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Associations of 24-Hour Movement Behaviors, Parental Academic Support, and Academic Achievement in Alaskan Adolescents

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Abstract

The purpose of this study was to examine the associations between meeting recommendations for 24-hour movement behaviors, parental academic support, and student academic achievement in a sample of Alaskan adolescents. Data were obtained from the 2019 Alaska Youth Risk Behavior Survey (YRBS; N = 1,897; mean age = 15.8 ± 1.3 years old). The associations between meeting recommendations for the 24-hour movement behaviors of physical activity, screen use, and sleep with high academic achievement (mostly A's and B's) were examined using weighted multivariable logistic regressions. Subpopulation analyses determined if associations differed by levels of parental academic support. Approximately 18.8% of the sample met PA recommendations, 70% met screen use recommendations, and 24.6% met sleep recommendations. Parents providing everyday academic support are associated with higher odds of an adolescent reporting mostly A's and B's (OR = 2.03, p < .001). Meeting screen use recommendations associated with high academic achievement in adolescents with less than every day pa-rental academic support (OR = 1.87, p = .001) and meeting sleep recommendations associated with high academic achievement in adolescents with less than every day (OR = 2.20, p = .005) and every day (OR = 1.77, p = .038) parental academic support. Meeting PA recommendations did not associate with high academic achievement. These findings elucidate the complexity of these interrelationships but warrant additional longitudinal investigation.

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1. Introduction

Within the "Whole Day Matters" conceptual framework of health behavior research, examining the associations between the 24-hour movement behaviors of physical activity (PA), screen use, and sleep with health and wellness outcomes has become a popular line of scientific inquiry [1-6]. PA, screen use, and sleep are behaviors that integrate across a 24-hour day (a "whole day") and share a degree of co-dependency with each other [1, 2]. Because of these characteristics, including all three behaviors in research studies is recommended [1, 2]. The daily recommendations for all three behaviors are based on empirical evidence and broad scientific consensus [1, 2]. The current Canadian 24-hour movement behavior recommendations include meeting 60 minutes of moderate to vigorous PA per day including 3 days of muscle strengthening, 2 hours or less per day of non-academic screen use, and 9-11 hours of sleep for 5–13-year-olds and 8-10 hours of sleep for adolescents 14 years and older [1,2]. These recommendations are used to facilitate health within the pediatric population [1, 2].

All three 24-hour movement behaviors have independently associated with several health and wellness outcomes [1-6]. Studies have not only explored the cognitive and physiological responses of 24-hour movement behaviors, but also how these behaviors may affect socio-environmental facilitators of academic achievement such as classroom behavior [7,8]. Many studies have found improvements in both cognitive skills (e.g., executive control, memory) and academic achievement (e.g., grades, standardized test scores) from youth engaging in higher levels of PA, lowering time spent in sedentary behaviors such as television watching and non-academic computer use, and receiving an adequate quality and quantity of school night sleep [9-11]. These findings have led to deriving of health behavior programs to not only improve physical health, but also to provide behavioral opportunities to facilitate high academic achievement [9, 12, 13-15].

Parental support for PA associates with higher child PA and reduced time in sedentary behaviors [16, 17]. The associations between parental support for PA and child PA, and the association between child PA and academic performance, has led to a preliminary theoretical framework linking these constructs to help derive testable hypotheses [18]. Although the link between 24-hour movement behaviors and academic achievement has been examined, there are several potential moderators, mediators, and confounding factors that may influence the true form and strength of these interrelationships. More complex relationships may include important "third" variables that have not been previously examined and include other 24-hour movement behaviors such as screen use and sleep.

Higher levels of parental academic support may either modify or confound the relationship between meeting recommendations for 24-hour movement behaviors and student academic achievement. This may occur partially by providing children and adolescents logistical and modeling support needed to excel within the academic classroom [19-21]. A meta-analysis examining the association between parental involvement and students' academic achievement revealed a small-to-moderate, but practically meaningful, association between parental involvement and student academic achievement with parental expectations for child academic achievement showing the strongest associations with global indicators for student achievement [22]. A more recent review stated that the quality and context of parental academic involvement, stated by the authors as the "how, whom, and why" of parental involvement, needs to be

considered with student academic achievement [23]. The review postulated that more academic involvement by parents may not always be better when the focus is on student academic improvement and that parental academic involvement may more directly influence child mental health rather than student achievement itself [23]. Specific to the adolescent population, using a relatively large sample of Spanish adolescents, Serna and Martinez [24] found that both parental educational involvement and academic performance is associated with adolescent school social adjustment with parental involvement being a protective factor, independent of academic performance. Therefore, the link be-tween meeting recommendations for 24-hour movement behaviors and academic achievement may be affected by parental academic involvement by influencing student school integration, student mental health, and student well-being.

In addition to examining other variables influencing the link between movement behaviors and academic achievement, examining these relationships within different populations of youth has potential merit. Within the US, school-based health behavior pro-grams have almost exclusively been implemented within the lower 48 states and/or in schools located within non-rural areas [25, 26]. Adolescents within the US state of Alaska may have different academic needs and health risks because of different population-level demographical characteristics in addition to Alaska's geographical characteristics [27]. Indeed, the Alaskan adolescent demographic has a substantial higher prevalence of American Indians and Alaskan Natives who tend to be at higher risk for cardio-metabolic disorders such as type II diabetes and who also tend to underachieve academically within traditional educational settings [28-30]. Alaskan adolescents may also have barriers to PA participation because of colder weather patterns that may preclude sufficient levels of outside play before and after school [31]. The unique demographics of the Alaskan adolescent population and the Alaska geography manifest a novel opportunity to examine the link between the 24-hour movement behaviors and academic achievement. Results of this study may be able to generalize to the Alaska adolescent population that is characterized as having a high prevalence of Native Americans/Alaskan Natives and comprises of adolescents who reside in relatively colder climates. Therefore, the purpose of this study was to examine the associations between meeting recommendations for 24-hour movement behaviors, parental academic support, and student academic achievement in a sample of Alaskan adolescents.

2. Materials and Methods

2.1. Sampling Procedures

The Alaska statewide traditional high school sampling frame included traditional public high schools with an enrollment of at least 10 students. The sampling frame excluded boarding, correspondence, home study, alternative, and correctional schools. Adolescents were selected using a two-stage cluster sample design. The first stage consisted of selecting schools with a probability proportional to the school enrollment size. The second stage consisted of randomly selecting classes within each school. The response rates yielded 39 out of 43 (91%) sampled traditional high schools that participated and 1,897 of 2,824 (67%) sampled traditional high school students who submitted usable questionnaires. The overall response rate was approximately 61%. The data were representative of all Alaska traditional high school students [32].

2.2. Participants

Sample demographic characteristics are presented in Table 1. The sex distribution was approximately equal with an unweighted female prevalence of 50.3% and a weighted female prevalence of 48.4%. The majority of the sample was White with an unweighted prevalence of

50.3% and a weighted prevalence of 45.5%. The unweighted prevalence of American Indian or Alaskan Native was 23.9% with a weighted prevalence of 31.4%. Approximately 67% of the sample was at a healthy weight with approximately 33% of the sample being either overweight or obese. The average age of the sample was 15.8 ± 1.3 years old. The average body mass index (BMI) of the sample was 23.6 ± 5.2 kg/m2 with an average BMI z-score of 0.61 ± 0.96 based on self-report height and weight and the 2000 CDC BMI-for-age growth charts.

2.3. Instrumentation

The Alaska Youth Risk Behavior Survey (YRBS) is part of a data collection system established by the Centers for Disease Control and Prevention (CDC) in 1990 and first implemented in Alaska in 1995. The 2019 survey includes questions on current health and risk behaviors such as PA, nutrition, tobacco, alcohol and drug use, safety, violence and bullying, suicide, and sexual behaviors. The Alaska YRBS also has the benefit of having survey items asking about the adolescents' connections with peers, adults, and the community. The Alaska YRBS is an anonymous and voluntary survey of students in grades 9–12 in public schools, including schools that teach students facing higher risks. It is administered throughout the state of Alaska in odd-numbered years. In Alaska, about 7,000 high school students from about 30 school districts participate every other year. The procedures for collecting YRBS data were previously approved by CDC's Institutional Review Board (protocol code: #1969.0; date: 11/10/15). Parental written consent was obtained prior to data collection on a respective Alaskan adolescent [32].

2.4. Data Processing

The outcome variable for all analyses was a YRBS item that asked, "How would you describe your grades at school?". The responses for this item ranged from "Mostly F's" to "Mostly A's". The responses were recoded into a binary response variable (0 = mostly C's, D's, and F's, 1 = mostly A's and B's) in order to represent low and high academic achievement and for appropriate coding for logistic regression. Students that responded "None of these grades" or "Not sure" were omitted from the current analysis (n = 73, 4.1% of recruited sample). Meeting recommendations for the 24-hour movement behaviors were the primary covariates that were analyzed, which included items asking about the weekly frequency of participating in 60 minutes of PA per day, hours per day of television watching and non-academic computer use, and hours of school night sleep. The PA item asked "During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spend in any kind of physical activity that increases your heart rate and makes you breathe hard some of the time)"with responses ranging from 0 days per week to 7 days per week (every day). Two screen use items were used pertaining to television watching and non-academic computer use/video game playing. The television item asked "On an average school day, how many hours do you watch TV?". The computer use/video game playing item asked "On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games, and the Internet.)?". Both screen use item's responses ranged fom 0 hours per day to 5 or more hours per day. Finally, the sleep duration item asked "On an average school night, how many hours of sleep do you get?" with responses ranging from 4 or hours per night to 10 or more hours per night.

We dichotomized the PA, screen use, and sleep item's responses to align with meeting the current Canadian 24-hour movement behavior recommendations [1-3]. Meeting PA recommendations (60 minutes per day for 7 days per week), meeting screen use

recommendations (2 hours or less per day), and meeting sleep recommendations (9-11 hours of sleep for youth 5-13 years old or 8-10 hours of sleep for youth 14-17 years old) were the three 24-hour movement behavior indicator variables (coded 1) with not meeting these recommendations coded as 0 (referent) [1-3]. The parental academic support variable was an Alaska YRBS item that asked, "How often (on how many days) does one of your parents talk with you about what you are doing in school?". The responses for this item ranged from "Never" to "About every day". These responses were recoded into a binary response variable (0 = not every day support, 1 = every day support) needed for subpopulation analysis.

2.5. Statistical Analysis

The complex YRBS survey design, including assigned stratum and PSU, was accounted for using Stata's "svyset" prefix command. Missing data were not imputed because of low prevelance (≤ 10%) and thus low risk of bias in the obtained estimates. Weighted analyses used the Taylor Series Linearization variance estimation. For all categorical variables, unweighted and weighted prevalence statistics were reported. To examine the associations between meeting recommendations for each 24-hour movement behavior and high academic achievement (reporting mostly A's and B's), weighted multivariable logistic regression models were employed. Crude and adjusted parameter estimates (odds ratios) were calculated and reported. Within the adjusted models, age, sex, race/ethnicity, weight status, and parental academic support were included as covariates to adjust for potential confounding influences. Subpopulation analyses were employed to examine the potential differentiating influence of parental academic support. Subpopulation analyses were carried out using Stata's "svy, subpop:" prefix command. Communication of the results consisted of reporting the unadjusted and adjusted odds ratios (ORs) with corresponding 95% confidence intervals (CIs). All analyses had an alpha level of $p < .05$ and were carried out using Stata v17.0 statistical software package (StataCorp LLC, College Station, TX, USA).

3. Results

3.1. Descriptive Statistics

Table 2 presents the descriptive statistics for academic achievement, meeting 24-hour movement behavior recommendations, and parental academic support. Much of the sample reported high academic achievement within the past 12 months, with approximately 75% of the sample self-reporting mostly A's and B's. Approximately 18.8% of the sample reported meeting PA recommendations. Much of the sample reported meeting screen use recommendations (approximately 70%) and approximately one-quarter of the sample (24.6%) reported meeting the sleep recommendations. When aggregating the movement behavior recommendations, 39.2% of the sample met 0 recommendations, 41.9% of the sample met 1 recommendation, 15.6% of the sample met 2 recommendations, and 3.03% of the sample met all 3 recommendations. Approximately 42.5% of the sample reported that their parents provided every day academic support.

3.2. Descriptive Associations with Parental Academic Support

Compared to non-every day parental academic support, every day parental academic support associated with higher odds of a student reporting Mostly A's and B's (OR = 2.03, 95%CI: 1.50–2.75, $p < 0.001$). This association held after controlling for student age, sex, race/ethnicity, weight status, and all 3 24-hour movement behaviors (OR = 1.86 95% CI: 1.31–2.62, $p = 0.001$). Parental academic support did not significantly associate with PA recommendations (OR = 1.34, 95%CI: 0.97–1.86, $p = 0.076$) or screen use recommendations

(OR = 1.34, 95%CI: 0.84–2.12, p = 0.213), but did significantly associate with sleep recommendations (OR = 1.40, 95%CI: 1.02–1.91, p = 0.037).

3.3. Single Movement Behaviors and Academic Achievement

The associations between meeting recommendations for each 24-hour movement behavior and high academic achievement (reporting mostly A's and B's) are presented in Table 3. Within the adjusted models, meeting the PA recommendation did not significantly associate with reporting mostly A's and B's (p = 0.724) and did not significantly associate with reporting mostly A's and B's within either the non-every day (p = 0.481) or every day (p = 0.060) parental academic support subsamples. Concerning screen use, meeting screen use recommendations significantly associated with higher odds of reporting mostly A's and B's when parents provided less than every day academic support (OR = 1.87, 95% CI: 1.28 – 2.73, p = .001). However, meeting screen use recommendations did not significantly associate with reporting mostly A's and B's when parents provided every day academic support (OR = 1.13, 95% CI: 0.72 – 1.77, p = .489). Concerning sleep, meeting sleep recommendations associated with higher odds of academic achievement within both less than every day and every day parental academic support subpopulations. Even though the associations tended to be stronger in the less than every day parental academic support subsample (OR = 2.20, 95% CI: 1.26 – 3.81, p = .005) compared to every day parental academic support subsample (OR = 1.77, 95% CI: 1.03 – 3.05, p = .038), parental support did not influence the statistical significance of the associations.

4. Discussion

The purpose of this study was to examine the associations between meeting recommendations for 24-hour movement behaviors, parental academic support, and academic achievement in a sample of Alaskan adolescents. Higher parental support correlated with higher student academic achievement. The results also indicated that meeting screen use recommendations associated with high academic achievement only in adolescents who had lower parental academic support. Meeting sleep recommendations significantly as-associated with high academic achievement regardless of the level of parental academic support. Interestingly, meeting PA recommendations did not significantly associate with academic achievement in this sample of adolescents. This is the first study to examine the influence of parental support on the link between 24-hour movement behaviors and academic achievement. The results have important implications for future research examining these relationships in other populations of adolescents. Interpretations of the findings and implications for public health practice are provided further.

The interrelationships of PA, academic performance, and parent support within the pediatric and adolescent populations has been initially proposed within a theoretical framework [18]; however, the testing of this association within specific populations of youth needs examination. One of the most salient findings from the current study was that meeting the PA recommendations did not significantly associate with academic achievement and parental academic support did not affect this association. The prevalence of meeting the PA recommendations was low in this sample of Alaskan adolescents compared to the general US adolescent population [33]. Alaska may have unique barriers to PA including colder climates and most of the state consists of small rural communities. Colder weather patterns and rural environments have shown to correlate with lower PA in children and adolescents [26,31]. Alaska also has a higher prevalence of Native American and Alaskan Native adolescents who, on average, tend to have lower PA and lower academic achievement [27, 30, 34, 35]. More research is needed to examine the determinants of PA and effective intervention strategies to improve PA

within this pediatric population. Although prior work has seen significant associations between PA and academic achievement, no association was observed in the current study, possibly because of the low prevalence of PA and the unique characteristics of the Alaskan adolescent population.

Two "screen use" variables were also examined in the current study, consisting of television watching and non-academic computer use/video game playing. These two variables were combined to analyze meeting the screen use recommendation, which limits child and adolescent screen use time to 2 hours per day or less [1-3]. In the current study, meeting the screen use recommendation associated with high academic achievement only in adolescents whose parents did not provide every day academic support. Other studies have showed conflicting findings regarding the associations between screen use/sedentary behaviors and facets of academic performance [36-38]. Confounding factors in these relationships that are often not adjusted for is device mobility, location of the device within the home environment, and the specific bout length of screen use [36-38]. Based on the results of the current study, limiting screen use may benefit the academic performance of adolescents whose parents do not provide every day academic support. This is indeed a novel finding, but it is unclear the potential mechanisms for this association. It is possible that limiting screen use provides more time for academic activities within out-of-school environments. By limiting screen use time, the additional out-of-school time that can be devoted to academics may partially compensate for a lack of every day parental academic support. Although parents may play vital role in both the modeling and logistical support needed for high academic achievement [19-22, 24], as stated previously, the context and quality of the parental academic support matters just as much as its frequency [23]. The current study examined the role of parent-student academic communication, but it is unclear if this behavior is a good proxy for the quality of parental academic support. Nevertheless, every day parental academic support did correlate with an approximate 2 times higher odds of a student reporting A's and B's in this sample. The differentiating influence of parental academic support on the association between screen use and student academic achievement may have been stronger in the less than everyday parental support subsample because there were overall lower grades in this subsample and more room for academic improvement as compared to the higher support subsample where there was already higher academic achievement regardless of screen use behaviors.

Of the movement behaviors examined in this study, meeting sleep recommendations was the most consistent correlate with self-reported academic achievement. Meeting sleep recommendations correlated with high academic achievement in both less than every day and every day parental support subsamples. Sleep has been shown to associate with better cognitive skills and grades in several previous studies [39-42]. Sleep provides the body rest and recovery and allows the brain to solidify obtained information related to academic performance [39,40]. A higher quality and quantity of sleep has been shown to associate with better executive control [41,42]. What is unknown specifically regarding school night sleep duration, is the form of the relationships with different facets of academic performance. Concerning the association with grades, some studies suggest a U-Shape pattern. This pattern has also been seen with indices of health within the adolescent population [43,44]. Practically, this suggest that there may be a threshold where too much sleep may be a detriment to academic performance. This potential phenomenon needs to be examined with additional research. Regardless, the current study's findings confirm the positive influence of school night sleep on academic achievement regardless of the level of pa-rental academic support.

Limitations to this study includes the use of a cross-sectional research design that precludes causal inferences. Additionally, this study used adolescent self-report for all variables collected; therefore, social desirability bias within the adolescent responses may have exaggerated their PA participation, academic achievement, and adherence to the 24-hour movement behavior recommendations. Third, only a dichotomized parental academic support variable was examined as a potential modifier. It is likely that other variables, such as socioeconomic status, which was not collected on the YRBS, may also be an important variable. Additionally, the parental academic support item on the Alaska YRBS may not have adequately captured the quality of support being provided by the parents and only captured the frequency of parent-child academic communication. This is unclear how the quality or context of parental academic support may have affected the observed associations, especially if the support is frequent but not every day. This is a recommendation for future research. Fourth, mediators of effect were not examined. The correlation between PA, screen use, sleep with academic achievement may be mediated by specific psychosocial constructs, future researchers should examine specific mediators of these relationships. Fifth, the 2019 YRBS only asked respondents about PA frequency, not intensity, which may play a very important role in the association with academic achievement. Sixth, the results of the screen time may have been underestimated without asking questions on the phone use time in the Alaska YRBS. This is a recommendation for future research to validate the association between academic achievement and screen time. Finally, the results do not generalize past the self-reporting of academic achievement to other aspects related to academic performance such as executive functioning and class-room behavior; the results also do not generalize to other population of adolescents.

5. Conclusions

Meeting screen use recommendations associated with high academic achievement only in adolescents who had less than every day parental academic support. Meeting sleep recommendations significantly associated with high academic achievement regard-less of the level of parental academic support. Meeting PA recommendations did not associate with academic achievement in this Alaska adolescent sample. These results suggest that even though there may be an association between specific 24-hour movement behaviors and academic achievement, parental academic support plays a role in the relationship. However, because these findings were from data collected using adolescent self-report, results should be interpreted with caution and examined further using objective assessment of both PA, screen use, and sleep duration. This study helps elucidate the complexity of these interrelationships between 24-hour movement behaviors and academic achievement within a seldom examined sample of Alaskan adolescents. Parental academic support should be an important consideration for health and educational interventions that use 24-hour movement behaviors as stimulus for improving academic outcomes.

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Informed Consent Statement: Informed consent was obtained from subjects in the study.

Data Availability Statement: Alaska YRBS data are available at the Alaska Department of Health and Social Services website.

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Table 1. Sample demographic characteristics.

Variable	Level	N	Unweighted Prevalence (%)	Weighted Prevalence (%)
Sex (Missing n = 48)	Male	919	49.7%	51.6%
	Female	930	50.3%	48.4%
Race/Ethnicity (Missing n = 78)	White	921	50.6%	45.5%
	American Indian or Alaska Native	434	23.9%	31.4%
	Black or African American	49	2.7%	2.5%
	Hispanic or Latino	157	8.6%	5.4%
	Other Races	185	10.2%	11.4%
	Multiple Races	73	4.0%	3.9%
Weight Status (Missing n = 161)	Healthy Weight	1,164	67.0%	66.9%
	Overweight/Obese	572	33.0%	33.1%

Table 2. Descriptive statistics for academic achievement, movement behaviors, and parent academic support.

Variable	Level	N	Unweighted Prevalence (%)	Weighted Prevalence (%)
Academic Achievement (missing n = 202)	Mostly C's, D's, and F's	416	24.5%	24.7%
	Mostly A's and B's	1,279	75.5%	75.3%
Met PA Recommendations (missing n = 82)	No	1,474	81.2%	82.1%
	Yes	341	18.8%	17.95
Met Screen Use Recommendations (missing n = 107)	No	539	30.1%	28.6%
	Yes	1,251	69.9%	71.4%
Met Sleep Recommendations (missing n = 104)	No	1,352	75.4%	74.4%
	Yes	441	24.6%	25.6%
Parental Academic Support (missing n = 117)	Not Everyday Support	1,023	57.5%	61.7%
	Everyday Support	757	42.5%	38.3%

Note: PA stands for physical activity.

Table 3. Odds ratios of meeting single movement behavior recommendations on self-reported high academic achievement (Mostly A's and B's) within the total sample and parental academic support subsamples.

Variable	Level	Crude OR (95% CI)	AOR (95% CI)	Not Every Day Parental Support AOR (95% CI)	Every Day Parental Support AOR (95% CI)
Met PA Recommendations	No	referent	referent	referent	referent
	Yes	0.81 (0.52—1.25)	1.02 (0.69—1.52)	0.91 (0.56–1.50)	1.67 (0.99—2.79)
Met Screen Use Recommendations	No	referent	referent	referent	referent
	Yes	**1.75*** **(1.26—2.42)**	**1.58*** **(1.18—2.11)**	**1.87*** **(1.28—2.73)**	1.13 (0.72—1.77)
Met Sleep Recommendations	No	referent	referent	referent	referent
	Yes	**1.65*** **(1.07—2.54)**	**1.98*** **(1.37—2.86)**	**2.20*** **(1.26—3.81)**	**1.77*** **(1.03—3.05)**
Age (years)			1.00 (0.86–1.18)	0.94 (0.74–1.14)	1.10 (0.88–1.37)
Sex	Male		referent	referent	referent
	Female		**1.68*** **(1.22–2.31)**	**1.82*** **(1.20–2.78)**	1.59 (0.95–2.62)
Race/Ethnicity	White		referent	referent	referent
	American Indian/Alaska Native		**0.50*** **(0.31–0.79)**	0.62 (0.38–1.05)	**0.31*** **(0.18–0.55)**
	Black		0.48 (0.21–1.04)	0.48 (0.16–1.41)	0.44 (0.13–1.53)
	Hispanic or Latino		0.84 (0.50–1.40)	0.87 (0.43–1.74)	0.75 (0.28–2.01)
	Other Race		1.24 (0.71–2.18)	1.42 (0.73–2.62)	0.99 (0.36–2.74)
	Multiple Races		1.05 (0.55–3.61)	1.36 (0.55–3.61)	0.57 (0.22–1.46)
Weight Status	Healthy Weight		referent	referent	referent
	Overweight/Obese		**0.68*** **(0.51–0.91)**	**0.56*** **(0.37–0.80)**	1.05 (0.72–1.52)
Parental Academic Support	Not Everyday Support		referent		
	Everyday Support		**1.86*** **(1.31–2.62)**		

Note: Referent for the academic achievement outcome is mostly C's, D's, and F's; OR stands for Odds Ratio; AOR stands for Adjusted Odds Ratio; 95% CI stands for 95% Confidence Interval; PA stands for Physical Activity; adjusted models control for adolescent age, sex, race/ethnicity, and weight status; bold and * denotes statistical significance, $p < .05$.