

Perception, Intention, and Action in Adolescent Obesity

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Background: Insight into adolescents' weight-loss behavior is needed.

Methods: Survey data were obtained from overweight and obese adolescents in the Youth Risk Behavioral Survey (YRBS) in Delaware. Cross tabulations were used to determine the frequency of accurate perception, recent action, and current intention regarding weight loss. Multivariable analysis identified factors associated with recent action to lose weight.

Results: From 2728 records, 482 overweight adolescents and 398 obese adolescents were identified. Most obese (83%) and overweight (79%) adolescents reported recent action to lose weight. Most obese (75%) and overweight (65%) adolescents intended to lose weight. Obese and overweight adolescents who reported a current intention to lose weight were more likely to have taken recent action to lose weight (odds ratio [OR], 11.6 and 6.6, respectively).

Conclusions: The percentage of obese and overweight adolescents who have an accurate perception of weight, intend to lose weight, and have taken recent action to lose weight suggests that this group is highly engaged in weight-related behavior change. Compared with their obese peers, overweight adolescents seem less engaged in weight change behavior. There is a strong association in both groups between intention and recent action, and this association indicates that obese and overweight adolescents are highly motivated to change their weight. (J Am Board Fam Med 2008; 21:555–61.)

The prevalence of children and adolescents who are overweight or obese in the United States has risen dramatically and persists at high levels. From 1976 to 1990, the percentage of obese children ages 6 to 17 rose from 4% to 11%, representing a 40% increase. More recent estimates from the National Health and Nutrition Examination Survey (NHANES) 2003/2004 data indicate that childhood obesity continues to rise, with 17.1% of US children and adolescents now classified as obese (body mass index [BMI] greater

than or equal to the 95th percentile).^{1–4} The alarming rise of obesity in the United States prompted Healthy People 2010 to designate physical activity and overweight/obesity in the top 10 priorities for action. While primary care physicians await scientific evidence on specific brief, office-based interventions which prevent obesity, the epidemic proportion of the problem urges intervention now.

Physician advice can promote behavior change regarding weight loss.⁵ In review of National Health and National Nutrition Survey data in 1999/2000 and 2001/2002, Kant and Miller⁶ found that physician advice was associated with attempted weight loss and targeted dietary changes in adolescents. When physician counseling is targeted to stage of readiness for change (compared with usual care), patients are more likely to change their diet and physical activity.^{7,8} By understanding the process of weight-related behavior change in adolescents, physicians will be better prepared to deliver effective stage-specific advice.⁸

Multiple theories exist which attempt to identify determinants of change. One such theory, the theory of planned behavior (TPB), posits that a “central determinant of behavior is the individual’s in-

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tion to perform the behavior in question.”⁹ This model has been specifically validated in promoting physical activity¹⁰ and links both intention and action to weight loss.¹¹ Therefore, information regarding the current intention and recent actions of adolescents would help physicians to formulate effective advice.

There is evidence that interventions which focus on diet or physical activity have a modest but desired effect on obesity prevention.¹² The scientific evidence that links behavior change regarding weight (ie, action) to obesity prevention is still accumulating.¹³ However, there are some safe and reasonably well supported strategies that are applicable to adolescents which could be targeted in a brief intervention. These include outdoor play, reduced screen time, and limited consumption of beverages with high sugar content.^{14–16}

This study was undertaken to explore the constructs of current intention and recent action in overweight and obese adolescents. It is based on the assumption that determining the frequency of actions taken (ie, diet or exercise), as well as current intention to lose weight, will indicate where these adolescents are in the process of behavior change.

Methods

Study Population

Secondary data on BMI among adolescents in Delaware were available from the Delaware Youth Risk Behavior Survey (YRBS). The YRBS is an epidemiologic surveillance survey created by the Division of Adolescent and School Health (DASH)/Centers for Disease Control and Prevention (CDC) to monitor health risk in adolescents in the United States; it is a 106-question survey completed anonymously by high school students enrolled in public high schools. Delaware’s 2002 YRBS was administered in grades 9 through 12 in all public high schools in Delaware. The survey was administered in classes which are considered required for all students in a particular grade level. In Delaware, the YRBS is qualified for a waiver of active parental consent as it is a minimal risk, uses no individual identifiers, and there is great anticipated value from a complete data set. For this study, two subgroups of adolescents were created based on BMI using CDC growth charts. The final study samples for analysis were overweight and obese adolescents.

The study was approved by expedited review through the Christiana Care Health Services Institutional Review Board.

Variables

According to the Center for Disease Control, weight status in adolescents (and children) is measured by BMI-for-age and plotted on growth charts to determine a percentile category. In this paper, adolescents with a BMI greater than or equal to the 95th percentile are categorized as obese, and adolescents with a BMI greater than or equal to the 85th percentile but less than the 95th percentile are categorized as overweight.¹⁷ These groups were analyzed separately because their likelihood of future obesity is different and the overweight group is likely to be underrecognized.

BMI was calculated from self-reported height and weight using standard equations.¹⁷ Age was a continuous variable, self-reported in years, according to 7 choices: ≤ 12 , 13, 14, 15, 16, 17, and ≥ 18 ; because of sample size, we combined groups to create a single group: ≤ 14 years.

Race/ethnicity data are categorical, self-reported, and collected in a single question with the following choices: American Indian or Alaskan native, Asian, black or African-American, Hispanic or Latino, Native Hawaiian or other Pacific Islander, or white. Gender is self-reported as male or female.

Responses to questions were categorized to represent behavior stage variables. Perception of body weight was defined as a dichotomous variable (accurate perception or inaccurate perception) using the question, “How do you describe your weight?” Adolescents who answered “slightly overweight” or “very overweight” were categorized as having an accurate perception. Any other answer (about the right weight, slightly underweight, very underweight) would classify the individual as having inaccurate perception.

Intention was defined as a dichotomous variable in terms of having an intention to lose weight. This measure was determined by using the question, “Which of the following are you trying to do about your weight?” Answers included lose weight (A); gain weight (B); stay the same weight (C); and not trying to do anything (D). Those adolescents who responded that they were trying to lose weight were classified as having an active intention to modify their weight. Any other answer qualified as not having intent to lose weight. Having an inten-

Table 1. Demographic Characteristics of Delaware Youth Risk Behavior Survey Population: General Population, Obese Group, and Overweight Group

	Obese* (n = 398)		Overweight† (n = 482)	
	n‡	%	n‡	%
Age (years)				
14 and younger	65	16.3	73	15.1
15	109	27.4	106	22
16	113	28.4	133	27.6
17	78	19.6	117	24.3
18 or older	33	8.3	53	11
Sex/gender				
Male	245	61.6	244	50.6
Female	153	38.4	238	49.4
Race/ethnicity				
White	221	55.9	253	52.9
Black	113	28.6	153	32
Hispanic	30	7.6	38	7.9
Asian	7	1.8	16	3.3
Native/Alaskan	19	4.8	14	2.9
Hawaiian	5	1.3	4	0.8
Diet modification§	242	60.9	243	50.5
Exercise modification§	292	73.4	351	72.8
Diet and/or exercise	329	82.6	380	78.9
Accurate perception of weight¶	326	81.8	261	54.2
Intention to change weight¶¶	300	75.3	314	65.2

*BMI for age is greater than or equal to the 95th percentile for gender.

†BMI is greater than or equal to the 85th and less than the 95th percentile for gender.

‡95% confidence interval.

§Individuals who indicated that they changed what they ate or exercised more respectively in the last 30 days in an attempt to lose weight.

¶Individuals who classified themselves as either "slightly overweight" or "very overweight."

¶¶Individuals who answered "lose weight" when asked "What are you trying to do about your weight?"

tion to lose weight is proposed as an indicator of preparation for change, according to Prochaska's stages of change.

Recent actions taken to lose weight were accessed as a dichotomous variable. The adolescents who were classified as having taken action to modify their weight affirmed that they have modified their diet in the past 30 days or exercised more in the past 30 days to lose weight or to keep from gaining weight. Those individuals classified as not taking action neither exercised more nor modified their diet in the last 30 days.

Data Analysis

Cross tabulations were created for demographic and behavioral variables in both the overweight and obese groups. Multivariable logistic regression models were used to examine the impact of each

independent variable on the dichotomous outcome variable of action. We modeled the probability of taking action. All covariates were entered into the model simultaneously. Odds ratios and 95% CIs were calculated for the impact of each predictor variable including age, gender, and behavior stage (perception and intention) on each outcome variable. For the dichotomous variables of perception, intent, and action, the reference group was inaccurate perception, not having intent, and not taking action, respectively. For all analyses, SPSS (version 10.0) was used.¹⁸

Results

There were 482 overweight adolescents and 398 obese adolescents in the sample. Table 1 presents the demographic characteristics of the study sample. Individuals in the study were predominately 15

to 17 years of age and white, and the population was evenly balanced between males and females. There were more males in the obese group, but otherwise, there were no major differences in gender or race in the subgroups of overweight and obese adolescents.

Most obese (82.6%) and overweight (78.9%) adolescents had taken a recent action aimed at reducing (or maintaining) their weight. Both obese and overweight adolescents had a low rate of diet change to lose weight (60.9% and 50.5%, respectively). The overweight group had lower levels of recent action (both diet and exercise), current intention, and perception compared with their obese counterparts. The level of current intention to lose weight was moderately high in both groups (75.3% and 65.2%, respectively). However, the proportion of individuals with current intention to lose weight was lower than that of recent action to lose weight (diet and/or exercise) for both groups. In the overweight population, approximately half, 54.2%, had an accurate perception of themselves as overweight, and 65.2% of overweight adolescents intended to lose weight whereas 78.9% took action to lose weight.

Table 2 presents factors associated with taking action to lose weight in both obese and overweight adolescents. By multivariable analysis, intention to lose weight was positively associated with taking action to lose weight in both the obese and the overweight group. After controlling for other modeled variables, perception, gender, and age were not associated with action in the obese group. In the obese group, African-American/black race had a positive effect but no significant association with action. In the overweight group, black race was negatively associated with action. In the overweight group, age, gender, and race were not associated with action.

Discussion

Obese and overweight adolescents perceive their weight as a problem, intend to lose weight, and have taken recent action to lose weight. Exercise is more commonly chosen than diet as an action aimed at losing weight in both groups. These observations fit with previous work that indicates a majority of adolescents both intend and act to reduce their body weight.² Because obesity continues to increase in both adolescents and adults, the

Table 2. Factors Associated with Recent Action to Lose Weight in Obese and Overweight Adolescents

Variable	Odds Ratio	95% Confidence Interval*
Obese[†]		
Accurate perception (yes/no) [‡]	1.0	0.5 to 2.2
Intention (yes/no) [§]	11.6	5.9 to 22.8
Gender (female/male)	0.9	0.5 to 1.9
Age (categorical/years)	0.9	0.7 to 1.1
Race (black/other)	1.6	0.8 to 3.4
Overweight[†]		
Variable		
Accurate perception (yes/no) [‡]	1.4	0.8 to 2.7
Intention (yes/no) [§]	6.6	3.6 to 12.3
Gender (female/male)	1.2	0.7 to 2.1
Age (categorical/years)	1.0	0.8 to 1.2
Race (black/other)	0.6 [¶]	0.3 to 0.9

[†]Obese refers to BMI greater than or equal to the 95th percentile. Overweight refers to BMI greater than or equal to the 85th percentile and less than the 95th percentile. The comparisons for age were by year. The comparison for race was white.

*95% confidence interval.

[‡]Individuals who classified themselves as either "slightly overweight" or "very overweight."

[§]Individuals who answered "lose weight" when asked "What are you trying to do about your weight?"

^{||} $P \leq .01$.

[¶] $P \leq .05$.

knowledge that most adolescents are actively trying to lose weight highlights an important discrepancy. It suggests that recent actions may be ineffective or not sustained over time. Advice given by physicians should aim to assist adolescents who are already taking action. For example, through inquiry as to the quality and frequency of action aimed at weight loss, physicians may optimize the effectiveness of recent action, as well as promote the maintenance of desired actions.

The proportion of individuals with current intention is lower than the proportion of individuals who had taken recent action. Therefore, some adolescents who have recently taken action to lose weight no longer have an intention to take an action. It is likely that some adolescents have become frustrated by a lack of success and have not continued the behavior change. Similar to smoking cessation advice, understanding the potential frustrations associated with prior attempts could provide a powerful tool to the physician who is trying to encourage effective, long-term behavior changes.^{8,11,19-22}

The point prevalence of accurate perception, intention, and action were all less in the overweight group compared with the obese group. Notably, accurate perception is much lower in the overweight group compared with the obese group (54% and 81%, respectively). This suggests that, compared with their obese counterparts, the overweight adolescents may be less engaged in the process of behavior change. This observation is consistent with findings reported elsewhere that indicate >20% of overweight and obese students did not see themselves as overweight,²³ and that obese and overweight youth are more likely to misperceive their weight compared with their normal weight peers.²⁴ This overweight group is a particularly interesting target for intervention. With relatively lower BMIs than their obese counterparts, this group is not necessarily visibly overweight and therefore may be unrecognized as having a high BMI. If these adolescents could be identified, physicians would have the opportunity to intervene earlier in the natural course of disease and models of primary prevention, such as that used for prehypertension and impaired glucose tolerance, could be applied. The lack of accurate perception suggests an important target area for physician inquiry. It is likely that perception influences how intensely an individual engages in behavior change, ie, an adolescent who does not see himself/herself as overweight may be less likely to engage in sufficiently intense physical activity. A doctor may inquire about the adolescent's personal perception of body image, health risk, and physical fitness.

Understanding behavior change in adolescents regarding weight would allow physicians to more effectively target advice and interventions, similar to what has been done in smoking cessation.²⁵ The constructs of perception and intention would be targeted in a brief intervention with a family physician. The nature of this study precludes any interpretation of causality and a larger prospective study would be needed to demonstrate cause.⁹ However, intention is strongly associated with recent action to lose weight and this association was consistent in all groups. The relatedness of the variables of intention and action suggests that these adolescents are highly motivated to change their weight. The use of the construct of intention is consistent with the theory of planned behavior (TpB). The TpB assumes that if an individual has adequate behavioral control, then intention is the

immediate antecedent of action. Intention is formed or not formed according to attitude toward the behavior, subjective norms, and perceived behavioral control. Physicians can apply the TpB to give advice which is targeted to the individual's stage of change and behavioral beliefs.^{26,27} The behavioral domains of the TpB could be used to guide physician inquiry. For example, a physician could ask an adolescent what she sees as the potential benefits of behavior change, what his/her family and peers do in regards to physical activity/diet, and finally, does the adolescent believe that she will be personally successful in changing his/her own diet, physical activity, or weight.⁹

Although not significant, perception is associated with recent action and this trend exists in both groups. This suggests that addressing subjective norms could be an important initial step in behavior change. There is a trend whereas overweight females are more likely to take action than their overweight male counterparts. Subjective norms may play a role here, eg, overweight males may value larger body size and may have a positive body image compared with their female overweight counterparts. The race effect is opposite in the two groups, overweight and obese. Black race seems to have positive association with recent action in the obese group. In contrast, black race is negatively associated with action in the overweight group. This raises the possibility of a threshold effect in which black adolescents do not recognize a problem and do not act to lose weight until their BMI reaches a higher level. Closer attention may be needed in this subgroup.

There are important limitations of this study. First, the cross-sectional design precludes interpretation of causality; therefore the associations demonstrated are not causal. For example, it is reasonable to suggest that individuals who are already taking action would also have an intention to change their weight, without this individual's intention preceding the action. Similarly, it is reasonable to expect a large degree of association between intention and perception without a relationship in which perception precedes the formation of an intention. Second, although reliable and commonly used in adolescents, self-reported data on height and weight has limitations of accuracy in estimating true weight; specifically, adolescents are likely to underestimate their weight.²⁸⁻³⁰ Our study probably excluded individuals who inaccurately reported

their weight and were inappropriately classified as normal weight. Therefore, this study may underestimate the proportion of overweight and obese adolescents who do not have accurate perception and are not taking action. Finally, the constructs of perception, intention, and action have not been formally validated, and the variable of action does not quantify the intensity of action nor does it capture the longitudinal pattern of activity beyond 30 days.

The TpB has been validated in many other health-related behaviors and, applied here, it suggests a theoretical framework for interventions in this group, whereas behavior change can be promoted along stages toward action.³¹ In an obese adolescent who is unaware of a problem, the physician would first move the individual toward an intention to change. Perhaps a physician would increase awareness by calculating the adolescent's BMI and discussing the implications. Next, a physician would assess intention to change in terms of facilitators and barriers. Finally, the physician would inquire regarding past actions taken and assist their patients to choose behavior changes that are likely to be effective and sustainable.

In summary, many overweight adolescents have already taken action to change (or at least maintain) their weight. The discrepancy between the high proportion of adolescents trying to lose (or maintain) weight and the rising prevalence of overweight implies that adolescents are taking actions which are not effective. Physicians can use the TpB to gauge an individual's current behavior change and promote actions which are most likely to be successful in preventing obesity, eg, decreased screen time, more outdoor play, and limiting high sugar content beverages.¹⁴ Compared with their obese counterparts, overweight adolescents may be less engaged in the process of behavior change. In this group, the routine collection and interpretation of BMI may be an important initiating step in weight loss or maintenance.

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References

1. Troiano RP, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents. The national health and nutrition examination surveys, 1963 to 1991. *Arch Pediatr Adolesc Med* 1995;149:1085–91.
2. Grunbaum JA, Kann L, Kinchen SA, et al. Youth risk behavior surveillance—United States, 2001. *Morb Mortality Wkly Rep Surveill Summ* 2002;51:1–62.
3. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA* 2006;295:1549–55.
4. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. *JAMA* 2008;299:2401–5.
5. Egede LE. Lifestyle modification to improve blood pressure control in individuals with diabetes: Is physician advice effective?. *Diabetes Care* 2003;26:602–7.
6. Kant AK, Miner P. Physician advice about being overweight: association with self-reported weight loss, dietary, and physical activity behaviors of US adolescents in the national health and nutrition examination survey, 1999–2002. *Pediatrics* 2007; 119: e142–7. Accessed 26 March 2007.
7. Steptoe A, Kerry S, Rink E, Sally M, Rink E, Hilton S. The impact of behavioral counseling on stage of change in fat intake, physical activity, and cigarette smoking in adults at increased risk of coronary heart disease. *Am Pub Health Assoc* 2001;91:265–9.
8. Wilson DM, Taylor DW, Gilbert JR, et al. A randomized trial of a family physician intervention for smoking cessation. *JAMA* 1988;260:1570–4.
9. Ajzen I, Fishbein M. *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice-Hall; 1980.
10. Blue CL. The predictive capacity of the theory of reasoned action and the theory of planned behavior in exercise research: An integrated literature review. *Res Nurs Health* 1995;18:105–21.
11. Schifter DE, Ajzen I. Intention, perceived control, and weight loss: an application of the theory of planned behavior. *J Pers Soc Psychol* 1985;49:843–51.
12. Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. [update of Cochrane Database Syst Rev 2002;2:CD001871; PMID: 12076426]. *Cochrane Database of Syst Rev* 2005;4:CD001871.
13. Katz DL, O'Connell M, Yeh MC, et al. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the task force on community preventive services. *Morb Mortality Wkly Rep Surveill Summ* 2005;54:1–12.
14. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999;282:1561–7.
15. James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of car-

- bonated drinks: cluster randomised controlled trial. *BMJ* 2004;28:1237.
16. Whitaker RC. Obesity prevention in pediatric primary care: four behaviors to target. *Arch Pediatr Adolesc Med* 2003;15:725–7.
 17. Centers for Disease Control and Prevention (CDC). About BMI for children and teens. Available at http://www.cdc.gov/nccdphp/dnpa/bmi/childrens_BMI/about_childrens_BMI.htm. Accessed 3 October 2007.
 18. SPSS Inc. About SPSS inc.—corporate history. Available at <http://www.spss.com/corpinfo/history.htm>. Accessed 10 July 2007.
 19. Lancaster T, Stead L. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2004;4:CD000165.
 20. Bronson DL, Flynn BS, Solomon LJ, Vacek P, Secker-Walker RH. Smoking cessation counseling during periodic health examinations. *Arch Intern Med* 1989;149:1653–6.
 21. Schwartz RP, Hamre R, Dietz WH, et al. Office-based motivational interviewing to prevent childhood obesity: a feasibility study. *Arch Pediatr Adolesc Med* 2007;161:495–501.
 22. Yzer MC, van den Putte B. Understanding smoking cessation: the role of smokers' quit history. *Psychol Addict Behav* 2006;20:356–61.
 23. Brener ND, Eaton DK, Lowry R, McManus T. The association between weight perception and BMI among high school students. *Obes Res* 2004;12:1866–74.
 24. Maximova K, McGrath JJ, Barnett T, O'Loughlin J, Paradis G, Lambert M. Do you see what I see? Weight status misperception and exposure to obesity among children and adolescents. *Int J Obes (Lond)* 2008;32:1008–15.
 25. Kreuter MW, Chheda SG, Bull FC. How does physician advice influence patient behavior? Evidence for a priming effect. *Arch Fam Med* 2000;9:426–33.
 26. Norcross JC, Prochaska JO. Using the stages of change. *Harv Ment Health Lett* 2002;18:5–7.
 27. Prochaska JO, DiClemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. *Am Psychol* 1992;47:1102–14.
 28. Levin S, Lowry R, Brown DR, Dietz WH. Physical activity and body mass index among US adolescents: Youth risk behavior survey, 1999. *Arch Pediatr Adolesc Med* 2003;157:816–20.
 29. Jacobson BH, DeBock DH. Comparison of body mass index by self-reported versus measured height and weight. *Percept Mot Skills* 2001;92:128–32.
 30. Brener ND, McManus T, Galuska DA, Lowry R, Wechsler H. Reliability and validity of self-reported height and weight among high school students. *J Adolesc Health* 2003;32:281–7.
 31. Brener ND, Billy JO, Grady WR. Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *J Adolesc Health* 2003;33:436–57.