

Healthy Choices and their Associations with Academic Achievement and Future School Plans

Julio C. Cabrera, Stacy R. Karl, Michael C. Rodriguez
University of Minnesota

Minnesota Youth Development Research Group

April, 2016

Paper presented at the annual meeting of the
American Educational Research Association
Washington DC.

Citation:

Cabrera, J.C., Karl, S.R., Rodriguez, M.C. (2016, April). *Healthy choices and their associations with academic achievement and future school plans*. Paper presented at the annual meeting of the American Educational Research Association, Washington DC.

Abstract

This study examined the associations between healthy choices and two indicators of academic success (i.e., grade point average and future school plans) in high school students. Healthy choices (i.e., physical activity, eating behaviors and food choices, sleeping behaviors, and alcohol or drug use) have been shown to have an impact on academic performance and attainment, however, information regarding these choices and their relationship to future school plans of students have not been thoroughly investigated. Using survey responses from a sample of 42,381 students, preliminary results show that healthy choices are positively associated with grade point average (GPA), even after controlling for demographic variables, whereas unhealthy choices were negatively associated with GPA. Results for associations between healthy choices with future school plans are forthcoming.

Healthy Choices and their Associations with Academic Achievement and Future School Plans

Objectives

The associations between the healthy choices that students make during the school year and academic achievement have been shown to be strong. However, it remains unclear whether associations between healthy choices (defined below) and future school plans exist, and if they do, it is also unclear what the direction and strength of these associations will be. The purpose of this study is to examine the associations between healthy choices and two indicators of academic success (i.e., grade point average [GPA] and future school plans) of high school students.

Perspective

The relationships between healthy lifestyles and academic outcomes have continued to provide much needed information to policymakers in order to address both health and academic problems among students. Multiple studies indicate that students who are less physically active have academic achievements far below those who are more physically active. Similarly, several studies show that students that make responsible choices regarding food consumption and drug or alcohol use have better healthy and academic outcomes than their age-related peers that make unhealthy choices. On the other hand, the associations between healthy lifestyles (including responsible drug or alcohol choices) and college plans—as an outcome measure—have rarely been analyzed with regression models.

The evidence regarding the positive academic outcomes of physical activity is strong. Several studies indicate that students with higher rates (or intensity) of physical activity show improved academic outcomes than students with a low level of physical activity (Carlson et al., 2008; Castelli, Hillman, Buck, & Erwin, 2007; Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Nelson & Gordon-Larsen, 2006). The link between physical activity, and physical and

mental health has been the primary driver of recent governmental physical activity and food consumption efforts, such as *Let's Move!* and *My Plate*, in order to “raise a healthier generation of kids” (USDA, 2015).

Food consumption among children and teenagers has been shown to be a significant factor for academic, health, and psychosocial outcomes. Studies have shown that food-insufficient teenagers, that is, those whose family members sometimes or often do not get enough food to eat, are more likely to have been suspended from school and have difficulty getting along with other children (Alaimo, Olson, & Frongillo, 2001). Similarly, children from households that become food insecure, that is, the family of the child who has been food secure becomes food insecure within a period of time, tend to exhibit poorer academic outcomes (e.g., Jyoti, Frongillo, & Jones, 2005). Aside from food security, the consumption of a daily breakfast, including grains, fruits, or vegetables, has been shown to improve health outcomes (Smith, Gall, McNaughton, Blizzard, Dwyer, & Venn, 2010) as well as the cognitive abilities and school performance outcomes of individuals (Adolphus, Lawton, & Dye, 2013; Hasz & Lampion, 2012). Unfortunately, food security is still a big issue for a large percentage of people throughout the United States, and it is known that a relatively large number of students, particularly low-income students and students of color, skip breakfast on a continuous basis (Rotakhina, 2015).

In addition to food consumption and choices, alcohol and drug use have detrimental effects on the health of an individual, as well as on their academic performance or academic attainment. Middle and high school students who consume alcohol, especially those who binge drink, tend to show acute and chronic health problems, lower GPAs, and higher unexcused absences (Newbury-Birch et al., 2009; Rees, 2014). Similarly, students who use illicit drugs perform poorly in school, and are more likely to drop out and not graduate (Rees, 2014).

Unfortunately, there are many students that use alcohol or illicit drugs. Descriptive results from the 2014 Monitoring the Future Survey show that alcohol and drug use are prevalent among high school students, with 23.5 percent of 10th graders reporting past month-use of alcohol, and 18.5 percent of 10th graders reporting past month-use of illicit drugs (National Institute on Drug Abuse, 2014).

Healthy choices have an impact on academic performance and attainment, however, information regarding these choices and their relationship to the future school plans of students have not been investigated statistically including the use of demographic control variables. The relationship between healthy choices and school plans ought to have a similar trend as those of healthy choices and academic performance and attainment. More specifically, students that are food secure, eat a regular breakfast, consume a sufficient amount of fruits and vegetables, do not use alcohol or illicit drugs, sleep well, and are consistently physically active, ought to show better school plans than students who partake in unhealthy choices.

Methodology

Data

Minnesota Student Survey (MSS). The current study entails a secondary analysis of the 2013 MSS database. Data from the MSS are provided by public school students in Minnesota (MN). The MSS is administered every three years, most recently in 2013. During each administration year, all operating public school districts are invited to participate. In 2013, a total of 162,034 students participated from grades 5, 8, 9, and 11.

Procedure

Regression analyses were (and will be) performed in order to highlight the associations between healthy choices and the academic success of 42,381 students in ninth grade. The

majority of the sample is White (72.2%) and about half of the students are females (50.4%).

Students that reported being American Indian, Pacific Islander, or did not report their race were dropped from the analyses because there were few in number from the total sample.

Consequently, the total student sample size was reduced with no major subgroup changes noted; ethnic minorities compose 25.9% and females compose 50.1% of the final sample ($N = 41,299$).

Measures

Individual control variables. Several student-level control variables and predictors were used in the analyses. The control variables included age ($M = 14.6$, $SD = 0.5$); SES (0 = Low, 1 = High); gender; ethnicity; student mobility (0 = Moved 0 times; 1 = Moved 1 or more times); in-school (ISS) and out-of-school suspensions (0 = None; 1 = Once or more); overall health self-perception (five-point Likert-type scale; 1 = "Poor;" 5 = "Excellent"; see Table 1); long-term mental, behavioral, or emotional problems (Table 1); self-description of weight (About the right weight [Reference group]; Underweight; and, Overweight); distress or upset feelings; suicidal thoughts; attention and listening problems; and, actual weight status (Normal or underweight [Reference group]; Overweight; and, Obese; see Table 1).

Individual predictors. The following predictors were chosen from the MSS in order to investigate the relationship between the healthy choices that students make and academic success. Healthy choices are being described as those that either meet the daily food recommendations (USDA, 2015) or have shown to be related to academic achievement (e.g., physical activity). These healthy choices fall under four distinct categories, including: a) physical activity; b) eating behaviors and food choices; c) sufficient sleep; and, d) alcohol or drug use. The following predictor variables were included in the analyses: number of days being physically active ($M = 5.3$, $SD = 2.2$); number of days eating breakfast ($M = 5.7$, $SD = 2.5$); food

insecurity; lunch consumption; fruit servings (0 = 0 Servings [Reference group]; 1 = 1 to 13 servings; 2 = 14 or more servings [daily recommendation]); vegetable servings (0 = 0 Servings [Reference group]; 1 = 1 to 14 servings; 2 = 21 or more servings [daily recommendation]); fast-food consumption; dairy servings (0 = 0 Servings; 1 = 1 to 2 Servings; 2 = 3 or more servings [daily recommendation]); empty calorie consumption from soda, sports, energy, or sugar-sweetened drinks; water consumption ($M = 3.4$, $SD = 1.2$); hours of sleep ($M = 7.08$, $SD = 1.3$); alcohol use ($M = 0.4$, $SD = 1.1$); illicit drug use; and, tobacco use (four-point Likert-type item; ranging from 0 = “Never or Rarely” to 3 = “Always”).

Dependent variables. The purpose of the current analysis is to investigate the associations between healthy choices (as described above) and two academic outcomes (i.e., GPA and future school plans). One regression analysis was conducted with the dependent variable of GPA ($M = 3.1$, $SD = 0.9$), while another regression analysis (taking into consideration the nominal nature of the outcome variable) will be conducted with the dependent variable describing the main plans that students currently hold for “right after high school” (a categorical variable that includes: a) I don’t plan to graduate from high school; b) Get my GED; c) Go to a two-year community or technical college; d) Go to a four-year college or university; e) Get a license or certificate in a career field; f) Join the military; g) Work at a job; and, h) Other).

Regression Analyses. As stated, two regression models are being analyzed in the current study. For the first analysis including the GPA dependent variable, five different regression models were analyzed. The control and predictor variables were entered following the categories described above, that is, five different models were created where the first model contained only the control variables, the second model contained the control variables and included those variables under physical activity, the third model contained the additional eating behaviors and

food choices variables, the fourth model added the sleep variables, and the fifth model included all four categories, including alcohol or drug use, and the control variables (see Table 2).

Results

The preliminary results show that healthy choices are associated with GPA, even after controlling for demographic variables. Specifically: a) there was a significant effect for physical activity, $\beta = 0.03$, $p < .001$, explaining 0.4% of additional variance (Model 2, Table 2); b) all but two eating behaviors or food choice variables significantly predicted GPA (see Model 3, Table 2), explaining an additional 5.3% of variance ($adj. R^2 = 30.7\%$, $F(40, 29677) = 330.3$, $p < .001$); c) there was a significant effect for sufficient sleep, albeit small, $standardized \beta = .01$, $p < .05$, explaining 0.01% of additional variance (Model 4, Table 2); and, d) all alcohol or drug use variables significantly predicted GPA (see Model 5, Table 2), explaining an additional 0.6% of variance ($adj. R^2 = 31.3\%$, $F(44, 26785) = 278.9$, $p < .001$). Overall, healthy choices explained 6.3% additional variance when controlling for the demographic variables listed above. Similar to earlier studies, physical activity was found to be positively related to GPA (i.e., the more physical activity students partake in, the higher their GPAs); not eating lunch or breakfast, not meeting the daily recommended servings of fruits, vegetables, or dairy consumption, drinking sweetened, sports, or energy drinks were associated with lower GPA; receiving sufficient sleep was associated with higher GPA; and, the use of alcohol or drugs (including tobacco) was negatively associated with GPA.

Similar (and appropriate) regression analyses will be performed with the school plans dependent variable (to be included in the final version of this paper), taking into account the adjustments for multiple testing (i.e., controlling for compounding of Type I error rates).

Significance

Large datasets such as the MSS provide the ability to analyze the association of multiple variables and lead to a wholesome understanding of the effects of predictor variables (e.g., healthy choices) on outcome variables of choice (e.g., GPA and future school plans). These sufficient data provide us with the opportunity to uncover associations, such as the ones highlighted (and to be highlighted) in this paper, in sub-populations that researchers are usually unable to reach (e.g., ethnic/racial minorities). Results such as the ones provided (and to be provided) here warrant the attention of policymakers when making decisions in programs that could affect the way school districts provide services to students (e.g., House Bill 1295 and Senate Bill 5437 titled “Concerning breakfast after the bell programs”; Rotakhina, 2015). These results are also timely, especially with the recent added focus and programs that are trying to target the healthy choices of students regarding physical activity and food choices (e.g., www.choosemyplate.gov).

References

- Adolphus, K., Lawton, C. L., & Dye, L. (2013). The effects of breakfast on behavior and academic performance in children and adolescents. *Frontiers in human neuroscience*, 7(425), 1-28.
- Alaimo, K., Olson, C. M., & Frongillo, E. A. (2001). Low family income and food insufficiency in relation to overweight in US children: is there a paradox? *Archives of Pediatrics & Adolescent Medicine*, 155(10), 1161-1167.
- Carlson, S. A., Fulton, J. E., Lee, S. M., Maynard, L. M., Brown, D. R., Kohl III, H. W., & Dietz, W. H. (2008). Physical education and academic achievement in elementary school: Data from the early childhood longitudinal study. *American Journal of Public Health*, 98(4), 721-727.
- Castelli, D. M., Hillman, C. H., Buck, S. M., & Erwin, H. E. (2007). Physical fitness and academic achievement in third-and fifth-grade students. *Journal of Sport and Exercise Psychology*, 29(2), 239-252.
- Coe, D. P., Pivarnik, J. M., Womack, C. J., Reeves, M. J., & Malina, R. M. (2006). Effect of physical education and activity levels on academic achievement in children. *Medicine and Science in Sports and Exercise*, 38(8), 1515-1519.
- Hasz, L. A., & Lamport, M. A. (2012). Breakfast and Adolescent Academic Performance: An Analytical Review of Recent Research. *European Journal of Business and Social Sciences*, 1(3), 61-79.
- Jyoti, D. F., Frongillo, E. A., & Jones, S. J. (2005). Food insecurity affects school children's academic performance, weight gain, and social skills. *The Journal of nutrition*, 135(12), 2831-2839.

National Institute on Drug Abuse. (2015). Drug facts: High school and youth trends. Retrieved from <http://www.drugabuse.gov/publications/drugfacts/high-school-youth-trends>

Nelson, M. C., & Gordon-Larsen, P. (2006). Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics*, *117*(4), 1281-1290.

Newbury-Birch, D., Walker, J., Avery, L., Beyer, F., Brown, N., Jackson, K., ... & Stewart, S. (2009). *Impact of Alcohol Consumption on Young People. Research Report DCSF-RR067*. Department for children, schools and families. Newcastle University: Nottingham, UK

Rees, D. I. (2014). *Does substance use affect educational outcomes?* IZA World of Labor. Retrieved from <http://wol.iza.org/articles/does-substance-use-affect-educational-outcomes/long>

Rotakhina, S. (2015). *Health Impact Review of HB 1295. Concerning Breakfast after the Bell Programs*. Retrieved from <http://sboh.wa.gov/Portals/7/Doc/HealthImpactReviews/HIR-2015-01-HB1295.pdf>

Smith, K. J., Gall, S. L., McNaughton, S. A., Blizzard, L., Dwyer, T., & Venn, A. J. (2010). Skipping breakfast: longitudinal associations with cardiometabolic risk factors in the Childhood Determinants of Adult Health Study. *The American journal of clinical nutrition*, *92*(6), 1316-1325.

United States Department of Agriculture. (2015). *Myplate. About us*. Retrieved from <http://www.choosemyplate.gov/about.html>

Table 1

Percentages of Weight status, Overall health, and Long-term Mental, Behavioral, and Emotional (MBE) Problems by Demographic Variables

	Weight status			Overall Health					Long-term MBE Problems	
	Normal or underweight	Overweight	Obese	Excellent	Very good	Good	Fair	Poor	Yes	No
Asian American	76.6	13.9	9.5	22.7	34.9	29.7	11.0	1.7	5.8	94.2
African American	68.8	18.4	12.8	34.6	31.1	23.9	8.3	2.0	10.7	89.3
White	79.4	12.5	8.0	29.9	40.7	22.6	5.8	0.9	11.9	88.1
Multiple Races	71.1	16.3	12.6	24.8	36.4	27.2	9.4	2.2	19.9	80.1
Hispanic American	68.7	17.6	13.6	23.4	32.4	31.3	10.8	2.0	15.7	84.3
Male	73.5	14.8	11.8	34.3	38.0	21.0	5.5	1.2	9.6	90.4
Female	81.5	12.2	6.3	23.5	40.0	27.1	8.2	1.3	15.2	84.8
Low SES	69.8	16.3	13.9	23.0	33.8	30.7	10.6	1.9	16.6	83.4
High SES	80.1	12.5	7.4	31.1	41.0	21.5	5.5	0.9	10.9	89.1

	Model 1			Model 2			Model 3			Model 4			Model 5		
	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β
1 to 2 servings							0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.03
3 or more servings							0.06	0.01	0.03 ***	0.06	0.01	0.03 ***	0.06	0.01	0.01 ***
Empty Calories (Ref = High Empty Calorie Intake)															
Soda - Low							0.11	0.02	0.02 ***	0.11	0.02	0.05 ***	0.11	0.02	0.06 ***
Soda - No							0.23	0.02	0.04 ***	0.22	0.02	0.05 ***	0.22	0.02	0.12 ***
Sports drinks - Low							0.04	0.02	0.01 *	0.04	0.02	0.01 *	0.05	0.02	0.03 *
Sports drinks - No							0.12	0.02	0.12 ***	0.12	0.02	0.01 ***	0.12	0.02	0.06 ***
Energy drinks - Low							0.03	0.04	0.01	0.03	0.04	0.03	0.01	0.04	0.00
Energy drinks - No							0.28	0.03	0.23 ***	0.27	0.03	0.10 ***	0.23	0.03	0.04 ***
Sugary drinks - Low							0.08	0.02	0.04 ***	0.08	0.02	0.07 ***	0.07	0.02	0.01 ***
Sugary drinks - No							0.09	0.02	0.03 ***	0.09	0.02	0.04 ***	0.08	0.02	0.08 ***
Water							-0.01	0.00	-0.01 *	-0.01	0.00	0.00 *	-0.01	0.00	0.00 *
Hours of Sleep										0.01	0.00	0.01 *	0.00	0.00	0.00
Binge drinking													-0.03	0.01	-0.01 ***
Illicit Drug use (Yes)													-0.07	0.03	-0.03 *
Tobacco Use													-0.14	0.01	-0.08 ***
ΔR															0.01
R															0.31

Note: * $p < .05$. *** $p < .001$.