Parent healthful eating attitudes and motivation are prospectively associated with dietary quality among youth with type 1 diabetes

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Abstract

A family-based behavioral nutrition intervention grounded in Social Cognitive and Self-Determination Theories showed an increased intake of whole plant foods. This study examined 1) whether the intervention changed parent diet-related attitudes/beliefs, 2) whether these attitudes/beliefs were associated with youth diet quality, and 3) the moderating roles of youth age and parent nutritional knowledge. Youth with type 1 diabetes and their parents (n = 136, mean ± SD youth age = 12.6 ± 2.8 years) participated in an 18-month trial targeting intake of whole plant foods. Parents reported attitudes/beliefs (self-efficacy, outcome expectations, perceived barriers, autonomous and controlled motivation) for providing healthy food to their families, and type 1 diabetes-specific nutrition knowledge at 6, 12, and 18 months. Whole Plant Food Density (WPFD; cup or ounce equivalents per 1000 kcal of whole grains, fruit, vegetables, legumes, nuts and seeds) was calculated from 3-day youth food records. Linear mixed models estimated the intervention effect on parent attitudes/beliefs, associations of parent attitudes/beliefs with youth WPFD and the moderating roles of parent nutrition knowledge and youth age. There was no effect of the intervention on parent attitudes/beliefs. Across groups, higher parent self-efficacy and autonomous motivation were positively associated with youth WPF. Parent perceived barriers and negative outcome expectations were inversely associated with youth WPFD, especially when parents had higher nutrition knowledge. Youth age did not modify any associations. Parent diet-related attitudes/beliefs were associated with youth diet quality, highlighting the importance of parent psychosocial factors across this age range. Despite a positive effect on youth diet, the intervention did not affect parent attitudes/beliefs, suggesting it worked through a different mechanism.

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Keywords

diet; type 1 diabetes; nutrition knowledge; self-efficacy; outcome expectations; perceived barriers; autonomous motivation; adolescents

Introduction

Eating healthfully is critical for promoting optimal long-term health among youth with type 1 diabetes (T1D) (Smart, Aslander-van Vliet, & Waldron, 2009). Medical nutrition therapy includes education on healthful eating, carbohydrate estimation, and carbohydrate intake from low-fat milk and whole plant foods (fruits, vegetables, whole grains, and legumes) (ADA, 2008; Bantle et al., 2008). Despite this, plant food intake among youth with T1D is below recommendations while intake from saturated fats, sweets and refined grains is high, increasing risk of adverse health outcomes (Mehta, Volkening, Quinn, & Laffel, 2014; Nansel, Haynie, Lipsky, Laffel, & Mehta, 2012; Patton, 2011; Rovner & Nansel, 2009; Rovner et al., 2012). This presents a need to identify factors associated with improved diet quality in this population. Previous research indicates that parents influence their children's diets by modelling dietary habits and regulating access to food in the home (Videon & Manning, 2003). Additionally, while diet-related attitudes and beliefs delineated by Social Cognitive Theory (SCT) and Self-Determination Theory (SDT) impact one's own diet (e.g., Anderson, Winett, & Wojcik, 2007; Teixeira, Patrick, & Mata, 2011), less is known about how these parent psychosocial factors impact their children's diets.

SCT posits that people learn and acquire behaviors by observing others and that this process relies on self-efficacy (the belief that one has the ability to engage in the target behavior), outcome expectations (perceived positive and negative consequences of the behavior) and perceived barriers (factors inhibiting the behavior; Bandura, 1977; Bandura, 2001). Theoretically, the target behavior results from high self-efficacy and positive outcome expectations and low perceived barriers and negative outcome expectations (Bandura, 1977, 2001). These attitudes are associated with one's own healthful eating in adults, college students, and children (Anderson-Bill, Winett, & Wojcik, 2011; Anderson et al., 2007; Bruening, Kubik, Kenyon, Davey, & Story, 2010; Resnicow et al., 1997; Strachan & Brawley, 2009), and parent self-efficacy is associated with young children's healthful eating (Campbell, Hesketh, Silverii, & Abbott, 2010). However, no research has examined the influence of parent psychosocial factors on diet quality of older children and adolescents, and their importance in families of youth with T1D is unclear.

According to SDT, behaviors are influenced by the degree to which motivation is internalized. Behaviors such as healthy dietary intake are more likely when they are motivated by one's own volition ("autonomous motivation") (Teixeira et al., 2011), as opposed to when motivated by external sources such as to garner approval or to avoid feeling guilty ("controlled motivation") (E L Deci & Ryan, 2008). Autonomous, compared to controlled, motivation is associated with reducing fat intake and increasing fruit and vegetable consumption in adults in the general population (Fuemmeler et al., 2006; Teixeira et al., 2011). Additionally, among adolescents with T1D, autonomous motivation is

associated with better diabetes self-care (e.g., adherence to recommended caloric intake, adding high-fibre foods to meals, limiting sweets and deserts; Austin, Senécal, Guay, & Nouwen, 2011). Alternatively, controlled motivation is associated with less healthful eating and more disordered eating behaviors (Eisenberg, Lipsky, Dempster, Liu, & Nansel, In Press; Leong, Madden, Gray, & Horwath, 2012). Given the influence of parent modelling and home food access on youth diet (Larsen et al., 2015), SDT would posit that stronger autonomous motivation for serving healthful foods would be associated with better youth diet quality.

Additionally, the interplay of nutrition knowledge with parent psychosocial factors is not known. For families of youth with T1D, relevant aspects of nutrition knowledge include healthful eating, nutrition label reading, carbohydrate counting, and blood glucose response to food (Rovner et al., 2012). Nutrition knowledge is a necessary but not sufficient precursor for dietary behavior change (Axelson, Federline, & Brinberg, 1985; Hoelscher, Evans, Parcel, & Kelder, 2002). This suggests that the effect of parent psychosocial factors on youth diet quality would be contingent on parents' level of nutrition knowledge, whereby positive parental attitudes and beliefs about providing healthy foods to their families would be associated with better youth diet quality, only given sufficient nutrition knowledge for effectively carrying out these intentions.

An 18-month efficacy trial of a family-based behavioral nutrition intervention for youth with type 1 diabetes grounded in SDT and SCT showed increased intake of whole plant foods compared to the control group (Nansel et al, 2015). The aims of this study were to examine the intervention effect on parent SDT and SCT-based attitudes and beliefs and the overall relationship of parent attitudes and beliefs with youth diet quality. The study hypotheses were:

1. Parents in the intervention group will report higher self-efficacy, positive outcome expectations, and autonomous motivation and lower negative outcome expectations, perceived barriers, and controlled motivation than parents in the control group.

2. Higher parent self-efficacy, positive outcome expectations, and autonomous motivation and lower negative outcome expectations, perceived barriers, and controlled motivation will be associated with better youth diet quality across intervention groups..

3. Associations of parent attitudes and beliefs with youth diet quality will be stronger when parent nutrition knowledge is high (versus low).

Methods

Participants

Single parent-youth dyads (n = 136) participated in a randomized controlled trial of a family-based behavioral nutrition intervention, described previously (Nansel et al., 2015). Eligibility criteria for youth included age 8.0-16.9 years, diagnosis of T1D   1 year, daily insulin dose   0.5 units per kilogram, 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. 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. It was also required that participants' most recent hemoglobin A1C be 6.5% and 10.0% in order to avoid asking those already struggling to manage the essential diabetes tasks required for moderate glycemic control to extend added effort to improve healthful eating.

Design

The study employed a two-group design with one control group and one group participating in a behavioral nutrition intervention grounded in SCT (Bandura, 1977) and SDT (E.L. Deci & Ryan, 2000). Randomization was stratified by age (<13 years and 13 years), A1C (<8.5% and 8.5%), and insulin regimen (injection and insulin pump), with a permuted block randomization scheme. Randomization was conducted by the data coordinating centre; research team members with direct involvement in recruitment and enrolment did not have access to randomization schedules.

Procedures

The study was conducted from August 2010 through May 2013 at an outpatient, free-standing, multidisciplinary tertiary diabetes centre in Boston, Massachusetts. At baseline, six, twelve, and 18 months, parents completed all self-report measures. Families completed three-day youth diet records at each of these time-points as well as 3 and 9 months (which were not used in these analyses). 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.

Intervention

The intervention comprised nine in-person sessions led by trained research assistants that included behavioral techniques and educational content to promote increased intake of whole plant foods. It covered a broad scope of behaviors to facilitate skill building and engagement with educational information (Nansel et al., 2015). The intervention focus for parents was on improving the family food environment, including availability of healthful foods in the home at at meals, increasing family meals, and food choices outside the home. Participants in the control condition received an equal number of contacts with research staff (such as case management within the diabetes health care system) and completed identical assessments. Each session involved one single parent-youth dyad.

Sessions were tailored specifically to target parent outcome and efficacy expectations as well as increase autonomous motivation for consuming whole plant foods. To address outcome and efficacy expectations, families identified strategies to improve diet quality and personal motivators for healthful eating. Sessions also included hands-on activities, tailored family-based goal setting, monitoring and reinforcement for success, and practice through role

plays regarding difficult social settings (Bandura, 2004; Brown et al., 2012; Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Michie et al., 2011). Motivational interviewing (e.g., Knight, McGowan, Dickens, & Bundy, 2006; Taylor et al., 2010) was used to enhance autonomous motivation by allowing participants to examine and build their own reasons for change. Motivational interviewing is a directive, client-centered counselling style for eliciting behavior change that helps participants explore and resolve ambivalence. Although the intervention was grounded in SCT and SDT, none of these parent psychosocial variables have been evaluated in the context of this intervention yet.

Measures

Self-Efficacy for Healthy Eating—This 11-item measure assesses parents' perceived ability to provide healthful foods for the family (Nansel et al., 2013). Responses are on a 5-point scale from "strongly disagree" to "strongly agree"; internal consistency is high (α=.91). An example item is, "I am sure I can serve whole grain foods that my family will like."

Outcome Expectations for Healthy Eating—This 14-item measure assesses parents' perceived positive and negative consequences of providing healthy foods to their family (Nansel et al., 2013). Responses are on a 5-point scale from "strongly disagree" to "strongly agree." The measure includes subscales for positive and negative outcome expectations. Both the positive (α=.85) and negative (α=.85) subscales showed high internal consistency. An example of a positive outcome expectation is, "It would help my family manage their weight." An example of a negative outcome expectation is, "My family would not enjoy the food."

Barriers to Healthy Eating—This 7-item measure assesses perceived obstacles (i.e., environmental or skill impediments) that parents encounter when providing healthy foods to their families (Nansel et al., 2013). Responses are on a 5-point scale from "strongly disagree" to "strongly agree"; internal consistency is good (α=.81). A sample question is "My family is so busy that it's hard to eat healthy."

Treatment Self-Regulation questionnaire (TSRQ)—This 15-item measure assesses autonomous motivation, controlled motivation, and amotivation for eating healthfully (Williams, Grow, Freedman, Ryan, & Deci, 1996). For the current study, the measure was modified to query motivation for providing healthful diet to the family. Responses were on a 7-point scale ranging from "not at all true" to "very true," with higher scores indicating greater autonomous motivation, controlled motivation, or amotivation. Both the autonomous (α=.85) and controlled (α=.85) subscales demonstrated high internal consistency, but the three items assessing amotivation did not ($\alpha = .37$) and so were not used in the current analysis. Previous research showed that two items from the controlled motivation subscale loaded moderately on both controlled and autonomous motivation (Quick, Nansel, Lipsky, Laffel, & Mehta, 2015); these items were also removed from analysis. The final measure included 10 items (six autonomous motivation items and four controlled motivation items). All questions began with "The reason I would provide healthy food for the family is…" an example of an autonomous motivation question is, "Because I want to take responsibility for

my family's health." An example of a controlled motivation question is, "Because others would be upset with me if I did not."

Parent Nutrition Knowledge—This 23-item questionnaire covers content areas including healthful eating, carbohydrate counting, blood glucose response to food, and nutrition label reading (Rovner et al., 2012). The measure has shown acceptable internal consistency (KR-20 = 0.59) and association with dietary intake. Higher scores reflect greater nutrition knowledge (score range is 0-100%). An example question is, "which of the following are benefits of eating fruits and vegetables?" with response options of "good source of fibre; low in fat; good source of vitamins and minerals; and all of these."

Dietary intake—Families completed three-day youth food records together following instruction on accurately measuring and reporting food and beverage intake. Scales, measuring cups, and spoons were provided to all participants to facilitate portion-size estimation. Participants were reminded to include all necessary details for each food item including brand names. Research staff reviewed the records and contacted participants if needed to solicit any missing necessary information. Records were analysed using Nutrition Data System for Research (Nutrition Coordinating Centre, University of Minnesota, and Minneapolis, MN, USA). Diet quality was measured by calculating Whole Plant Food Density (WPFD), the sum number of cup or ounce equivalents per 1000 kcal of whole grains, whole fruit, vegetables, legumes, nuts, and seeds (Lipsky, Cheon, Nansel, & Albert, 2012). This measure was used based on its consistency with food groups targeted by the intervention and specified in the psychosocial measures.

Clinical and Demographic Data—Youth biomedical data were collected through medical record review. Youth age at baseline was dichotomized as pre-adolescent (12 years of age or younger) or adolescent (older than 12 years) (CDC, 2015; Valkenburg, 2011). Parents reported 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 (*Poverty Thresholds 2008*, 2010). Higher PIR indicates greater income relative to the poverty threshold.

Analysis

The intervention effect on each of the parent psychosocial variables was tested using linear mixed effects models. A series of models estimated the association of each time-varying psychosocial variable with time-varying youth WPFD, adjusting for treatment group, youth age, sex, parent education, and PIR, since these are all theoretically associated with youth diet quality. Multiplicative interaction terms were used to test whether parent nutrition knowledge moderated the associations of parent psychosocial variables with youth diet quality. Interpretation of any significant interactions with parent psychosocial factors was based on simple slopes analyses using a median split on nutrition knowledge. Because the sample spanned a large developmental age range, posthoc linear mixed effects models tested whether associations of parent psychosocial variables with youth WPFD were moderated by youth age.

Results

Of those invited to participate, 24% provided informed consent and 22% completed baseline assessment. Subject retention through study completion was 92% and all of the withdrawals were from the intervention group (Figure 1). Baseline characteristics were well-balanced between groups for parents and youth (Table 1). There was no intervention effect on any of the parent psychosocial variables (*p-values*>.10). Bivariate correlations between variables are in Table 2.

Across intervention groups, greater parent self-efficacy (B=.21, *p*=.02), autonomous motivation (B=.17, *p*=.002), and nutrition knowledge (B=.01, *p*=.03) as well as lower barriers (B=-.19, *p*=.02) and negative outcome expectations (B= −.20, *p*=.008) were associated with greater youth WPFD. Parent positive outcome expectations (B=.07, *p*=.45) and controlled motivation (B=-.03, *p*=.56) were not associated with youth WPFD.

Significant interactions of parent nutrition knowledge with healthy eating barriers (B=-.02, *p*=.001) and negative outcome expectations (B=−.02, *p*=.008) were observed (Figures 1). Simple slopes analysis revealed that parent healthy eating barriers were inversely associated with youth diet quality for parents with higher nutrition knowledge (B=-.32, *p*=.005), but there was no association for those with lower nutrition knowledge (B=-.09, *p*=.42). Similarly, parent negative outcome expectations was inversely associated with youth WPFD for parents with higher nutrition knowledge (B=-.32, *p*=.001), but not those with lower nutrition knowledge (B=-.18, *p*=.08). There were no significant interactions of parent nutrition knowledge with self-efficacy, autonomous motivation, or controlled motivation on youth WPFD (*p-values*>.37).

Youth age did not modify associations of parent psychosocial variables with youth WPFD (*p-values*>.12), suggesting no difference in the influence of each psychosocial variable with diet quality for adolescents vs. pre-adolescents.

Given the lack of an intervention effect on parent attitudes and beliefs, post-hoc analyses were conducted using separate linear mixed effects models to test the effect of the intervention on youth attitudes and beliefs. All analyses were identical to those run for the parents. Results showed no significant effect of the intervention on any youth attitudes/ beliefs (all *p*-values >0.23).

Discussion

This study examined whether the previously shown (Nansel, 2015) positive effect of a behavioral nutrition intervention grounded in SDT and SCT on youth diet quality is explained by changes in parent attitudes and beliefs. Contrary to our hypothesis, there was no effect of the intervention on any of the attitudes/beliefs. Thus, while the intervention did improve youth intake of whole plant foods (Nansel et al., 2015), this effect was not through the pathway of these theoretically-driven constructs. This conclusion is further supported by the lack of an effect on any of the youth attitudes/beliefs.

However, youth diet quality was associated positively with parent self-efficacy and autonomous motivation, and negatively with parent perceived barriers and negative outcome expectations, partially supporting hypothesis two. In contrast, neither positive outcome expectations nor controlled motivation was associated with youth diet quality. The association of youth diet quality with negative but not positive outcome expectations may indicate that parents' outcome expectations work as an inhibitor, rather than a motivator of youth healthy diet. The lack of an association between controlled motivation and youth diet quality is consistent with previous findings that autonomous motivation is a relatively stronger predictor of healthful eating (Pelletier & Dion, 2007; Teixeira et al., 2011).

The hypothesis that parent nutrition knowledge would moderate the association between parent psychosocial variables and youth dietary quality was partially supported. Inverse associations of youth diet quality with parent perceived barriers and negative outcome expectations were observed only when parent nutrition knowledge was high, suggesting that efforts to improve youth diet quality by reducing parent perceived barriers and negative outcome expectations may be more impactful when coupled with nutrition education.

There was no significant interaction of youth age with any parent psychosocial variable, indicating that parent's attitudes and beliefs regarding providing healthy food to their families influence youth diet throughout pre-adolescence and adolescence. This emphasizes the importance of parents when targeting youth diet quality. While adolescents, compared to pre-adolescents, may be less dependent on parents and more dependent on peers in their food choices, research shows that parents may continue influencing youth diet into adolescence, but due to behavioral modelling (Pedersen, Grønhøj, & Thøgersen, 2014) and parent social support (Piko & Brassai, 2009).

For youth with T1D, dietary intake is important for disease management and prevention of long-term complications, yet little research has examined how to improve dietary quality most effectively among this high-risk population. The current study tested whether the improvement in diet quality shown in the intervention group (Nansel et al., 2015) was driven by parents' attitudes/beliefs. It could be hypothesized that parent attitudes/beliefs would mediate the intervention's effect on youth diet quality, but our findings do not support this since the intervention had no effect on parent or youth attitudes/beliefs. Results highlight the difficulty in changing these attitudes/beliefs through intervention, despite these variables being associated with diet quality across conditions. This supports previous research showing an intervention effect on diet quality, but not always through the hypothesized psychosocial pathways (Burke, Dunbar-Jacob, Orchard, & Sereika, 2005; Glasgow, Toobert, Mitchell, Donnelly, & Calder, 1989; Spahn et al., 2010) and may reflect a possible inadequacy of these behavioral theories or the interventions based on these theories with respect to dietary change (Weinstein, 2007), at least in this specific population.

Study findings should be interpreted in light of the strengths and limitations. The longitudinal nature of the study is a considerable strength due to additional statistical power to detect associations, as are the three-day diet records which are among the most reliable and valid measures of dietary intake. While food records are susceptible to measurement error associated with reactivity bias, errors of self-assessment (e.g., portion size estimation),

and social desirability bias, a number of steps were taken to mitigate measurement error in the food records like providing participants with instructions and tools to make their records as accurate and complete as possible, reviewing completed records upon receipt from the family to ensure completeness, and soliciting missing information from the family as needed. Generalizability was limited because participants were primarily white, drawn from a single clinic with a limited number of low-income families, and, despite the relatively high retention rate, reflect a 24% recruitment rate. The positive skew of some psychosocial variables may have created a ceiling effect, limiting the ability to detect an intervention effect.

Despite recommendations to consume a healthful diet, youth with T1D consume diets high in foods of minimal nutritional value and low in whole plant foods, markedly similar to the general population. This study examined the importance of parent food-related attitudes/beliefs, specifically those deriving from SCT and SDT, on the diet quality of youth with type 1 diabetes in the context of an 18-month behavioral nutrition intervention. Findings support the associations of already-held parent self-efficacy, perceived barriers, negative outcome expectations, and autonomous motivation with diet quality of youth with T1D across pre-adolescence and adolescence, especially among those with high nutrition knowledge. Findings also highlight the challenge of changing these already-held attitudes and beliefs among parents of youth with T1D and suggest that additional research is warranted to modify and refine behavioral theories to drive interventions more effectively. Recognizing and better understanding the role of parent attitudes, beliefs, and nutrition knowledge may improve youths' diet quality and overall, long-term health.

Acknowledgments

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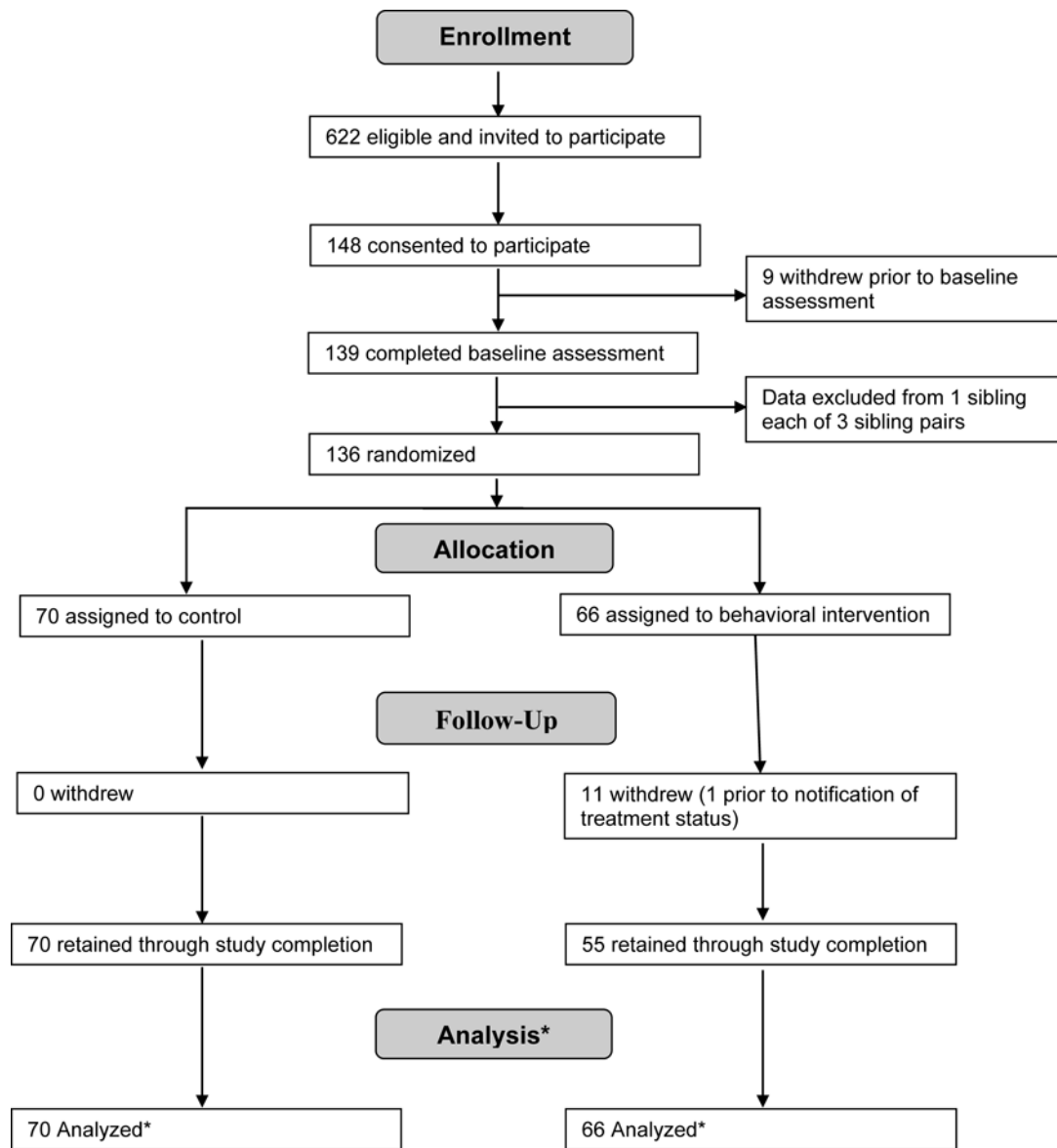
*Longitudinal analyses include all available data from each subject through withdrawal or study completion

Figure 1.
Participant Flow through a Randomized Clinical Trial of a Behavioral Nutrition Intervention for Adolescents and Pre-adolescents with Type 1 Diabetes.
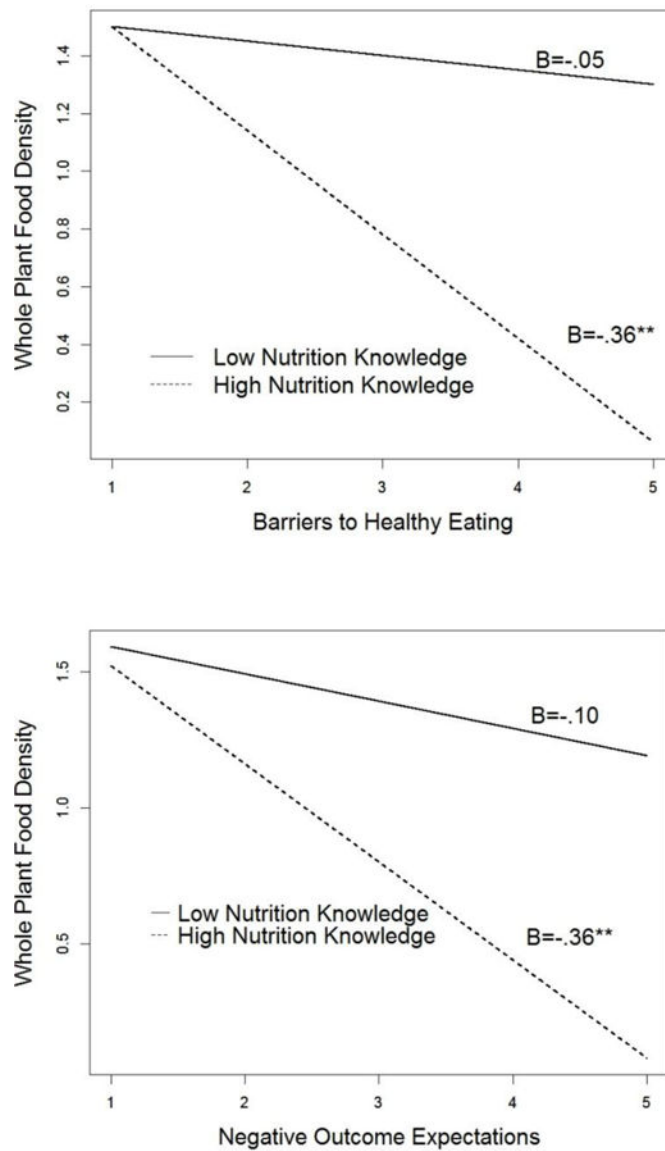
Figure 2.
Nutrition knowledge moderates the influence of perceived barriers a healthy eating on diet quality and the influence of negative outcome expectations of healthy eating on diet quality.

Table 1

Baseline sample characteristics of youth with type 1 diabetes participating in a behavioral nutrition intervention efficacy trial

	All Participants (N=136)	Treatment (N=66)	Control (N=70)	p-value*
Youth Sample Characteristics				
Demographics	**Mean ± SD or N (%)**	**Mean ± SD or N (%)**	**Mean ± SD or N (%)**	
Age (years)	12.8±2.6	12.6±2.7	13.0±2.5	0.27
Sex				
Male	66 (48.5)	35 (53.0)	31 (44.3)	0.31
Female	70 (51.5)	31 (47.0)	39 (55.7)	
Race/ethnicity				
White, non-Hispanic	123 (90.4)	58 (87.9)	65 (92.9)	0.17
Hispanic	7 (5.2)	6 (9.1)	1 (1.4)	
Black	5 (3.7)	2 (3.0)	3 (4.3)	
Other	1 (0.7)	0 (0.0)	1 (1.4)	
Duration of diabetes (years)	6.0±3.1	5.6±2.5	6.3±3.6	0.15
BMI z-score	0.68±0.82	0.65±0.81	0.71±0.84	0.65
Whole plant food density	1.89±0.09	1.87±0.13	1.91±0.13	0.84
Parent Sample Characteristics				
Relationship to child				
Mother	115 (84.6)	54 (81.8)	61 (87.1)	0.30
Father	17 (12.5)	10 (15.2)	7 (10.0)	
Stepmother	1(0.7)	1 (1.5)	0 (0)	
Stepfather	1(0.7)	1 (1.5)	0 (0)	
Other	2 (1.5)	0 (0)	2(2.9)	
Race/ethnicity				
White, non-Hispanic	123 (90.4)	58 (87.9)	65 (92.9)	0.17
Hispanic	7 (5.2)	6 (9.1)	1 (1.4)	
Black	5 (3.7)	2 (3.0)	3 (4.3)	
Other	1 (0.7)	0 (0.0)	1 (1.4)	
Highest parent education level				
High school or equivalent	8 (5.9)	4 (6.1)	4 (5.7)	0.48
Junior college, technical or some college	27 (19.9)	11 (16.7)	16 (22.9)	
College degree	46 (33.8)	20 (30.3)	26 (37.1)	
Graduate education	55 (40.4)	31 (47.0)	24 (34.3)	
Family poverty income ratio[†]	5.2±3.1	5.5±3.2	4.9±3.0	0.23
Parent BMI	28.89±7.37	28.31±8.07	29.42±6.68	0.39
Whole plant food density	1.89±0.09	1.87±0.13	1.91±0.13	0.84
Self-efficacy	3.98±0.57	4.03±0.60	3.94±0.55	0.36
Healthy eating barriers	1.95±0.70	1.87±0.67	2.03±0.72	0.19
Positive outcome expectations	4.21±0.51	4.23±0.56	4.20±0.47	0.69
Negative outcome expectations	2.31±0.72	2.22±0.73	2.41±0.70	0.12

	All Participants (N=136)	Treatment (N=66)	Control (N=70)	p-value*
Autonomous motivation	6.00±0.94	6.05±0.84	5.97±1.03	0.62
Controlled motivation	2.89±1.03	2.71±0.89	3.06±1.12	0.05
Nutrition knowledge	79.64±9.54	79.75±9.30	79.54±9.83	0.90

Table 2

Bivariate Correlations between Study Variables by Treatment Group

	1	2	3	4	5	6	7	8	9
				Treatment group (N = 66)					
1. Age	—								
2. WPFD	.07	—							
3. Healthy Eating Barriers	-.02	-.10	—						
4. Self-efficacy	-.08	.07	-.61***	—					
5. Positive Outcome Expectations	-.07	-.16	-.05	.21†	—				
6. Negative Outcome Expectations	-.02	-.14	.63***	-.67***	-.08	—			
7. Autonomous Motivation	-.05	.03	-.23*	.37**	.40**	-.31*	—		
8. Controlled Motivation	-.12	-.15	.21†	-.18	.19	.22†	.15	—	
9. Amotivation	-.04	.06	.21	-.13	-.10	.16	-.43***	.01	—
10. Nutrition knowledge	.03	.02	-.06	-.16	.05	-.06	.07	.00	-.28*
				Control Group (N = 70)					
1. Age	—								
2. WPFD	.22†	—							
3. Healthy Eating Barriers, Parent	-.01	-.20	—						
4. Self-efficacy	.02	.14	-.63***	—					
5. Positive Outcome Expectations	-.00	.16	-.35**	.39**	—				
6. Negative Outcome Expectations	-.11	-.31**	.67***	-.73**	-.29*	—			
7. Autonomous Motivation	-.14	.18	-.36**	.36**	.33**	-.29*	—		
8. Controlled Motivation	-.08	-.08	.09	.01	.09	.21†	.28*	—	
9. Amotivation	.07	.13	.14	.06	-.22†	.14	-.01	.36**	—
10. Nutrition knowledge	.38**	.31**	-.06	-.19	.13	.05	.02	-.11	-.22†

Note

†$P<.10$,

*$P<.05$,

**
p<.01,

***
p<.001

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