The Relationship between Grade Level and Breakfast Skipping among Adolescents: The Mediating Effects of Dietary Autonomy

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Abstract

Breakfast skipping among adolescents in the United States is a public health issue because it has adverse consequences on dietary intake and body mass index. The primary aim of this study is to examine the relationship between grade level and reported breakfast skipping among adolescents and whether it is mediated by dietary autonomy. Analyses were based on self-reported data from Wave I of the National Longitudinal Study of Adolescent Health, a nationally representative sample of adolescents in the United States surveyed in 1995. Logistic regression analysis was used to evaluate the effects of grade level and dietary autonomy on adolescents' reported breakfast skipping. Following MacKinnon and Dwyer, we tested whether the effect of grade level on breakfast skipping was mediated by adolescents' dietary autonomy. After controlling for sex, race, exercise, parental education, and household income, both grade level (OR = 2.005, 95% CI = 1.684-2.387) and dietary autonomy (OR = 1.435, 95% CI = 1.157-1.780) were each significant predictors of breakfast skipping when tested separately. Mediation analysis showed that dietary autonomy partially mediated the relationship between grade-level and breakfast skipping. Since adolescents in higher grades and those with more dietary autonomy are more likely to skip breakfast, nutritional messages may need to continue beyond the lower grades and emphasize that healthy eating habits can demonstrate autonomy.

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Introduction

Over the past few decades, daily breakfast consumption in the United States has significantly declined (Deshmukh-Taskar et al., 2010; Woodruff et al., 2008), with one in five adolescents skipping breakfast (Videon & Manning, 2003). In 1965 approximately 5% of early adolescents (11-14 years) and 12% of mid-adolescents (14-18 years) habitually skipped breakfast (Siega-Riz et al., 1998). Conversely, in a nationally representative sample from the National Health and Nutrition Examination Survey 1999-2006, 20% of 9-13-year-olds and 32% of 14-18-year-olds reported breakfast skipping (Deshmukh-Taskar et al., 2010).

Breakfast has been identified as a significant determinant of healthy nutrition, especially during childhood and adolescence (Arora et al., 2012; Birch et al., 2007). Breakfast consumption helps optimize physiological and psychological well-being in adolescents (Todd et al., 2015). For example, adolescents with daily and consistent breakfast consumption demonstrate better cognitive function (Hoyland et al., 2009; Wesnes et al., 2012), healthier overall eating habits (Medin et al., 2019), increased physical activity behaviors (Smith et al., 2017), and lower risks of developing obesity, compared to those who skip breakfast frequently (Cho et al., 2003; Fiore et al., 2006).

Two primary influences on breakfast-skipping patterns have been identified. First, adolescent maturational factors, as approximated by grade level, are a primary

influence (Deshmukh-Taskar et al., 2010; Sampasa-Kanyinga et al., 2014). Reasons for this shift may include the lack of time and appetite (Afolabi et al., 2013; Mullan et al., 2014), shifting circadian rhythms (i.e., chronotype; Boschloo et al., 2012), adolescent rebellion (Hill et al., 1992), weight control efforts (Tin et al., 2011), and perhaps boredom with common breakfast foods.

Second, parental influence has a critical impact on adolescents' breakfast consumption as eating behaviors are rooted in and influenced by parents' practices. Parental modeling of breakfast intake and having at least one parent at home in the morning are associated with more frequent breakfast consumption among adolescents (Merten et al., 2009). However, parents are less influential during later adolescence, and peer influence becomes more salient (Albert et al., 2013) with regard to food decisions in general (Savage et al., 2007), and breakfast consumption in particular (DeJong et al., 2009; Story et al., 2002), as adolescents often emulate peer social norms (Salvy et al., 2012) to gain peer acceptance (Soesyasmoro et al., 2016). For issues that have potentially problematic sequelae for adolescents' health and safety (e.g., drinking alcohol, smoking cigarettes, or having sex), parental control is often relinquished later than for areas associated with fewer risks (Daddis & Smetana, 2005). However, this does not appear to be the case for food decisions, despite their potential influence on future health issues. Indeed, adolescents with parents who allow more autonomy over food decisions are at higher risk of making poor food choices in contrast to adolescents of parents who allow less autonomy (Reicks et al., 2015). Thus, Videon and Manning (2003) suggest that adolescents' dietary autonomy could be considered a risk factor for inadequate nutrition. While continued parental monitoring of food intake, despite higher grade level, might be recommended to prevent breakfast skipping and its sequelae, parents vary in the extent of dietary autonomy they grant. Thus, the role of dietary autonomy in the age-related increase in breakfast skipping requires further attention.

Therefore, the purpose of this study is to examine the relationship between grade level and reported breakfast skipping among middle and high school students and whether students' dietary autonomy mediates this relationship. We hypothesize that (1) higher age (assessed by higher grade level) is linked to more inconsistent breakfast consumption because as adolescents mature, their parents' opinions matter less than peers' views (Albert et al., 2013); (2) greater dietary autonomy also increases with grade level, since parents tend to decrease regular monitoring as adolescents mature (Murphy et al., 2008); and (3) dietary autonomy explains some of or all of the association between grade level and breakfast skipping. The current study will help us to understand the role of autonomy in mediating the effect of rising grade levels, which, to our knowledge, has not been studied to date. Findings may help identify influences on adolescents' eating behaviors that can inform future nutrition interventions and health-promoting applications in education settings.

Methodology

Participants

The current study is based on Wave 1 of the public-use dataset outlined below from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative sample of adolescents in the United States. The total number of Wave I respondents in this dataset is 6,503 adolescents. Participants completed in-home interviews, which assessed the effect of social environment on high school students' health. Add Health objectives are to evaluate

the general well-being and prosperity of adolescents in the U.S., including (1) the practices that propel health and the practices that are adverse to health, and (2) the impact on the health of factors singular to the communities in which youths live. Adolescents reported factors involving demographic and lifestyle characteristics, breakfast behaviors, and autonomy over diet in this first wave (1995) of data collection.

Instrument

To assess grade level, adolescent respondents were asked: "What grade {are/were} you in?" Adolescents then reported their grade level ranging from 7th to 12th. For ease of interpretation, grade level was dichotomized into two categories: 7th and 8th grades were coded middle school (M.S.) level ("0"), and 9th through 12th grades were coded high school (H.S.) level ("1"). To measure breakfast skipping, Add Health respondents were asked whether they ate nothing for breakfast on a typical weekday morning. Response options included whether respondents ate something ("0") or nothing ("1") for breakfast. Lastly, dietary autonomy in the current study was defined as having control over food decisions. To measure dietary autonomy, Add Health respondents were asked whether their parents allowed them to make their own decisions on food choices. Response options included 0 = no and 1 = yes. Following Videon and Manning's (2003) approach, we coded adolescent autonomy ("1") and parental control ("0") over adolescents' food choices. Control variables were sex (male and female), race (non-white and white), exercise (no exercise and did exercise), parental education (no college degree and college degree), and total household income. Age was not a control variable as it was highly correlated with grade levels.

Procedure

A sample of 80 high schools and 52 middle schools from the United States was selected with an unequal probability of selection. Incorporating systematic sampling methods and implicit stratification into the Add Health study design ensured this sample is representative of U.S. schools with respect to the country's region, urbanicity, school size, school type, and ethnicity (Harris et al., 2009). In addition, African American adolescents from well-educated families and other minority groups (i.e., Chinese, Cuban, and Puerto Rican) were oversampled. The data for these analyses comes from Wave 1 interviews performed in the adolescents' homes from April to December 1995, with a response rate of 79%. A detailed description of the Add Health study can be found elsewhere (Popkin & Udry, 1998).

The current study was based on a secondary analysis of previously collected data from publicly available data (Add Health) reported in previous publications. The data were provided to the authors in an anonymized format. Research ethics approval was not required for this study as per applicable institutional and national guidelines and regulations.

Data Analysis

Logistic regression analysis (SPSS version 25) was used to evaluate the effects of grade level and dietary autonomy (respectively) on adolescents' reported breakfast skipping. Following the mediation analysis using a logistic regression approach for categorical variables proposed by MacKinnon and Dwyer (MacKinnon & Dwyer, 1993; Kenny, 2013; Sang et al., 2016), we tested whether the effect of grade level on breakfast skipping was mediated by adolescents' dietary autonomy.

Results

The sample consisted of 6,337 adolescent boys (48.5%) and girls (51.5%) between 7th and 12th grades (M.S. = 31.1%, H.S. = 68.9%) and between the ages of 11 and 21 years, with the *mean* age being 16 years. Almost 20% (1,279) of adolescents reported skipping breakfast on a typical weekday. Over three-fourths (79.8%, *n* = 5,191) of adolescents reported having autonomy over food choices. See Table 1.

The logistic regression model results evaluated the effect of grade level and dietary autonomy on the likelihood that adolescents reported breakfast skipping (shown in Table 2). The relationship between grade levels and

Table 1

Sample Demographic Characteristics (N = 6,337)

	M (S.D.)	*N*	%
Age	16.0 (1.773)		
Gender			
Boys		3,074	48.5
Girls		3,263	51.5
Race/ethnicity			
White, non-Hispanic		4,203	66.5
Non-white		2,120	33.5
Grade-level			
Middle School		1971	31.1
High School		4366	68.9
Parent education			
No College Degree		4,091	74.8
College Degree		1,379	25.2

Table 2

Summary of Logistic Regression Analysis for Variables Predicting Reported Breakfast Skipping, Controlling for Demographic Variables

	Model 1					Model 2				
Predictor	***B***	**SE**	**Wald**	**OR**	**95% CI**	***B***	**SE**	**Wald**	**OR**	**95% CI**
Grade level	.696***	.089	60.95	2.005	1.684-2.387					
Dietary Autonomy						.361***	.110	10.773	1.435	1.157-1.780
Sex	.422***	.077	30.21	1.524	1.312-1.772	.409***	.077	27.906	1.505	1.293-1.751
Race	-.085	.084	1.018	.919	.779-1.083	-.070	.085	.684	.932	.790-1.101
Exercise	-.479***	.094	26.033	.619	.515-.745	-.466***	.095	24.091	.627	.521-.756
Household Income	-.001	.001	1.543	.999	.997-1.001	-.001	.001	1.573	.999	.997-1.001
Parental Education	-.182*	.092	3.954	.833	.696-.997	-.169	.092	3.383	.845	.705-1.011

Note. Grade level (middle school served as the reference group). Controls are sex (male served as the reference group), race (white served as the reference group), exercise (no exercise served as the reference group), parental education (no college degree served as the reference group), and total household income.
B = Unstandardized Regression Weight; SE = Standard Error; OR = Odds Ratio; CI = Confidence Interval. ***$p < .001$, *$p < .05$.

breakfast skipping was statistically significant. The odds ratio suggests that adolescents in high school are 2 times more likely to report breakfast skipping than those in middle school. The relationship between dietary autonomy and breakfast skipping was also significant, suggesting that adolescents with autonomy over food choices have 1.4 times greater odds of reporting breakfast skipping compared to adolescents with no control over food choices. In addition, dietary autonomy and grade level were correlated at phi = .175, $p < .001$.

Following the procedure suggested by MacKinnon and Dwyer (1993), we analyzed whether dietary autonomy mediates the effect of grade level on reported breakfast skipping, as depicted in Figure 1. In Step 1, after covarying sex, race, exercise, parental education, and total household income, and dietary autonomy, grade level was a significant predictor of breakfast skipping (path *c*). In Step 2, grade level was also a significant predictor of dietary autonomy (path *a*). In Step 3, dietary autonomy, controlling for grade level, significantly predicted breakfast skipping (path *b*). In Step 4 of the mediation analysis, after controlling for the mediator (dietary autonomy), grade level remained a significant predictor of breakfast skipping (path *c'*), but at a smaller magnitude. A Sobel test was conducted and indicated partial mediation in the model ($z = 3.17$, $p = .002$). Thus, the relationship between grade level and breakfast skipping was partially mediated through dietary autonomy.

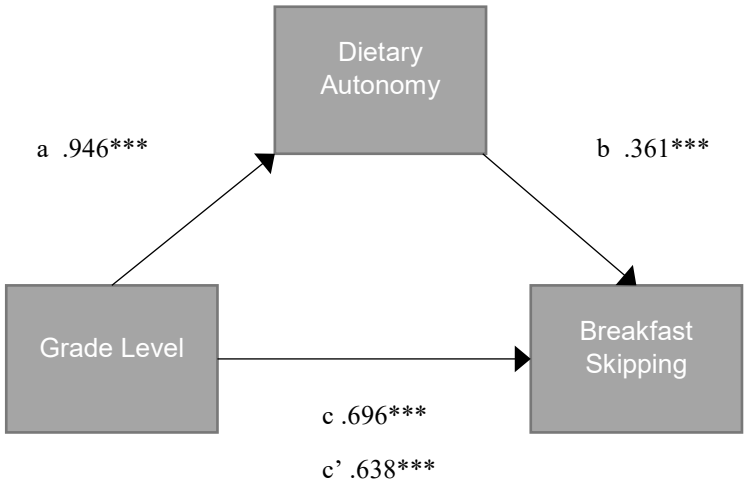

Figure 1. Results of the analyses on the relationship between grade level and breakfast skipping with the mediating effect of dietary autonomy. *Note.* The effect of dietary autonomy is controlled in step 1. Unstandardized betas shown. ***$p < .001$.

Discussion

The present study examined the relationship between grade level and reported breakfast skipping among middle and high school students, and whether students' dietary autonomy mediates this relationship. In a nationally representative sample of adolescents, both grade level and dietary autonomy significantly contributed to the risk for reported breakfast skipping. High school students were twice as likely to skip breakfast as middle school students. Adolescents with autonomy over food choices were more likely to also skip breakfast compared to their peers with no autonomy over food choices. In support of our hypothesis, we were able to establish that dietary autonomy partially mediates the relationship between grade level and breakfast skipping.

Our finding that breakfast skipping increases with grade level is consistent with previous literature (Sampasa-Kanyinga et al., 2014). Similarly, our findings are consistent with Videon and Manning (2003), who found that adolescents with autonomy over food choices were more likely to report breakfast skipping than peers without such autonomy. Our findings suggest that the two risk factors for breakfast skipping may act independently of one another, but the mediation suggests they may also be part of a causal chain, although this is not testable with cross-sectional data.

Several factors may explain our findings. Adolescence is a period of increasing autonomy and changing lifestyle practices, including eating habits (Ostachowska-Gasior et al., 2016). Because dietary needs change, intake may be affected, but without adequate nutritional knowledge, adolescents may neither understand what their nutritional needs are nor want to follow their parents' advice on these matters. The demands of higher grade levels and the associated time pressures, shifts in circadian rhythms, and adolescents' cognitive limitations and invincibility beliefs may contribute to breakfast skipping by adolescents in higher grades.

Limitations

This study has several limitations. First, measures of breakfast skipping were all based on adolescent self-reports. Secondly, this study was conducted with only one wave of the Add Health study, collected in 1995. A cross-sectional design does not allow us to determine conclusively whether autonomy is the cause of breakfast skipping or whether more breakfast-skipping leads to a greater sense of dietary autonomy. Furthermore, though somewhat unlikely, more breakfast skipping in higher grades may be due to cohort effects not detected in the current cross-sectional design. Longitudinal studies focused on intra-individual change in breakfast skipping and autonomy would allow further insights into their inter-relationship over time and the influence of potential third variables (e.g., weight status) that might predict both. A third limitation is the use of a single item to measure dietary autonomy, limiting the sensitivity of the measure. Finally, the data were collected in the mid-1990s, and the authors acknowledge this as a limitation, as there have been many changes among adolescents and the society in which they live in since 1995. However, the data enabled us to investigate adolescent maturational factors and how these factors influence eating behaviors, such as reported breakfast skipping among middle and high school students, which required further investigation. A strength of the study is the nationally representative sample, which supports the generalizability of the results.

Implications for Health Behavior

Because breakfast skipping jeopardizes proper nutrient intake and may endanger healthy development, these findings have implications for school health programming

and education. To ensure that adolescents are receiving adequate nutrition, serving breakfast in the classroom through federal programs such as the School Breakfast Program may provide a solution, as these programs have been shown to increase breakfast consumption (Bartfeld et al., 2009) and are positively associated with healthy intake and reduced BMI (Gleason et al., 2009). Participation in School Breakfast Programs has also been positively associated with school performance (Kim et al., 2016; Meyers et al., 1989). However, the School Breakfast Program is often underutilized by high school students. Thus, strategies centered around helping adolescents redefine their understanding of autonomous control need to include school breakfast participation. Because campaigns to reduce adolescents' autonomy are likely to fail, another way to improve their breakfast consumption may be to reframe nutritional messages so that adolescents link healthy habits to their own dietary autonomy rather than their parents' recommendations, as proposed by a game developed by Mitsis et al. (2019). Finally, health education campaigns and prevention programs that disseminate information to parents about establishing healthy breakfast habits for children early in life may support parents' ability to convince adolescents to maintain these behaviors throughout their lives.

Conclusion

During adolescence, developmental transitions often include gradually gaining independence from parental guidance and attaining greater autonomy over daily decisions, potentially leading to changes in eating behaviors. Adolescents in higher grades and those with more dietary autonomy are more likely to skip breakfast, which can have harmful implications on eating behaviors and developmental outcomes. As a result, dietary autonomy must be considered a potential risk factor for inadequate dietary intake during adolescence, particularly if adolescents define their dietary autonomy in terms of skipping breakfast. Therefore, nutritional instruction should continue beyond the lower grades, and messages at higher grade levels should emphasize that healthy eating habits, including attention to regular breakfast intake, can actually demonstrate autonomy. Additionally, future research should further explore both sex and exercise status, as they are significant predictors, suggesting that boys and girls and exercisers and non-exercisers may have different behavior patterns.

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