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I Should but I Can't: Controlled Motivation and Self-efficacy are Related to Disordered Eating Behaviors in Adolescents with Type 1 Diabetes

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Abstract

Purpose—Among adolescents with type 1 diabetes, disordered eating behaviors (DEB) are more prevalent and have more serious health implications than in adolescents without diabetes, necessitating identification of modifiable correlates of DEB in this population. This study hypothesized that 1) autonomous motivation and 2) controlled motivation for healthy eating (i.e., eating healthfully because it's important to oneself versus important to others respectively) are associated with DEB among adolescents with type 1 diabetes. The third hypothesis was that baseline healthy eating self-efficacy moderates these associations.

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Methods—Adolescents with T1D (n = 90; 13–16 years) participating in a behavioral nutrition intervention efficacy trial reported DEB, controlled and autonomous motivation, and self-efficacy at baseline, 6, 12, and 18 months. Linear mixed models estimated associations of controlled and autonomous motivation with DEB, adjusting for treatment group, BMI, socio-economic status, age, and gender. Separate models investigated the interaction of self-efficacy with each motivation type.

Results—Controlled motivation was positively associated with DEB ($B=2.18\pm.33$, $p<.001$); the association was stronger for those with lower self-efficacy ($B=3.33\pm.55$, $p<.001$) than those with higher self-efficacy ($B=1.36\pm.36$, $p<.001$). Autonomous motivation was not associated with DEB ($B=-.70\pm.43$, $p=.11$).

Conclusions—Findings identify controlled motivation for healthy eating as a novel correlate of DEB among adolescents with type 1 diabetes and show that self-efficacy can modify this association. Motivation and self-efficacy for healthy eating represent potential intervention targets to reduce DEB in adolescents with type 1 diabetes.

Keywords

disordered eating behaviors; type 1 diabetes; controlled motivation; autonomous motivation; self-efficacy; insulin restriction; Self-Determination Theory

Adolescents with type 1 diabetes demonstrate higher prevalence of eating disorders and disordered eating behaviors (DEB) than their peers without diabetes (1–3). DEB are unhealthy weight management behaviors such as skipping meals or intentional vomiting that may not be severe or frequent enough to be classified as a diagnosable eating disorder (1,4). In the context of type 1 diabetes, DEB may also include the use of insulin restriction or omission for weight loss, which can directly cause elevated blood glucose levels and hyperglycemic excursions (5). Consequently, even at subclinical levels, DEB can lead to adverse short-term (e.g., ketoacidosis) and long-term (e.g., neuropathy, retinopathy, clinical eating disorders) (1,3,6) health outcomes. Research is needed to elucidate risk factors for DEB to reduce adverse health consequences in this population.

During adolescence, DEB risk increases partly due to greater perceived importance of appearance and social comparisons (1,7). Body dissatisfaction often arises from a perceived inability to achieve others' standards of beauty; "others" could represent peers, family, or more abstract entities like societal expectations or media representations (8). In adolescents with type 1 diabetes, intensive insulin therapy is associated with weight gain (9), thus increasing the risk of body dissatisfaction (10,11), and insulin restriction for weight control (12). Daily disease management requires constant attention to diet and surveillance of the insulin-to-carbohydrate ratio, which may predispose adolescents to DEB and clinical eating disorders (13).

The influence of social comparisons and body dissatisfaction on DEB may be informed by Self-Determination Theory (SDT) (14), which posits that motivation to engage in a behavior ranges from highly external (controlled) to highly internal (autonomous). Controlled motivation is "other-determined", based on real or perceived influence of others, and reflects stronger extrinsic (e.g., improved appearance) than intrinsic (e.g., improved health) goals

(15). Conversely, autonomous motivation is “self-determined”, based on enjoyment or personal endorsement of the behavior, and reflects stronger intrinsic than extrinsic goals. Three studies have examined the association of controlled motivation with eating disorders (16–18). Among female college students, higher controlled motivation for food restriction was associated with more bulimic symptoms (16,17). Among adolescents with clinical eating disorders, eating disorder psychopathology over a 12-week intervention was inversely associated with baseline autonomous motivation for treatment, but was not associated with controlled motivation. Controlled motivation has also been positively associated with dietary rigidity (e.g., cutting out entire food groups) and focusing on quantity over quality of foods (19,20). However, the association of controlled motivation with DEB among youth with type 1 diabetes has not been examined.

While there is evidence suggesting a potential positive association of controlled with DEB, the degree to which it increases risk may depend on one’s level of healthy eating self-efficacy. Self-efficacy, a core construct in multiple health-behavior models referring to the belief that one has the ability to engage in the target behavior (21), is associated with more engagement in health behaviors including improved diet, better disease management, and improved diabetes self-care (21–24). Self-efficacy and controlled motivation are independently predictive of both healthful and disordered eating among adolescents (e.g., 20,25). However, if controlled motivation increases risk of DEB due to a perceived inability to meet “others” presumed standards of beauty food and thinness (16,17), then this association may be exacerbated in the presence of low healthy eating self-efficacy. Previous studies have not investigated whether healthy eating self-efficacy modifies the association of DEB with controlled motivation for healthy eating.

The purpose of this study was to examine associations of time-varying autonomous and controlled motivation with time-varying DEB among adolescents with type 1 diabetes in the context of an 18-month behavioral nutrition intervention, and to investigate whether baseline self-efficacy moderates these associations. We hypothesized that over 18 months, DEB would be associated positively with controlled motivation and negatively with autonomous motivation. We also hypothesized that the positive association of controlled motivation with DEB would be stronger for those with lower versus higher baseline self-efficacy for healthful eating, and the inverse association of autonomous motivation with DEB would be stronger for those with higher versus lower baseline self-efficacy.

Methods

Participants

This study is a secondary data analysis of a randomized clinical trial of a family-based behavioral nutrition intervention among youth with type 1 diabetes (*Cultivating Healthy Environments in Families with Type 1 Diabetes (CHEF)*; $n = 136$). As detailed elsewhere (26), eligibility criteria for the main trial included: age 8.0–16.9 years, diagnosis of type 1 diabetes ≥ 1 year, daily insulin dose ≥ 0.5 units per kilogram, most recent hemoglobin A1c $\geq 6.5\%$ and $\leq 10.0\%$, insulin regimen of ≥ 3 injections daily or use of insulin pump, at least one clinic visit in the past year, and ability to communicate in English. Criteria were chosen to ensure that participants had no residual insulin production and to exclude participants

with very poor glycemic control, who are unlikely to be ready for the additional effort required to change dietary intake. Exclusion criteria included daily use of premixed insulin, transition to insulin pump in the last three months, real-time continuous glucose monitoring use in the last three months, participation in another intervention study in the last six months, and presence of gastrointestinal disease such as celiac disease, multiple food allergies, use of medications that interfere significantly with diabetes management or glucose metabolism, or significant mental illness. Sample size for the larger study was based on power analyses for its main aims. This analysis includes only those participants who completed the disordered eating behavior questionnaire, which was administered only to participants who were aged 13 years or older ($n=90$) at some point in the study.

Design and Procedure

The study was conducted in the context of a behavioral nutrition intervention grounded in Social Cognitive Theory (21) and further informed by Self-Determination Theory (SDT) (14). The intervention included nine sessions employing behavioral techniques and educational content to promote increased intake of whole plant foods (i.e., fruit, vegetables, whole grains, legumes, nuts, and seeds) (26). The intervention did not target weight loss or disordered eating. The control condition was designed to provide equivalence on certain aspects of research contact unrelated to nutrition behavior, including an equal number of contacts with research staff and completion of identical assessments.

The study was conducted from August 2010 through May 2013 at an outpatient, free-standing, multidisciplinary tertiary diabetes center in Boston, Massachusetts. Assessments were conducted at baseline and six (near the end of the core intervention sessions), twelve (during booster sessions), and eighteen months (follow up). All study materials and procedures were approved by the institutional review boards of the participating institutions. All youth provided assent; parents and youth turning 18 during the trial provided written informed consent.

Measures

Self-Efficacy for Healthy Eating—This 8-item measure assesses perceived ability to eat healthfully (9). Responses are on a 5-point scale from “strongly disagree” to “strongly agree”; internal consistency is high ($\alpha = .91$). An example item is, “I am sure I can prepare a healthy meal for myself.” This measure has been validated in adolescents with type 1 diabetes (30) and was chosen specifically because it assesses overall healthy eating and not just aspects of healthy eating like fruit and vegetable consumption.

Self-Regulation Questionnaire (SRQ)—This 15-item measure assesses autonomous motivation, controlled motivation, and amotivation for healthy eating among youth. Responses ranged from “not at all true” to “very true” on a seven-point scale, with higher scores indicating greater autonomous motivation, controlled motivation, or amotivation. Both the autonomous ($\alpha = .84$) and controlled ($\alpha = .65$) motivation subscales demonstrated at least moderately high internal consistency but the three items assessing amotivation did not ($\alpha = .31$). Therefore, only the autonomous and controlled motivation subscales were used in the current analysis. Further, previous research (27) showed that five items from the

SRQ loaded moderately on both controlled and autonomous motivation; these items were also removed from analysis. The final measure included seven items (four autonomous motivation items and three controlled motivation items). All questions began with “The reason I would eat healthy foods is...” The four autonomous items were, “Because it’s important to me,” “Because I think it’s a good way to take care of myself,” “Because it’s a choice I really want to make for myself,” “Because of the good things it does for me.” The three controlled motivation items were, “Because I want others to be pleased with me,” “Because I feel pressure to eat healthy,” “Because I’d feel bad about myself if I did not.” A list of the questions used can be found in Table 1.

Disordered Eating—The Diabetes Eating Problem Survey-Revised (DEPS-R) includes 16 items that assess disordered eating behaviors among youth with type 1 diabetes age 13 years and older. Response options range from “never” to “always,” on a 6-point Likert scale, and address general (e.g. “I feel that my eating is out of control”) and diabetes-specific DEB (e.g. “I try to keep my blood sugar high so that I will lose weight”). Scores can range from zero to eighty and higher scores indicate greater endorsement of DEB. The DEPS has previously demonstrated good psychometric properties and is associated with worse diabetes management (28).

Demographic Data—Adolescent height, weight, gender and age were collected through medical record review. Parents reported information on education level, household income and number of people in the home. The poverty income ratio (PIR) was calculated as reported household income divided by the 2008 US census poverty threshold for household size and composition adjusted for inflation (29). Higher PIR indicates greater income relative to the poverty threshold.

Data Analysis

Linear mixed effects models tested the associations of time-varying controlled and autonomous motivation with time-varying DEB. There was no intervention effect on DEB (data not shown); however, all analyses controlled for treatment group. Additional covariates included age, gender, parent education, and family PIR.

To determine whether healthy eating self-efficacy moderated the associations of controlled and autonomous motivation with DEB, self-efficacy and the interaction of self-efficacy with controlled or autonomous motivation were added into the model. To interpret any significant interactions, simple slopes analyses were run using a median split on baseline self-efficacy, and assessing the association of controlled and autonomous motivation with disordered eating for those with higher versus lower self-efficacy. For the simple slopes analysis, baseline self-efficacy scores were used to create the two unique groups in which interactions with controlled and autonomous motivation were examined. SPSS version 22 was used for all analyses.

Results

Of those invited to participate in the main study, 24% provided informed consent; of these old enough to be included in this analysis, only one failed to complete all four sessions. Sample characteristics and bivariate correlations are presented in Tables 2 and 3 respectively. DEB were positively correlated with controlled motivation, negatively correlated with self-efficacy and uncorrelated with autonomous motivation. Autonomous and controlled motivation were positively correlated with each other.

In linear mixed effects models, DEB were associated with controlled ($B=2.18\pm.33$, $p<.001$), but not autonomous motivation ($B=-.70\pm.43$, $p=.11$) to eat healthfully. There was also a statistically significant interaction of controlled motivation by self-efficacy to eat healthfully on DEB ($B=-1.04\pm.40$, $p=.01$). Simple slopes analysis indicated that the association of controlled motivation with DEB was stronger for those with lower self-efficacy ($B=3.33\pm.55$, $p<.001$) than those with higher self-efficacy ($B=1.36\pm.36$, $p<.001$) (Figure 1) although significant for both groups. There was no significant interaction of autonomous motivation by self-efficacy on DEB ($B=-.84\pm.55$, $p=.12$); neither age nor sex moderated the association of controlled motivation with DEB (all p -values $>.10$)

Discussion

DEB are more prevalent among adolescents with type 1 diabetes than in the general population, and because they can interfere with diabetes management, have more serious health implications (2,6). While two studies have shown an association of controlled motivation with eating disorders in non-diabetic youth (16,17), to our knowledge, this is the first study to examine whether findings regarding the association of controlled motivation with clinical eating disorders are generalizable to more commonly occurring DEB among youth with type 1 diabetes, and whether self-efficacy modifies these associations.

As hypothesized, controlled motivation for healthy eating was associated with DEB across the 18-month study. Examining the goals that underlie controlled motivation may facilitate understanding its association with DEB. If controlled motivation reflects stronger appearance-focused (extrinsic) and weaker health-focused (intrinsic) goals for weight loss, this may explain why youth with type 1 diabetes show greater susceptibility to DEB. Intensive insulin therapy may promote weight gain (12); consequently, some adolescents may perceive a conflict between diabetes management and weight management goals. This could increase the perceived need to risk health in order to satisfy appearance goals rather than trying to satisfy both simultaneously. Accordingly, future research should investigate how to influence the strength of health versus appearance goals and whether change in differential strength of health vs. appearance goals influences controlled and autonomous motivation. If so, intervention research could examine whether shifting focus from appearance to health-focused goals reduces controlled motivation and, ultimately, DEB. Researchers and clinicians could achieve this shift by executing a multi-pronged approach aimed to improve body image, self-worth and media literacy (30–32) such as that recommended by McVey and colleagues (30). Further, adopting a healthful diet that

promotes both weight and diabetes management may also help youth with type 1 diabetes understand that they can accomplish both goals (33).

Contrary to our hypothesis, DEB was not associated with autonomous motivation. Previously, we observed that autonomous motivation was associated with healthful eating in this sample, while controlled motivation was not (34). Taken together, findings indicate differential roles of autonomous and controlled motivation in healthful eating versus DEB. Some methods of assessing autonomous and controlled motivation conceptualize the constructs as alternate ends of the same spectrum (35). Others treat them as distinct constructs, specifically recognizing that people can be simultaneously high in both controlled and autonomous motivation (36). In this study, bivariate analyses showed a positive, rather than negative, association between autonomous and controlled motivation, further supporting the latter conceptualization and suggesting that the association of controlled and autonomous motivation may be differentially associated with various diet-related outcomes.

As hypothesized, the association of controlled motivation with DEB was stronger among adolescents with lower self-efficacy. Research on diabetes adherence suggests that both self-efficacy and motivation for diabetes management may be enhanced when parents and healthcare providers provide care that is autonomy-supportive (providing choice, positive feedback and meaningful rationale for action) rather than controlling (providing pressure or coercive measures) (37). Similarly, promoting healthy eating using autonomy-supportive, rather than controlling, means may promote higher autonomous motivation and self-efficacy for healthful eating, potentially minimizing the adverse effect of controlled motivation on DEB. The question of whether associations with diabetes management broadly generalize to specific behaviors like healthful eating warrants examination. Future studies should examine whether autonomy-supportive environments also indirectly reduce controlled motivation.

Neither sex nor age were significantly associated with DEB after adjusting for self-efficacy or motivation nor did either modify the association of controlled motivation with DEB. This suggests that both girls and boys as well as younger and older adolescents could be at similar risk for DEB in the presence of strong controlled motivation to eat healthfully. However, we were limited in our ability to fully examine differences in association by age because of our limited age range (13–16 years).

Study findings should be interpreted in light of limitations. Caution in generalizing findings is warranted because of the sample's sociodemographic characteristics (e.g., primarily white, drawn from a single clinic), and the 24% recruitment rate, which could reflect systematic differences between participants and those who declined to participate on characteristics such as motivation or self-efficacy to change diet. Further, this investigation was conducted in the context of an efficacy trial of an intervention aimed at improving diet quality. While the intervention did not address DEB or weight loss, and analyses adjusted for treatment group, the study context may have influenced results in some way that we did not anticipate or measure. It should also be noted that the non-diabetes specific items primarily assess behaviors associated with bulimia or binge eating disorder (e.g., vomiting, out-of-control eating) but only one item assesses anorexia-specific behaviors (e.g., eating too little).

As such, this measure is likely a poor screener for anorexia nervosa-like behaviors. Finally, because the primary aim of the study was not weight management, we did not specifically assess motivation or self-efficacy for weight management, which may have differential associations with DEB.

This study demonstrated that controlled but not autonomous motivation was associated with DEB among adolescents with type 1 diabetes and that self-efficacy modified this association. Notable strengths include the study's longitudinal design, which allowed for greater statistical power to detect associations. The DEB measure was designed specifically for adolescents with type 1 diabetes and assesses a broad range of general and diabetes-specific DEB. By examining the potential interaction of controlled motivation with self-efficacy, findings identify two potential paths to reducing DEB: changing controlled motivation directly or mitigating the effect of controlled motivation on DEB by increasing self-efficacy. Findings from this study apply SDT to identify novel correlates of DEB among youth with type 1 diabetes and potential targets for intervention to reduce these dangerous behaviors.

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Implications and Contribution

Disordered eating behaviors (DEB) are more common yet also more dangerous when adolescents have type 1 diabetes. Findings highlight the longitudinal association of controlled but not autonomous motivation with DEB and the moderating role of self-efficacy, highlighting potential interventions targets to identify and reduce DEB in this population.

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Figure 1. Self-efficacy moderates the influence of controlled motivation on disordered eating behaviors * $p<.05$, ** $p<.01$, *** $p<.001$

Table 1

Youth with type 1 diabetes Self-Regulation Questionnaire for healthful eating

<i>The following statements are different reasons why you might choose to eat healthy foods (like vegetables, fruit, whole grains, and beans). For each item, choose the ONE answer that best describes how true that reason is for you.</i>						
<i>The reason I would eat healthy foods is...</i>	Not at all true			Somewhat true		Very true
1. Because it's important to me	1	2	3	4	5	6
2. Because I think it's a good way to take care of myself	1	2	3	4	5	6
3. Because it's a choice I really want to make for myself	1	2	3	4	5	6
4. Because of the good things it does for me	1	2	3	4	5	6
5. Because I want other to be pleased with me	1	2	3	4	5	6
6. Because I feel pressure to eat healthy	1	2	3	4	5	6
7. Because I feel bad about myself if I did not	1	2	3	4	5	6

Table 2

Baseline sample characteristics of youth with type 1 diabetes

All Participants (N=90)	
Demographics	Mean $\pm$ SD or N (%)
Treatment assignment	
Intervention	42 (46.7)
Control	48 (53.3)
Age (years) at enrollment	13.8 $\pm$ 1.6
Sex	
Male	44 (48.9)
Female	46 (51.1)
Race/ethnicity	
White, non-Hispanic	82 (91.1)
Hispanic	7.0 (7.8)
Black, non-Hispanic	1.0 (1.1)
Highest parent education level	
High school or equivalent	6.0 (6.7)
Junior college, technical or some college	15 (16.6)
College degree	33 (36.7)
Graduate education	36 (40.0)
Family poverty income ratio [†]	5.6 $\pm$ 3.3
Duration of Diabetes (years)	6.7 $\pm$ 3.34
Body mass index (kg/m ²)	22.7 $\pm$ 4.0
Disordered eating behaviors [*]	12.4 $\pm$ 10.1
Self-efficacy for healthy eating	3.9 $\pm$ 0.6
Autonomous motivation for healthy eating	5.2 $\pm$ 1.3
Controlled motivation for healthy eating	2.8 $\pm$ 1.4

[†]Missing data from 2 participants on family income.

^{*}Missing data for 24 participants who were not yet 13 years of age at baseline.

Table 3

Baseline bivariate associations

	Controlled Motivation	Disordered Eating Behaviors	Controlled Motivation	Autonomous Motivation	Self-Efficacy	BMI	Age	Parent Education	Sex
Controlled Motivation	0.63 ***								
Autonomous Motivation	−0.06		0.26 *						
Self-Efficacy	−0.33 **		0.04	0.42 ***					
Body Mass Index	0.21		0.12	0.18	0.15				
Age	0.21		−0.05	0.06	0.09	0.30 **			
Parent Education	0.04		0.20	−0.03	0.16	−0.07	0.11		
Sex	.24 ***		.21 ***	.22 ***	.21 ***	.03	.08	.04	
Poverty Income Ratio	−0.05		0.14	0.05	0.21	−0.07	0.19	0.60 **	−.12 *

* p<.05,

** p<.01,

*** p<.001