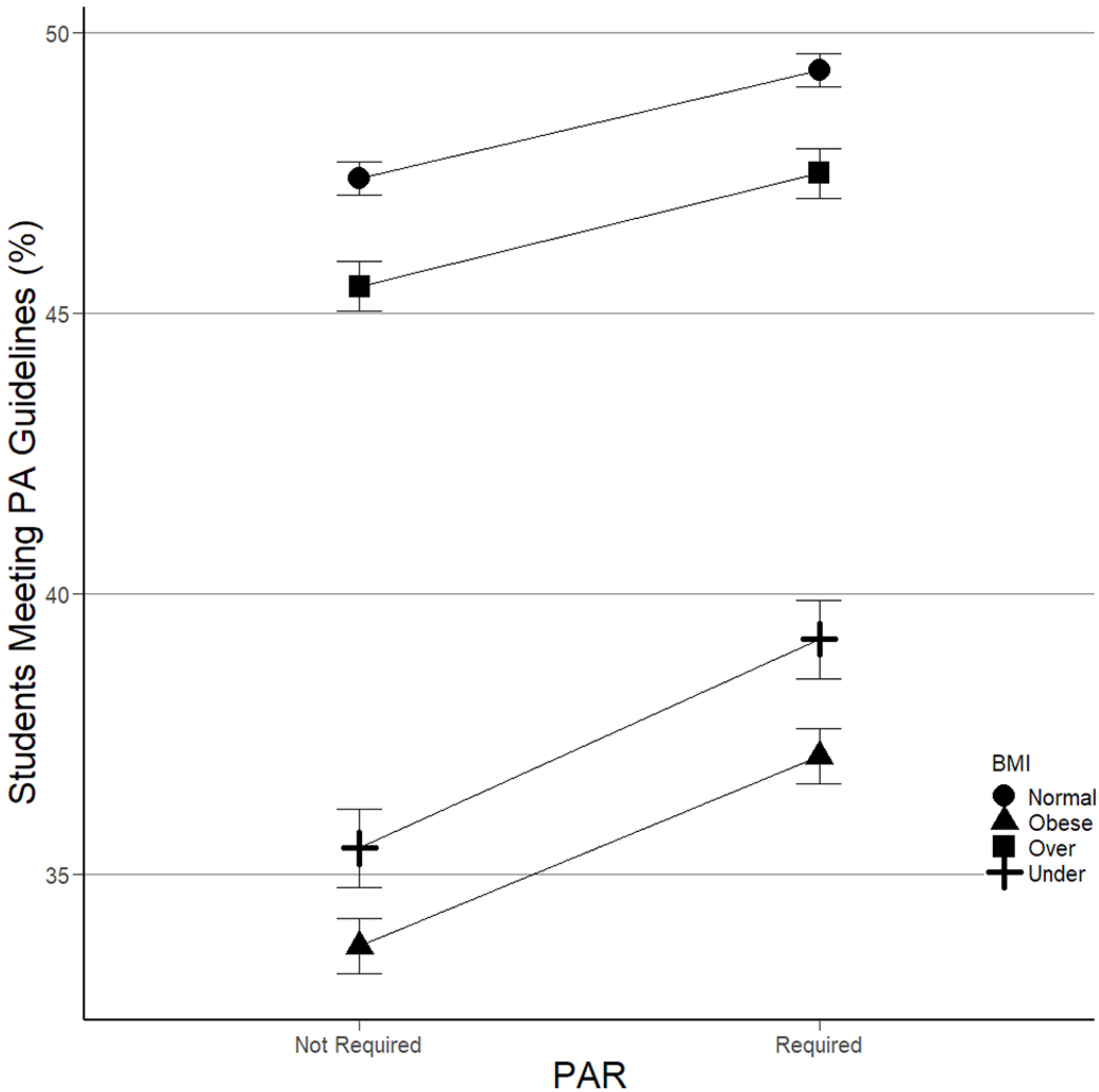

Figure 1.
Adjusted percentage of students meeting physical activity guidelines by PAR status and BMI. Error bars represent 95% Highest Density Intervals.

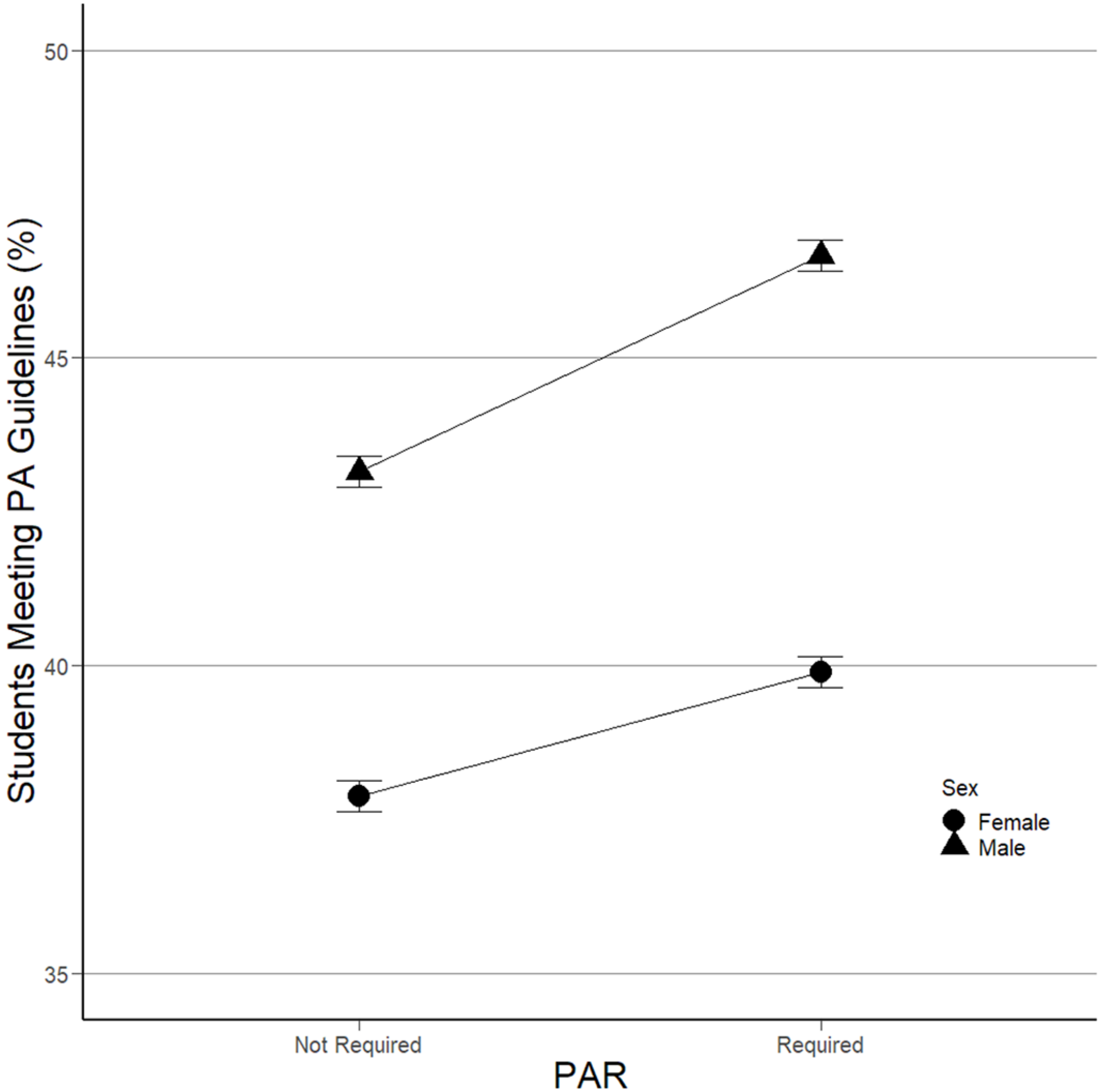

Figure 2.

Adjusted percentage of students meeting physical activity guidelines by PAR status and sex. Error bars represent 95% Highest Density Intervals.

Table 1.

Descriptive statistics of the analytic sample: n=383,632 students from 379 unique schools.

Student characteristics	N (%)
Meeting physical activity guidelines	178,601 (46.6)
Attending schools with PAR	58,757 (15.3)
Female	262,680 (68.5)
BMI category	
Underweight	18,101 (4.7)
Normal weight	222,953 (58.1)
Overweight	87,943 (22.9)
Obese	54,635 (14.2)
Race	
White	232,277 (60.5)
Black	17,746 (4.6)
Hispanic/Latino	52,095 (13.6)
Asian/Pacific Islander	53,944 (14.1)
Other	27,570 (7.2)
US Region	
Northeast	74,395 (19.4)
Midwest	70,674 (18.4)
South	84,872 (22.1)
West	153,691 (40.0)
School type	
Public	257,283 (67.1)
Two-year	16,486 (4.3)
Minority Serving Institution	76,058 (19.8)

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Table 2.

Raw and Adjusted Means as well as results of the Bayesian Hierarchical Model for the outcome of meeting physical activity guidelines

Source	Level	Raw Mean (SE)	Adjusted Mean	β	95% HDI	
					Lower	Higher
Intercept		46.6% (0.1)	41.9%	41.9%	33.5%	49.8%
PAR	Not Required	46.5% (0.1)	40.5%	**−1.4%**	−2.2%	−0.4%
	Required	46.7% (0.2)	43.3%	**1.4%**	0.4%	2.2%
BMI	Normal	49.6% (0.1)	48.4%	**6.5%**	5.9%	6.7%
	Underweight	36.2% (0.3)	37.3%	**−4.6%**	−5.3%	−3.8%
	Overweight	48.0% (0.1)	46.5%	**4.6%**	4.0%	5.1%
	Obese	35.0% (0.2)	35.4%	**−6.5%**	−7.2%	−5.8%
Sex	Male	50.6% (0.1)	45.0%	**3.0%**	2.7%	3.3%
	Female	44.7% (0.1)	38.9%	**−3.0%**	−3.3%	−2.7%
PAR x BMI	Not Req. Norm.	49.8% (0.1)	47.4%	**0.4%**	0.02%	0.8%
	Not Req. Under	36.1% (0.4)	35.5%	−0.5%	−1.2%	0.2%
	Not Req. Over	47.9% (0.2)	45.5%	*0.4%*	−0.1%	0.8%
	Not Req. Obese	34.7% (0.2)	33.7%	−0.3%	−0.8%	0.2%
	Req. Norm	49.2% (0.3)	49.3%	**−0.4%**	−0.8%	−0.02%
	Req. Under	36.6% (0.9)	39.2%	0.5%	−0.3%	1.2%
	Req. Over	48.4% (0.4)	47.5%	*−0.4%*	−0.8%	0.1%
	Req. Obese	36.6% (0.6)	37.1%	0.3%	−0.2%	0.8%
PAR x Sex	Not Req. Male	50.4% (0.2)	43.2%	**−0.4%**	−0.6%	−0.1%
	Not Req. Female	44.8% (0.1)	37.9%	**0.4%**	0.1%	0.6%
	Req. Male	51.8% (0.4)	46.7%	**0.4%**	0.1%	0.6%
	Req. Female	44.2% (0.3)	39.9%	**−0.4%**	−0.6%	−0.1%
Race/Ethnicity	White	49.5% (0.1)	46.4%	**4.5%**	4.1%	4.8%
	Black	49.3% (0.4)	41.3%	−0.5%	−1.1%	0.0%
	Hispanic/Latino	52.8% (0.2)	42.0%	1.5%	−0.3%	0.6%
	Asian/Pac Islander	40.0% (0.2)	37.2%	**−4.7%**	−5.2%	−4.2%
	Biracial/Multi/Other	44.6% (0.3)	42.5%	**0.6%**	0.1%	0.1%
Region	Northeast	46.8% (0.2)	42.0%	0.1%	−1.0%	1.3%
	Midwest	46.3% (0.2)	40.3%	**−1.6%**	−2.7%	−0.5%
	South	47.2% (0.2)	42.4%	0.5%	−0.6%	1.5%
	West	46.2% (0.1)	42.9%	1.0%	−0.1%	2.0%

Source	Level	Raw Mean (SE)	Adjusted Mean	β	95% HDI	
					Lower	Higher
School Type I	Two Year	42.7% (0.4)	40.4%	**−1.5%**	−2.7%	−0.1%
	Four Year	46.7% (0.1)	43.4%	**1.5%**	0.1%	2.7%
School Type II	Public	45.5% (0.1)	40.4%	**−1.5%**	−2.1%	−0.8%
	Private	48.8% (0.1)	43.4%	**1.5%**	0.8%	2.1%

Note: **Bold** percentages indicate a credible deflection was found at a 95% HDI. *Italic* percentages indicate a credible deflection was found at an 85% HDI.