HHS Public Access

Author manuscript

J Sch Health. Author manuscript; available in PMC 2020 November 05.

Published in final edited form as:

J Sch Health. 2009 June ; 79(6): 286–292. doi:10.1111/j.1746-1561.2009.00411.x.

Correlates of Depressive Symptoms in Urban Youth at Risk for Type 2 Diabetes Mellitus

Sarah S. Jaser, PhD[a] [Postdoctoral Associate], **Marita G. Holl, PhD[b] [Associate Research Scientist]**, **Vanessa Jefferson, MSN[c] [Diabetes and Chronic Disease Progress Coordinator]**, **Margaret Grey, DrPH, RN, FAAN[d] [Dean and Annie Goodrich Professor of Nursing]**

[a]Yale University School of Nursing, PO Box 9740, New Haven, CT 06536

[b]Yale University, 300 George St., New Haven, CT 06511

[c]Yale University, PO Box 208237, New Haven, CT 06520

[d]Yale University School of Nursing, PO Box 9740, New Haven, CT 06536

Abstract

BACKGROUND: Rates of overweight in youth have increased at an alarming rate, particularly in minority youth, and depressive symptoms may affect the ability of youth to engage in healthy lifestyle behaviors to manage weight and reduce their risk for health problems. The purpose of this study was to examine the relationships between depressive symptoms, clinical risk factors, and health behaviors and attitudes in a sample of urban youth at risk for type 2 diabetes mellitus (T2DM).

METHODS: We obtained self-report questionnaire data on depressive symptoms and health attitudes and behaviors related to diet and exercise and clinical data on risk markers (eg, fasting insulin) from 198 youth from an urban setting. Seventh-grade students were eligible if they were at risk for developing T2DM because they had a body mass index (BMI) in the 85th percentile or higher and a family history of diabetes.

RESULTS: Clinically significant levels of depressive symptoms were evident in approximately 21% of the sample, and Hispanic youth reported higher levels of depressive symptoms than black youth. Higher levels of depression were associated with several health behaviors and attitudes, in particular less perceived support for physical activity and poorer self-efficacy for diet. Depressive symptoms were also related to some clinical risk markers, such as higher BMI and fasting insulin levels.

CONCLUSIONS: Because depressive symptoms may affect ability to engage in healthy behavior changes, evaluation and treatment of depressive symptoms should be considered in preventive interventions for youth at risk for T2DM.

Keywords

child and adolescent health; mental health; nutrition and diet; physical fitness and sport

Address correspondence to: Sarah S. Jaser, Postdoctoral Associate, (sarah.jaser@yale.edu), Yale University School of Nursing, PO Box 9740, New Haven, CT 06536.

INTRODUCTION

Rates of overweight in youth have increased at an alarming rate in recent decades, particularly in minority youth.[1] Overweight in youth affects physical health, including greater risk for developing type 2 diabetes mellitus (T2DM), and psychosocial functioning, including poor quality of life and low self-esteem.[2] Depressive symptoms in youth at risk for T2DM may affect the ability of youth to engage in healthy lifestyle behaviors to manage weight and reduce their risk for health problems. Thus, there is a need to determine the associations between depressive symptoms, health behaviors and attitudes, and clinical markers of risk.

Urban Youth at Risk for T2DM

Using age- and sex-specific reference data for body mass index (BMI), children above the 95th percentile are considered to be obese. The percentage of obese adolescents (aged 12–19) has tripled over the past decades, increasing from 5% in 1970 to more than 17% in 2006, with similar increases in girls and boys.[1,3] Furthermore, Hispanic male and Hispanic and black female adolescents are now significantly more likely to be overweight than non-Hispanic white adolescents.[1] The percentages of obese adolescents in 2003 to 2006 were 18.5% of black non-Hispanic boys, 27.7% of black girls, 17.3% of Hispanic (Mexican American) boys. and 14.5% of Hispanic girls.[1] Thus, rates of overweight in minority youth have increased at even higher rates than those for the general population.

The increases in overweight in minority youth place this population at greater risk for developing health problems, including T2DM. Obesity in adults is associated with metabolic abnormalities of insulin resistance, glucose intolerance, and dyslipidemia, and evidence for insulin resistance in overweight youth is mounting.[4] A study of overweight African-American girls aged 5 to 10, for example, demonstrated a significant relationship between overweight and insulin resistance.[5] Overweight children are not only at greater risk for health problems,[6] they are also at greater risk for psychosocial distress.[7]

Research supports the concept that obesity is associated with depressive symptoms in adolescents, and until recently, it was thought that depression was a consequence of obesity.[8,9] However, a study using a large, nationally representative sample of adolescents demonstrated that depressive symptoms predicted later obesity; adolescents who had depressive symptoms at baseline were twice as likely to be obese 1 year later.[10] Even after controlling for self-esteem, physical activity, parental obesity, and parental education, depressed mood remained a significant predictor of obesity. A longitudinal study of adolescent girls also found that depressive symptoms predicted onset of obesity, with each additional depressive symptom increasing the likelihood of becoming obese.[11] These findings suggest that depressive symptoms are an important predictor of obesity, but there is still a need to determine the pathways of risk to inform prevention strategies.

Research in adults strongly supports that depression predicts the onset of T2DM, increasing risk by 37%.[12] This relationship is thought to be due to the effects of depression on glucose dysregulation, resulting in the development of T2DM.[12] In adults with diabetes (type 1 and type 2), depression has been consistently and significantly related to poorer metabolic control (ie, higher glycosylated hemoglobin (HbA1c) levels).[13] One mechanism of risk may be the greater insulin resistance associated with depression.[14] Thus, there is a need to explore associations between depressive symptoms and clinical markers of risk (eg, HbA1c, insulin resistance) in youth.

Depressive Symptoms in Youth

The most common measure of depressive symptoms in youth is the Children's Depression Inventory (CDI).[15] A meta-analysis of children's scores on the CDI from 310 samples found no sex difference in children but a small effect ($d = .22$) of sex in adolescents, with girls reporting more symptoms of depression than boys beginning at age 13.[16] There was a large effect of race and ethnicity on scores; Hispanic youth scored significantly higher on the CDI than whites ($d = .62$) and blacks ($d = 1.31$). A recent study examining racial and ethnic differences in depressive symptoms in adolescents also found an effect for race and ethnicity for girls but not boys wherein Hispanic girls reported higher levels of depressive symptoms on the CDI than white or black girls.[17] None of these studies focused on overweight children, however, and it is unknown whether similar sex and racial or ethnic differences exist in the CDI scores of urban, overweight youth.

Purpose

The purpose of this study was to examine the relationships between depressive symptoms, clinical risk factors, and health behaviors and attitudes in a sample of urban youth at risk for T2DM. We explored the relationship between depressive symptoms on the CDI with BMI and other clinical markers (eg, fasting insulin) and with health behaviors and attitudes related to diet and physical activity. Based on results from the general population,[16] we expected to find higher levels of depressive symptoms in girls than in boys and in Hispanics than in non-Hispanic blacks or whites.

METHODS

Subjects

Participants were 198 seventh-grade students and their parents or guardians who completed baseline data as part of a larger randomized, clinical trial of a school-based intervention for youth at risk for T2DM. The primary aim of the larger study was to determine the efficacy of a multifaceted school-based, teacher-delivered intervention to reduce obesity and diabetes risk factors. The human subjects committee of the Yale School of Nursing institutional review board approved study procedures. Seventh-grade students from 6 schools in a New England city were eligible to participate if they were at risk for T2DM (defined as BMI ≥85th percentile and a family member with diabetes). Exclusion criteria included chronic diseases (except well-controlled asthma) or current involvement in another clinical trial.

Children in this study ranged in age from 10 to 15 (mean = 12.3, SD = 0.7), and approximately half of the sample was female (53%). Parents and guardians ranged in age from 27 to 75 (mean = 38.68, SD = 7.5), and the majority were female (91%). Most (83.3%) of the parents and guardians were mothers of the children in the study, 10.3% were fathers, 3.8% were grandmothers, and 2.6% were nonrelative guardians. In terms of race and ethnicity, the sample was 48.7% black and 47.2% Hispanic, with 7.1% identifying as biracial and 1.5% as other. Socioeconomic status as measured according to annual income was generally low, with 16% under $5000, 17.5% under $10,000, 27.5% between $10,000 and $20,000, 15.7% between $20,000 and $40,0000, and 12.8% at $40,000 or more. Average level of education attained by parents and guardians was also low; 7.6% reported that they had completed less than eighth grade, 12.1% completed less than high school, 37.4% completed high school or received a GED, 9.6% completed trade school, 25.8% completed some college, and 7.6% completed college or graduate school.

Instruments

Demographics.—Parents and guardians completed a demographic form, including questions about age, race or ethnicity, marital status, education level, income level, and health of the parent or guardian and child.

Anthropomorphic Measures.—Weight in kilograms was measured using a scale and body composition analyzer (Model BF-350; Tanita Corporation of America, Inc, Arlington Heights, IL). Height was measured using a wall-mounted stadiometer, calibrated in 1/8-cm intervals. Weight and height were measured in light indoor clothing with bare feet and were used to calculate BMI.

Metabolic Measures.—Blood samples were sent to a laboratory for analysis. Plasma insulin was determined according to radioimmunoassay, a highly sensitive method for measuring insulin in the blood (Linco, St. Charles, MO). The normal value for fasting insulin is less than 15 μU/mL. Insulin resistance was estimated using the homeostasis model assessment of insulin resistance (HOMA-IR)[18] using the following equation: HOMA-IR = fasting insulin (μU/mL) × fasting glucose (mmol/L)/22.5. Higher HOMA-IR values indicate lower insulin sensitivity, and a value greater than 2.2 is indicative of insulin resistance. In the current study, HOMA-IR values were log-transformed to normalize the distribution, and log values were used in all analyses. Glycosylated hemoglobin (HbA1c) levels were determined using the DCA 2000 Analyzer (Bayer, Tarrytown, NY). The normal range is less than 6.3%.[19]

Child Depressive Symptoms.—The CDI[20] is a self-reported measure of depressive symptoms in children and adolescents consisting of 27 items. Total scores range from 0 to 54, with higher scores reflecting greater symptomatology. The CDI has been used extensively; concurrent and discriminant validity has been established in children with known mental health problems and in studies of children with type 1 diabetes.[21] Internal consistency for the current sample (Cronbach's alpha) was .84. A score of 16 has been recommended as a criterion score for detecting depressive disorders.[22] In the current study, a score above the clinical cutoff or an indication of current suicidal thoughts (eg, "I want to kill myself") required an immediate assessment by a licensed clinician (clinical psychologist or nurse practitioner), who determined whether the child needed a referral for treatment or required hospitalization.

Health behaviors and attitudes.—The Health Behavior Questionnaire, developed for the Child and Adolescent Trial for Cardiovascular Health (CATCH), was used to measure health behaviors and attitudes.[23] The following scales were used in the present study: Dietary Intention (13 items, measures students' intentions to choose foods considered heart healthful), Usual Food Choices (14 items, measures students usual food selections), Perceived Support for Physical Activity (18 items, measures social support for physical activity from family members, teachers, and friends), and Social Reinforcement for Healthy Food Choices (7 items, measures social support for heart-healthy food from family members, teachers, and friends). These scales use dichotomous forced-choice formats; students choose from among 2 foods or yes/no. Acceptable reliability and validity of the instrument was determined during testing in a sample of 5000 children, of which 14% were Hispanic and 13% were African American, with alpha coefficients ranging from 0.76 to 0.84.[24] Internal consistency values for the current study are as follows: Dietary Intent: α = .69; Usual Food Choices: α =.68; Support for Physical Activity: α =.60; and Social Reinforcement for Healthy Food Choices: α = .87. The Revised Godin-Shephard Activity Survey[25] is a self-administered instrument in which subjects report the number of times in an average week that they spent more than 15 minutes in activities classified as mild (3 metabolic equivalents; METs), moderate (5 METs), or strenuous (9 METs). The MET is the standard unit of work measure used in exercise physiology and involves the ratio of oxygen consumption, body weight, and unit of time. Testing with adolescent and school-aged children revealed concurrent validity with the 7- and 14-day Physical Activity Record and test–retest coefficients ranging from 0.81 to 0.84. The original survey has been revised to include examples of activities relevant to urban middle school populations in each of the activity levels.

Self-efficacy.—Two scales of the Health Behavior Questionnaire (see above for full description) were used to measure self-efficacy related to diet and exercise.[23] There are 15 items for the dietary self-efficacy scale (eg, "How sure are you that you can eat a baked potato instead of French fries?") and 5 items for the physical self-efficacy scale (eg, "How sure are you that you can choose to jog during recess?"). These scales use a 3-point Likert-type scale (1 = not sure, 2 = a little sure, and 3 = very sure). Internal consistency for the current study was as follows: dietary self-efficacy: α =.85; physical activity self-efficacy: α =.64.

Procedure

Recruitment occurred in several ways. Nurse practitioners in school-based health centers gave some students brochures and followed up with phone calls to parents and guardians to describe the study in further detail. The research team recruited the majority of students at school functions (eg, orientation), where parents could complete a consent packet or set up a later appointment to provide consent. All questionnaire and clinical data reported here were collected before participation in the school-based intervention.

Between April 2004 and February 2007, 426 students expressed interest and were screened for eligibility, with 244 students meeting inclusion criteria. Of those, 217 families assented or consented to participate, and 27 families declined participation. Eleven students were later determined to be ineligible (low BMI, promoted to eighth grade, expelled, or moved out of the school district). Of the remaining 206, 8 refused to participate in data collection. Trained research staff collected questionnaire data, and experienced research nurses from the Yale Center for Clinical Investigation collected fasting blood samples in the school-based clinics from 198 participants. Children were compensated for their time with a small token (toy worth $5–10) after data collection.

Data Analysis

We examined the relationship between depressive symptoms and demographic and clinical variables in several ways. First, we conducted multiple analyses of variance to test for group differences in sex and race or ethnicity in levels of depressive symptoms and to test for interactions between sex and race or ethnicity. We then examined bivariate correlations between adolescents' depressive symptoms (CDI scores), health behaviors and attitudes related to diet and exercise, and clinical risk markers. Next, we separated the sample into those who scored above the clinical cutoff on the CDI (total score ≥16) and those who did not. Using these categories, we used chi-square tests to determine whether there were significant group differences in sex and race or ethnicity. Finally, we determined whether there were significant differences between students above and below the clinical cutoff on the clinical markers and health behaviors using logistic regression analyses. All analyses were conducted using the SPSS 15.0 statistical software package (SPSS, Inc., Chicago, IL).

RESULTS

The multivariate analysis of variance (MANOVA) including sex and race as within-subjects factors indicated that there was a significant main effect for race ($F = 3.53$, $p = .02$) in that white youth reported higher levels of depressive symptoms (mean CDI = 11.3, SD = 7.3) than black youth (mean CDI = 8.3, SD = 6.1). The MANOVA including sex and ethnicity indicated that there was a significant main effect for ethnicity ($F = 6.19$, $p = .01$), in that Hispanic youth reported higher levels of depressive symptoms (mean CDI = 11.3, SD = 7.5) than non-Hispanic youth (mean CDI = 8.7, SD = 6.3). There was no main effect for sex, and the sex-by-race interaction was not significant.

As shown in Table 1, depressive symptoms were associated with several clinical and behavioral variables. Youth who reported higher levels of depressive symptoms were more likely to have higher BMI and fasting insulin levels. In addition, greater depressive symptoms were associated with several negative health behaviors and attitudes, including lower levels of self-reported physical activity (METs) and poorer self-efficacy for diet and physical activity. Higher levels of depressive symptoms were also related to poorer dietary intention and dietary choice, as well as less support for physical activity. Depressive symptoms were not significantly related to HbA1c, HOMA-IR, or support for healthy eating.

Chi-Square Analyses

Using the clinical cutoff of 16 on the CDI, we separated the sample into two groups: those who scored at or above the cutoff and those who scored below it. Clinically significant levels of depressive symptoms (CDI score ≥16) were evident in 20.8% (n = 41) of the sample. There was a significant difference between groups for race ($\chi^2 = 6.86$, $p = .03$), with white and biracial students more likely to score above the clinical cutoff than black students. There was not a significant group difference in sex ($\chi^2 = 1.91$, $p = .17$) or ethnicity ($\chi^2 = 2.09$, $p = .15$).

Logistic Regression

A logistic regression analysis was conducted to predict CDI scores above or below the clinical cutoff. Predictor variables were entered in 3 blocks: the first block included demographic variables (sex and race), the second block included clinical measures (BMI and fasting insulin), and the third bock included health behaviors and attitudes (dietary intent and choice, perceived support for physical activity, self-efficacy for diet and physical activity and self-reported activity) (Table 2). Only the block for health behaviors and attitudes was significant. Youth with clinically significant scores (CDI ≥ 16) reported significantly less perceived support for physical activity (odds ratio = 0.88) and lower self-efficacy for diet (odds ratio = 0.91) than those with scores in the acceptable range. In the final model, there was also a trend for youth with clinically significant scores to have higher BMIs than those with scores in the acceptable range ($p < .10$). Youth sex, race, fasting insulin levels, dietary intent or choice, self-efficacy for physical activity, and self-reported physical activity (METs) were not significant predictors of high CDI score.

DISCUSSION

Results from the current study indicate that approximately 21% of urban youth at risk for T2DM were experiencing clinically significant levels of depression. Furthermore, depressive symptoms in these youth were associated with poorer health behaviors and attitudes and some clinical markers for risk of T2DM. Specifically, greater depressive symptoms were related to reports of poorer dietary intent and choice, less perceived support for healthy eating, poorer self-efficacy for physical activity, higher levels of BMI and insulin, and less self-reported physical activity. The factors associated with clinically significant depressive symptoms were perceived support for physical activity and self-efficacy for diet. These associations have important implications for preventive interventions with this population.

The relationship between depressive symptoms and self-efficacy for diet seems especially important, because social learning theory suggests that self-efficacy is critical for the initiation of behavior.[26] If greater depressive symptoms are related to poorer self-efficacy, depressed children may be less likely to make positive behavior changes. Depressive symptoms were also related to less perceived support for physical activity and lower levels of self-reported activity. It is possible that some depressive symptoms, such as lethargy and decreased motivation, make it difficult for youth to engage in physical activity. Although more research is needed to determine the direction of these relationships, interventions grounded in social learning theory aimed at increasing self-efficacy for diet and physical activity and parental support of physical activity, such as the larger intervention study, may be important in preventing T2DM in at risk youth.

Depressive symptoms in youth were also associated with higher BMI and higher fasting insulin levels, consistent with the adult literature linking depression to clinical health markers,[14] although we did not find an association between depressive symptoms and insulin resistance (HOMA-IR) or glucose levels (HbA1c), and there were no significant differences on clinical variables for adolescents above and below the clinical cutoff on the CDI. This lack of findings may be because of the use of a self-reported measure of depressive symptoms, which is likely to yield higher rates of depression than a diagnostic interview. It may be that a relationship between depressive symptoms and insulin resistance would be evident in adolescents meeting the full criteria for a depressive disorder. Future research is needed to understand the relationship between depression and insulin resistance in youth.

Results from the present study regarding sex and racial and ethnic differences in depressive symptoms differ somewhat from previous studies. Contrary to findings in the general population, in which adolescent girls report more depressive symptoms than boys,[16] we did not find a significant sex difference in depressive symptoms, but the mean age of our sample was 12, and sex differences in depression may not emerge until later adolescence (after age 13). Alternatively, overweight boys may experience higher levels of depression than boys in the general population. We found a significant difference for race and ethnicity in our urban sample, wherein white youth reported more depressive symptoms than black youth and were more likely to have scores above the clinical cutoff, and Hispanic youth reported more depressive symptoms than non-Hispanic youth. The majority of the white youth in our sample identified themselves as Hispanic (all but 5), so these findings may be interpreted as a difference between Hispanic and black youth. Higher rates of depression are evident in Hispanic youth in the general population,[16,17] which may be related to the stress of acculturation.[27] Whereas Hispanic culture emphasizes the needs of the family, American culture promotes the development of autonomy during a dolescence.[28] More research is needed to determine the causes of these group differences, particularly in youth at risk for T2DM.

There are several limitations to the current study. Our analyses were cross-sectional, preventing determination of causality (ie, whether depressive symptoms were a cause or consequence of high BMI), but previous research[10,11] indicates that depressive symptoms precede obesity in adolescents. We had limited information about other psychosocial factors, such as self-esteem or quality of life, which may clarify the relationship between depressive symptoms and health behaviors and attitudes. Furthermore, we did not have diagnostic information regarding depressive disorders in youth, but subthreshold symptoms of depression have been linked with greater incidence of major depression and substance use disorders[29] and with poorer quality of life in overweight youth.[7] Finally, we did not have information about the parent’s or guardian’s mental health, which is likely to affect children’s depressive symptoms.[30]

The current study represents an important extension of previous research linking depressive symptoms to health behaviors and attitudes in an urban, largely minority sample of adolescents and is one of the first to examine the relationship between depressive symptoms and clinical markers of diabetes risk in adolescents. Results suggest that depressive symptoms may affect ability to engage in healthy behavior changes, and therefore, school nurses and educators should consider evaluating for depressive symptoms in youth at risk for T2DM. For some adolescents, treatment of depression may prevent later obesity. Cognitive–behavioral interventions designed to reduce depressive symptoms[31] may have the potential to improve overweight children's quality of life, as well as adherence to treatment recommendations for weight management. The odds ratios for perceived support for physical activity and self-efficacy for diet suggest that these may be protective factors against depression and could therefore represent important targets for future interventions. Moreover, existing school-based programs that address the psychosocial determinants of diet and physical activity, such as CATCH,[32] are likely to be more effective if depressive symptoms are first addressed. Thus, there is a need to assess and treat depressive symptoms in overweight youth before addressing weight management.

Future research should include multiple measures of psychosocial functioning, including self-esteem and quality of life. Information regarding parental mental health also requires consideration, because maternal psychological distress has been shown to be a significant predictor of depressive symptoms in obese youth.[2] Finally, we need longitudinal studies to determine the direction of effects, especially because many of the variables of interest are likely to influence each other over time. Given the increasing epidemic of youth at risk for T2DM, further research to understand how psychosocial variables affect weight management is warranted.

REFERENCES

1. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. JAMA. 2008; 299(20):2401–2405. [PubMed: 18505949]
2. Zeller MH, Saelens BE, Roehrig H, Kirk S, Daniels SR. Psychological adjustment of obese youth presenting for weight management treatment. Obes Res. 2004;12(10):1576–1586. [PubMed: 15536221]
3. Department of Health and Human Services. National Health and Nutrition Examination Survey: Overweight Among U.S. Children and Adolescents. Atlanta, GA: Centers for Disease Control and Prevention, 2002.
4. Bloomgarden ZT. Type 2 diabetes in the young: The evolving epidemic. Diabetes Care. 2004;27:998–1010. [PubMed: 15047665]
5. Young-Hyman D, Schlundt DG, Herman L, DeLuca F, Counts D. Evaluation of the insulin resistance syndrome in 5 to 10 year old overweight/obese African American children. Diabetes Care. 2001;24:1357–1364.
6. Dietz WH. Health consequences of obesity in youth: Childhood predictors of adult disease. J Pediatr. 1998;101:518–525.
7. Janicke DM, Marciel KK, Ingerski LM, et al. Impact of psychosocial factors on quality of life in overweight youth. Obesity. 2007; 15:1799–1807. [PubMed: 17636099]
8. Erickson SJ, Robinson TN, Haydel KF, Killen JD. Are overweight children unhappy? Body mass index, depressive symptoms, and overweight concerns in elementary school children. Arch Pediatr Adolesc Med. 2000;154:931–935. [PubMed: 10980798]
9. Wallace WJ, Sheslow D, Hassink S. Obesity in children: A risk for depression. Ann NY Acad Sci. 1993;699:301–303. [PubMed: 8267334]
10. Goodman E, Whitaker RC. A prospective study of the role of depression in the development and persistence of adolescent obesity. Pediatrics. 2002;110(3):497. [PubMed: 12205250]

11. Stice E, Presnell K, Shaw H, Rohde P. Psychological and behavioral risk factors for obesity onset in adolescent girls: A prospective study. J Consult Clin Psychol. 2005;73:195–202. [PubMed: 15796626]
12. Knol MJ, Twisk JWR, Beekman ATF, Heine RJ, Snoek FJ, Pouwer F. Depression as a risk factor for the onset of type 2 diabetes mellitus. A meta-analysis. Diabetologia. 2006;49:837–845. [PubMed: 16520921]
13. Lustman PJ, Anderson RJ, Freedland KE, DeGroot M, Carney RM, Clouse RE. Depression and poor glycemic control: A meta-analytic review of the literature. Diabetes. 2000;23:934–942.
14. Bjorntorp P Do stress reactions cause abdonminal obesity and comorbidities? Obes Rev. 2001;2:73–86. [PubMed: 12119665]
15. Kovacs M, Finkelstein R, Feinberg TL, Crouse-Novak M, Paulauskas S, Pollock M. Initial psychologic responses of parents to the diagnosis of insulin-dependent diabetes mellitus in their children. Diabetes Care. 1985;8:568–575. [PubMed: 4075942]
16. Twenge JM, Nolen-Hoeksema S. Age, gender, race, socioeconomic status, and birth cohort differences on the Children’s Depression Inventory: A meta-analysis. J Abnorm Psychol. 2002; 111(4):578–588. [PubMed: 12428771]
17. McLaughlin KA, Hilt LM, Nolen-Hoeksema S. Racial/ethnic differences in internalizing and externalizing symptoms in adolescents. J Abnorm Psychol. 2007;35:801–816.
18. Matthews DR, Hosker JP, Rudenski AS, Naylor BA, Treacher DF, Turner RC. Homeostasis model assessment: Insulin resistance and beta cell function from fasting plasma glucose and insulin concentrations in man. Diabetologia. 1985;28:412–419. [PubMed: 3899825]
19. American Diabetes Association. Standards of medical care in diabetes. Diabetes Care. 2007;30:S4–S41. [PubMed: 17192377]
20. Kovacs M The Children’s Depression Inventory (CDI). Psychopharm Bull. 1985;21:995–998.
21. Kovacs M, Iyengar S, Goldston D, Stewart J, Obrosky DS, Marsh J. Psychological functioning of children with insulin-dependent diabetes mellitus: A longitudinal study. J Pediatr Psychol. 1990; 15:619–632. [PubMed: 2283571]
22. Timbremont B, Braet C, Dreessen L. Assessing depression in youth: Relation between the Children’s Depression Inventory and a structured interview. J Clin Child Adolesc Psychol. 2004;33(1):149–157. [PubMed: 15028549]
23. Parcel GS, Emundson E, Perry CL, Feldman HA, O’Hara-Tompkins N, Nader PR. Measurement of self-efficacy for diet-related behaviors among elementary school children. J School Health. 1995;65(23–27): 23–27. [PubMed: 7731197]
24. Nader PR, Stone EJ, Lytle LA. Three-year maintenance of improved diet and physical activity: The CATCH cohort. Arch Pediatr Adolesc Med. 1999;153(695–704).
25. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. Med Sci Sports and Exerc. 1993;25:99–108. [PubMed: 8423762]
26. Bandura A Self-efficacy: The exercise of control. New York, NY: W.H. Freeman; 1986.
27. Hovey JD, King CA. Acculturative stress, depression, and suicidal ideation among immigrant and second-generation Latino adolescents. J Am Acad Child Adolesc Psychiat. 1996;35(9):1183–1192.
28. Lugo Steidel A, Contreras JM. A new familism scale for use with Latino populations. Hispanic J Behav Sci. 2003;25:312–330.
29. Lewinsohn PM, Solomon A, Seeley JR, Zeiss A. Clinical implications of “subthreshold” depressive symptoms. J Abnorm Psychol. 2000;109:345–351. [PubMed: 10895574]
30. Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. Psychol Rev. 1999;106:458–490. [PubMed: 10467895]
31. Clarke GN, Hornbrook M, Lynch F, et al. A randomized trial of a group cognitive intervention for preventing depression in adolescent offspring of depressed parents. Arch Gen Psychiat. 2001;58(12):1127–1134. [PubMed: 11735841]

32. Edmundson E, Parcel GS, Feldman HA, et al. The effects of the child and adolescent trial for the cardiovascular health upon psychosocial determinants of diet and physical activity behavior. Prev Med. 1996;25:442–454. [PubMed: 8812822]

Table 1.

Descriptive Statistics and Correlations Between CDI Scores and Clinical Measures and Health Behaviors

	1	2	3	4	5	6	7	8	9	10	11	12
1. CDI	-											
M = 9.83 (6.96)												
2. BMI	.19**	-										
M = 30.40 (6.66)												
3. Fasting Insulin	.20**	31***	-									
M = 41.72 (38.14)												
4. HbA1c	−.02	.15	.12	-								
M = 5.23 (.37)												
5. HOMA-IR	.00	.43***	.92***	.25***	-							
M = .85 (.25)												
6. METs	−.17*	.03	.06	−.07	.10	-						
M = 1005.92 (438.45)												
7. Dietary Intent	−.16*	.12	.10	−.03	.05	.16*	-					
M = −1.22 (5.76)												
8. Dietary Choice	−.15*	.07	.05	−.02	−.03	.09	.66***	-				
M = −1.52 (5.83)												
9. Support for PE	.38***	−.03	−.02	−.02	.01	.20**	.20**	.16*	-			
M = 9.22 (5.36)												
10. Support for Diet	.09	−.08	−.13	.08	−.02	−.08	21***	−.17*	−.32***			
M = 1.55 (10.13)												
11. Diet Self-Efficacy	.−32***	.18*	.09	.10	.12	.14	.41***	.38***	.27***	−.15*	-	
M = 6.38 (6.36)												
12. PE Self-Efficacy	−.23***	.01	.04	.00		.18*	.26***	.20**	.39***	−.17*	.53***	-
M = 2.79 (2.54)												

PE = Physical Exercise; METs = measure of physical activity; HbA1c = hemoglobin A1c, HOMA-IR = measure of Insulín Resistance (log).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2.

Regression Analyses Predicting Clinically Significant CDI Score

	Block 1 β	Block 2 β	Block 3 β	Odds Ratio	95% CI
Demographic Indices					
Block 1 $\Delta\chi^2 = 3.75$					
Child Gender	.59	.57	.50	1.64	.65–4.16
Child Race	.18	.19	.19	1.21	.91–1.59
Clinical Measures					
Block 2 $\Delta\chi^2 = 5.78$					
BMI		.05	.08	1.08	1.00–1.17
Fasting Insulin		.01	.01	1.01	.97–1.02
Health Behaviors/Attitudes					
Block 3 $\Delta\chi^2 = 22.13^{***}$					
Dietary Intent			−.04	.96	.87–1.07
Dietary Choice			.02	1.02	.96–1.12
Support for PE			$-.13^{**}$	.88	.80–.96
Dietary Self-Efficacy			$-.10^{*}$	.91	.84–.99
PE Self-Efficacy			.11	1.12	.90–1.40
METs			.00	1.00	1.00–1.00
Model $\Delta\chi^2 = 31.66^{***}$					

Note: PE = Physical Exercise; METs = measure of physical activity; CI = confidence Interval.

$^{*}p < .05$.

$^{**}p < .01$.

$^{***}p < .001$.