

Insomnia, Psychosocial Well-Being, and Weight Control Behaviors Among Healthy-Weight Adolescent Females: Brief Report

By: E. Earlyynn Lauer, Jessica R. Dietch, [Tsz Lun \(Alan\) Chu](#), Mitch Barton, Scott B. Martin, Trent A. Petrie, Christy A. Greenleaf, Daniel J. Taylor

Lauer, E. E., Dietch, J. R., Chu, T. L., Barton, M., Martin, S. B., Petrie, T. A., Greenleaf, C. A., & Taylor, D. J. (2021). Insomnia, Psychosocial Well-Being, and Weight Control Behaviors Among Healthy-Weight Adolescent Females: Brief Report. *International Journal of Behavioral Medicine*, 28, 259–264. <https://doi.org/10.1007/s12529-020-09872-x>

***© International Society of Behavioral Medicine. Reprinted with permission. No further reproduction is authorized without written permission from Springer. This version of the document is not the version of record. Figures and/or pictures may be missing from this format of the document. ***

Made available courtesy of Springer: <https://doi.org/10.1007/s12529-020-09872-x>

Abstract:

Background Weight control behaviors (WCBs) typically involve appearance- or health-driven behaviors that may be influenced by physiological, psychological, or social factors. Sleep disturbances like insomnia are an important area of research for adolescent populations, as early intervention may result in improvements in other physical and mental health domains. The purpose of this study was to investigate the relationship of insomnia, psychosocial well-being, and current WCBs in healthy weight female adolescents.

Method Female adolescents ($N = 323$; $M_{age} = 12.33 \pm .04$) who had healthy body mass index (BMI) levels completed self-report items on insomnia, depression, self-esteem, and physical self-concept. Multivariate analysis of covariance (MANCOVA), controlling for age, was conducted to further examine differences in insomnia and psychosocial variables among the WCB groups.

Results Compared to those who were trying to stay the same weight or not trying to do anything about their weight, the girls who were trying to lose weight had significantly greater insomnia and depression symptoms, and lower self-esteem, with small to medium effect sizes.

Conclusions Clinicians working with adolescent girls should include assessments of WCBs in addition to measures of insomnia symptoms, even for adolescent girls within a normal BMI range, as these are common and frequently co-occurring phenomena. Additional research is needed to further disentangle these complicated relationships.

Keywords: mental health | sleep | weight control | self-esteem | depression

Article:

Introduction

Weight control behaviors (WCBs) typically involve appearance- or health-driven behaviors that may be influenced by physiological, psychological, or social factors [1]. One way WCBs can be defined is by asking participants if they are taking one of the following actions: trying to lose weight, gain weight, stay the same weight, or were doing nothing about their weight. Many young people have reported engaging in WCBs [2], and self-reported WCBs are higher in adolescent girls compared to boys [3]. In fact, both normal weight and overweight adolescent girls have reported engaging in WCBs [4–8]. For instance, Martin and colleagues [8] found that, though a majority of participants (i.e., 72%) had a normal body mass index (BMI), about half of participants (49.3%) reported that they were trying to lose weight.

Existing research on WCBs has explored the relationship between healthy (e.g., exercising, reducing food intake) or extreme/unhealthy (e.g., taking diet pills or laxatives, purging) behaviors and sleep behaviors (e.g., insomnia, sleep duration). For example, Wheaton et al. [3] reported that in US high school students, self-reported short sleep duration was associated with dieting, fasting, and taking diet pills in both males and females, with shorter sleep duration relating to greater reporting of WCBs. However, the link between WCBs and sleep disorders is not well-understood. Similarly, existing research has examined the relationship between healthy and unhealthy eating and psychosocial variables (e.g., depression), but not the link between WCBs and the constructs.

Insomnia is a significant public health concern, occurring in 10–25% of adolescents [9]. Insomnia among adolescents is associated with numerous negative consequences, particularly in the psychosocial domain, including increased risk of depression, suicidal ideation and attempts, substance use, and poor academic performance [10, 11]. Insomnia is unlikely to remit without targeted treatment [12], suggesting adolescents may carry this diagnosis into their adult years unless adequately treated. Sleep disturbances like insomnia are an important area of research for adolescent populations, as early intervention may result in improvements in other physical and mental health domains (e.g., WCBs).

To date, no research has examined the relationship between WCBs and insomnia. This is an important area of research because sleep disturbances like insomnia are a novel, highly modifiable treatment target in the field of adolescent WCBs. Insufficient and poor-quality sleep among adolescents is increasingly recognized as a severe public health epidemic [13]. In the USA, 59% of students in grades 6 through 8 get less than the amount of sleep recommended by the National Sleep Foundation (i.e., 8.5 to 10 h; [14, 15]). One important contributor to insufficient sleep is insomnia symptomatology, defined as difficulty falling or staying asleep paired with a daytime consequence (e.g., difficulty concentrating, irritability, fatigue). Insomnia symptoms are linked with numerous negative psychosocial outcomes (e.g., depressive symptoms, engagement in risky behaviors, poor academic performance; [16–18]). One previous study examining the relationship between body weight and insomnia in Taiwanese early and midadolescents did not reveal a link, although this study used a different measure and was conducted in an older sample than the current study [19]. Similar to other psychosocial variables, it may be the case that WCBs, rather than objective body weight, are associated with insomnia symptoms and negative psychosocial outcomes. However, more work is needed to understand the relationship between insomnia, weight, and WCBs.

As previously noted, limited research has examined the link between adolescent females' WCBs and sleep variables, and even less has examined this relationship in samples with normal BMI. Thus, the primary aim of this study was to investigate the relationship between WCBs and

insomnia symptoms by WCBs. A secondary aim was to replicate the existing research investigating the relationship between WCBs and psychosocial well-being (i.e., depression, self-esteem, physical self-concept) in a sample of adolescent girls within a normal BMI range. Our hypothesis was that healthy-weight adolescent females using WCBs (defined in the “Method” section) would report worse insomnia and psychosocial functioning (i.e., depression, self-esteem, physical self-concept) than those not using WCBs.

Method

Participants

Participants were 323 female adolescents ($M_{age} = 12.33 \pm .04$) attending one of the six middle schools in a suburban school district in the southwestern USA. All participants met the Healthy Fitness Zone standards for BMI according to the FITNESSGRAM® (i.e., for females age 12, 15.5 to 22.1 kg/m²); 178 were excluded due to being either underweight ($n = 13$) or overweight ($n = 165$) based on the FITNESSGRAM® standards. Through the school district’s database on their students, researchers were provided with demographic information (i.e., race/ethnicity, age, socioeconomic status (SES)). SES was operationalized through the family income federal guidelines for determining students who qualified for free or reduced-cost school lunches [20]. Approximately 72% of the sample was white, and 21% of the participants were on free or reduced-cost lunch.

Instrumentation

Body Composition Weight status was determined by body mass index (BMI) status, and the FITNESSGRAM® [21] provided an objective measure of body composition using students’ BMI, represented in kg/m². Weight was measured by the researchers (in conjunction with the physical education teachers at each school) using a seca digital scale (Model 882) and recorded to the nearest .1 lb. The FITNESSGRAM/ ACTIVITY manual [21] provides information about the validity and reliability of BMI as a measure of body composition.

WCB Participants were asked what they currently were doing about their weight and given four options from which to pick: “I am trying to lose weight,” “I am trying to gain weight,” “I am trying to stay the same weight,” and “I am not trying to do anything about my weight in any way.” High test-retest reliability ($> .97$) over a 2-week period was indicated by a sample of similar aged children [1].

Insomnia Symptoms The Insomnia Severity Index (ISI [22]) is composed of 7 items which assess difficulty initiating and maintaining sleep and the impact of these sleep problems. Scores on the ISI are summed to a range from 0 to 28, with higher scores indicating greater insomnia severity. Internal consistency ranges from .74 to .78, and the ISI has good content and concurrent validity with other insomnia measures [22] and with this population [23, 24]. In the current study, internal consistency was acceptable ($\alpha = .74$).

Psychosocial Variables The Center for Epidemiological Studies – Depression Scale for Children (CES-DC) includes 20 items used to measure behavioral (e.g., “I didn’t sleep as well as I usually

sleep”) and cognitive (e.g., “I felt down and unhappy”) aspects of depression [25]. Scores range from 0 to 60, with higher total scores indicating greater depressive symptomatology. The CES-DC has demonstrated acceptable internal consistency, stability, and concurrent validity [26]. In addition, the Rosenberg Self-Esteem Scale [27] was used to measure general self-esteem (i.e., the degree to which individuals view themselves favorably or maintain a favorable impression of themselves) and physical self-concept dimensions (e.g., strength, flexibility, and endurance/aerobic ability). Higher averaged scores indicated greater esteem. Adequate scale stability, internal consistency, and validity (e.g., discriminant, construct) provided support for using these items [28]. Cronbach’s alpha was .83 in the current study. Likewise, previous research indicates that the PSDQ has suitable test-retest reliability, convergent validity, and discriminant validity [27, 28].

Procedure

The study was approved by the institutional review board at the fourth and fifth authors’ university as well as the school district at which the study took place and the principals of the presiding middle schools. Child assent and parental consent were obtained prior to the study through two protocols depending on the middle school. First, at some schools, consents were obtained during the in-person registration process. Parents were provided with written information about the study and questions were answered; parents could then provide consent at that time or return the consent at a later time to the children’s physical education (PE) teachers. Second, at other schools, descriptions of the study as well as consent forms were sent to children’s homes via the students’ physical education teachers. This consenting procedure occurred in the month prior to when data were scheduled to be collected; consents were initially collected by the PE teachers and delivered to study personnel. Data were collected during the 2010– 2011 academic school year. Students completed a questionnaire packet in conjunction with their required annual FITNESSGRAM testing during their PE classes. Data were managed and analyzed using SPSS® version 22.0 (IBM Corporation, Armonk NY, USA). All procedures were in accordance with the ethical standards of the institutional and with the 1964 Helsinki declaration and its later amendments.

Data Analysis

Descriptive statistics and correlation coefficients were first computed for insomnia and the psychosocial variables (i.e., depression, self-esteem, physical self-concept). Then, two chisquare tests of independence were conducted to compare the prevalence of the four WCBs by race/ethnicity and SES. Bonferroni-corrected p values of .0125 (.05/4) were used to determine the significant comparisons based on the standardized adjusted residuals of the four WCBs [29]. To further examine the potential differences in insomnia and the psychosocial variables among the WCB groups, a multivariate analysis of covariance (MANCOVA) was conducted with age as a covariate. This covariate was selected due to its significant associations with the insomnia and psychosocial variables based on our correlation analyses and previous research that indicated girls’ body dissatisfaction increased and subsequent psychosocial well-being decreased significantly around the age of 13 [30].

Results

WCB groups included 74 girls (22.9%) trying to stay the same weight, 85 (26.3%) trying to lose weight, 20 (6.2%) trying to gain weight, 144 (44.6%) were not trying to do anything about their weight. Chi-squared tests showed significant comparisons of WCB groups by SES ($\chi^2 = 12.22$, $p = .007$), but not by race/ethnicity ($\chi^2 = 6.17$, $p = .10$). Specifically, a significantly larger proportion of girls not receiving lunch benefits were not trying to do anything about their weight compared to their counterparts on free or reduced-cost lunch (48.6% vs. 30.3%, $p = .007$)

The correlations among the four psychosocial variables were significant with medium to large effect sizes ($r_s = \pm .37-.67$, $p < .001$). Girls who had greater general self-esteem and physical self-concept generally had fewer depressive and insomnia symptoms. The MANCOVA results indicated that insomnia and psychosocial variables differed across the four WCBs, Wilk's $\lambda = .93$, $F(1.938, 12)$, $p = .027$, $\eta^2 = .024$. The multivariate model explained approximately 3.4%, 5.4%, 5.0%, and 1.2% of the variance in insomnia, depression, general self-esteem, and physical self-concept, respectively. Follow-up post hoc tests with Bonferroni adjustments revealed significant univariate effects for insomnia, depression, and general self-esteem, but not physical self-concept (see Table 1). Specifically, compared to those who were trying to stay the same weight or not trying to do anything about their weight, the girls who were trying to lose weight had significantly greater insomnia symptoms ($d = .43$ and $.43$, respectively), higher depression scores ($d = .49$ and $.52$, respectively), and lower self-esteem ($d = -.52$ and $-.59$, respectively), with small to medium effect sizes. The girls who were trying to gain weight did not significantly differ from other groups in any psychosocial variables.

Discussion

The purpose of this study was to investigate the relationship between WCBs, insomnia symptoms, and psychosocial variables (i.e., depression, self-esteem, physical self-concept) in healthy weight adolescent females. Results indicated that adolescent girls who were trying to lose weight had significantly higher greater insomnia and depression symptoms, and lower self-esteem, with small to medium effect sizes compared to those who were trying to staying the same weight or not trying to do anything about their weight. Thus, the research hypothesis was mostly supported, with the exception of physical self-concept that indicated nonsignificant differences across WCBs.

These findings extend the available research on WCBs. It is important to note that all participants in this study were within the Healthy Fitness Zone standards for BMI according to the FITNESSGRAM, even those who reported wanting to lose weight. However, girls who were trying to lose weight had the most negative health outcomes compared to the other groups. They self-reported higher insomnia and depression symptoms and described themselves as having lower self-esteem. These findings may be informed by considering the average age of girls in this study as well as the physical and social aspects associated with adolescence. Participants were within an age range marked by rapid physical changes, including changes in weight, height, body composition and shape, and secondary sex characteristics [31]. These physical changes coincide with an increased emphasis on comparison, particularly to cultural ideals of beauty and thinness (i.e., the "thin ideal" [32]). Even girls within a normal BMI range may not meet this "thin ideal," resulting in a drive to change their weight and appearance to meet these societal standards. In light of these connections, future research should investigate normal-BMI adolescent girls' self-reported

Table 1 Descriptive statistics and MANCOVA results among the four weight control behaviors

	Stay the same weight		Lose weight		Gain weight		Do nothing		<i>F</i>	<i>p</i>	η_p^2
	(n = 74)		(n = 85)		(n = 20)		(n = 144)				
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>			
General self-esteem	34.02 _a	4.20	31.41 _{ab}	5.77	32.73	5.75	34.18 _b	5.14	5.61	.001	.050
Physical self-esteem	4.70	1.11	4.43	1.12	4.51	1.07	4.69	1.04	1.34	.262	.012
Depression	11.16 _c	8.22	16.31 _{cd}	12.83	15.04	13.81	10.54 _d	9.47	6.07	< .001	.054
Insomnia	5.60 _e	4.91	7.88 _{ef}	5.68	6.35	5.46	5.64 _f	4.78	3.78	.011	.034

Means with the same subscripts indicate significant differences based on the post hoc tests with Bonferroni adjustments after controlling for age

reasons for engaging in WCBs to better understand how those reasons may relate to negative psychosocial outcomes.

These findings also provide novel information about the relationships among WCBs, insomnia symptoms, and psychosocial well-being. Though it is a normal and anticipated occurrence for sleep duration to decrease as a function of age and developmental stage [33], the incidence of insomnia symptoms related to negative psychosocial well-being may be informed by the recent work of Mazzer and colleagues [34]. Their findings indicated that rumination (i.e., negative and perseverative thought) was highly predictive of psychological distress (i.e., depressive and anxiety symptoms) even though sleep duration declined during adolescence and subjective sleep duration partially mediated this effect. In the current study, girls who reported wanting to lose weight had more insomnia symptoms and lower psychosocial well-being scores than those in other WCB groups. Thus, it may be the case that wanting to lose weight, and body image generally, is something about which adolescent girls ruminate and thus report disturbed sleep. However, more work needs to be done to establish the connection between reported WCBs, psychosocial well-being, and insomnia symptoms.

Strengths and Limitations

Overall, there are several strengths associated with this study. This is the first study to investigate the relationships among WCBs and insomnia symptoms using a fairly large sample of adolescent girls. The results of the study also provide valuable insight into the relationship between healthy-weight girls' intentions to modify or control their weight and a range of psychosocial outcomes. Though this study used validated measures of insomnia and psychosocial constructs, future studies in this area should strive to use a comprehensive sleep measurement strategy (i.e., a combination of subjective and objective measures of multiple facets of sleep health) in order to increase our understanding of the role of sleep in WCBs beyond the scope of the current paper.

Several limitations of this study must be considered. First, the cross-sectional nature of the study did not allow for temporal relationships to be established. A longitudinal or experimental design would be needed to establish whether trying to lose weight is a determinant for negative psychological outcomes. Second, there was a risk for social desirability bias with the self-report measures (e.g., participants may have reported lower levels of depression than actually experienced). Third, given participants' age, BMI may not be an ideal indicator of body composition. Lastly, the participants were recruited from a single school district, which limits the generalizability of the results to a larger population of adolescent girls. Future research is needed with more representative samples to determine if these results can be replicated with other groups.

Conclusion

In this study, healthy-weight adolescent girls' WCBs were related to worse insomnia and psychosocial symptoms. Specifically, girls trying to lose weight reported significantly greater insomnia and depression symptoms and lower self-esteem compared to those trying to stay the same weight or doing nothing about their weight. Clinicians working with adolescent girls should include assessments of WCB in addition to measures of insomnia and psychosocial symptoms, even for adolescent girls within a normal BMI range, as these are common and frequently co-occurring phenomena. Interventions simultaneously or sequentially addressing the interrelated factors of WCBs, insomnia, and negative psychosocial variables are warranted, particularly in

school settings. More specifically, we contend that school health professionals should identify as a health risk factor [35], and those in school environments should work to create an environment of weight and body appreciation in adolescents regardless of body size. Additional research is needed to investigate these complex relationships among WCBs, insomnia, and negative psychosocial variables.

Acknowledgments We appreciate the school superintendents, middle school principals, teachers, and students that consented and participated in this project.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Animal Subjects This article does not contain any studies with animals performed by any of the authors.

References

- Yeatts PE, Martin SB, Petrie TA, Greenleaf C. Weight control behavior as an indicator of adolescent psychological well-being. *J Sch Health*. 2016;86:561–7.
- Neumark-Sztainer D, Story M, Hannan PJ, Perry CL, Irving LM. Weight-related concerns and behaviors among overweight and nonoverweight adolescents: implications for preventing weight-related disorders. *Arch Pediatr Adolesc Med*. 2002;156:171–8.
- Wheaton AG, Perry GS, Chapman DP, Croft JB. Self-reported sleep duration and weight-control strategies among US high school students. *Sleep*. 2013;36:1139–45.
- Neumark-Sztainer D, Wall MM, Larson N, Story M, Fulkerson JA, Eisenberg ME, et al. Secular trends in weight status and weight-related attitudes and behaviors in adolescents from 1999 to 2010. *Prev Med*. 2012;54:77–81.
- Neumark-Sztainer D, Wall M, Eisenberg ME, Story M, Hannan PJ. Overweight status and weight control behaviors in adolescents: longitudinal and secular trends from 1999–2004. *Prev Med*. 2006;43:52–9.
- Neumark-Sztainer D, Wall M, Story M, Standish A. Dieting and unhealthy weight control behaviors during adolescence: associations with 10-year changes in body mass index. *J Adolesc Health*. 2012;50:80–6.
- Cruz-Sáez S, Pascual A, Salaberria K, Echeburúa E. Normalweight and overweight female adolescents with and without extreme weight-control behaviours: emotional distress and body image concerns. *J Health Psychol*. 2015;20:730–40.
- Martin SB, Rhea SJ, Greenleaf CA, Judd DE, Chambliss HO. Weight control beliefs, body shape attitudes, and physical activity among adolescents. *J Sch Health*. 2011;81:244–50.

- de Zambotti M, Goldstone A, Colrain IM, Baker FC. Insomnia disorder in adolescence: diagnosis, impact, and treatment. *Sleep Med Rev.* 2018;39:12–24.
- Roane BM, Taylor DJ. Adolescent insomnia as a risk factor for early adult depression and substance abuse. *Sleep.* 2008;31(10): 1351–6.
- Gaultney JF. The prevalence of sleep disorders in college students: impact on academic performance. *J Am Coll Heal.* 2010;59(2):91–7.
- Morin CM, Bélanger L, LeBlanc M, et al. The natural history of insomnia: a population-based 3-year longitudinal study. *Arch Intern Med.* 2009;169(5):447–53.
- Owens J. Adolescent sleep working group. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics.* 2014;134(3):e921–32.
- Hirshkowitz M, Whiton K, Albert S, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation’s sleep time duration recommendations: methodology and results summary. *Sleep Health.* 2015;1(1):40–3.
- Melville NA. AAP issues a wake-up call on teen sleep. <http://www.medscape.com/viewarticle/830401>. Accessed June 15, 2019.
- Carskadon MA, Acebo C. Regulation of sleepiness in adolescents: update, insights, and speculation. *Sleep.* 2002;25:606–14.
- Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. *Sleep Med Rev.* 2002;6:97–111.
- Wheaton AG, Ferro GA, Croft JB. School start times for middle school and high school students—United States, 2011–11 school year. *Centers Disease Control Prev Morb Mortal Wkly Rep.* 2015;64(30):809–13.
- Lee JI, Yen CF. Associations between body weight and depression, social phobia, insomnia, and self-esteem among Taiwanese adolescents. *Kaohsiung J Med Sci.* 2014;30:625–30.
- United States Department of Agriculture. National School Lunch Program. Available at: <http://www.fns.usda.gov/cnd/Lunch/>. Retrieved June 15, 2016
- The Cooper Institute. FITNESSGRAM/ACTIVITYGRAM Test Administration Manual. 4th ed. Champaign: Human Kinetics; 2007.
- Bastien CH, Vallieres A, Morin CH. Validation of the insomnia severity index as an outcome measure for insomnia research. *Sleep Med.* 2001;2:297–307.
- Chahoud M, Chahine R, Salameh P, Sauleau EA. Reliability, factor analysis and internal consistency calculation of the insomnia severity index (ISI) in French and in English among Lebanese adolescents. *eNeurologicalSci.* 2017;7:9–14.
- Gerber M, Lang C, Lemola S, et al. Validation of the German version of the insomnia severity index in adolescents, young adults and adult workers: results from three cross-sectional studies. *BMC Psychiatry.* 2016;16:174.
- Faulstich ME, Carey MP, Ruggiero L, Enyart P, Gresham F. Assessment of depression in childhood and adolescence: an evaluation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC). *Am J Psychiatry.* 1986;143:1024–7.

- Fendrich M, Weissman MM, Warner V. Screening for depressive disorder in children and adolescents: validating the Center for Epidemiologic Studies Depression Scale for Children. *Am J Epidemiol.* 1990;131:538–51.
- Rosenberg M. *Society and the adolescent self-image.* Princeton: Princeton University Press; 1965.
- Gray-Little B, Williams VSL, Hancock TD. An item response theory analysis of the Rosenberg Self-Esteem Scale. *Personal Soc Psychol Bull.* 1997;23:443–51.
- García-Pérez MA, Núñez-Antón V. Cellwise residual analysis in two-way contingency tables. *Ed Psychol Meas.* 2003;63:825–39.
- Rosenblum GD, Lewis M. The relations among body image, physical attractiveness, and body mass in adolescence. *Child Dev.* 1999;70:50–64.
- Voelker DK, Reel JJ, Greenleaf C. Weight status and body image perceptions in adolescents: current perspectives. *Adolesc Health Med Ther.* 2015;6:149–58.
- Groesz LM, Levine MP, Murnen SK. The effect of experimental presentation of thin media images on body satisfaction: a metaanalytic review. *Int J Eat Disorder.* 2002;31:1–16
- Colrain IM, Baker FC. Changes in sleep as a function of adolescent development. *Neuropsychol Rev.* 2011;21:5–21.
- Mazzer K, Boersma K, Linton SJ. A longitudinal view of rumination, poor sleep and psychological distress in adolescents. *J Affect Disord.* 2019;245:686–96.
- Gerber L. Sleep deprivation in children: a growing public health concern. *Nurs.* 2014;45:22–8.