Published in final edited form as:

Pediatr Diabetes. 2008 June ; 9(3 Pt 2): 74–82. doi:10.1111/j.1399-5448.2007.00356.x.

Short-term Effects of Coping Skills Training in School Age Children with Type 1 Diabetes

Jodie M. Ambrosino, PhD[Postdoctoral Fellow], Kristopher Fennie, PhD, MPH[Associate Research Scientist], Robin Whittemore, PhD APRN[Associate Professor], Sarah Jaser, PhD[Postdoctoral Associate], Michael F. Dowd, Ph.D.[Statistician], and Margaret Grey, DrPH, RN, FAAN[Dean and Annie Goodrich Professor]

Yale School of Nursing, New Haven, CT, United States

Abstract

Objective—Little is known about the use of psychosocial interventions in children younger than adolescence with type 1 diabetes (T1D) and their parents. We report preliminary short term outcomes of a randomized controlled trial of coping skills training (CST) compared to group education (GE) with school-aged children with T1D and their parents.

Methods—111 children (range = 8–12 years) with T1D for at least 6 months (3.71 ± 2.91 years) were randomized to CST (55.6%F; 81.5%W) or GE (69.7%F; 90.9%W). Children and parents (N=87) who completed the intervention, baseline, 1 and 3 month data are included. Children completed measures of self efficacy, coping, and quality of life; parents completed measures of family functioning (adaptability, cohesion), diabetes-related conflict, parent depression and parent coping. Metabolic control was assessed with glycosylated hemoglobin (HbA1c). Mixed model repeated measures ANOVA was used to analyze the data.

Results—CST and GE group composition was generally comparable. Children had good psychosocial adaptation and metabolic status. CST parents reported significantly more improvement in family adaptability compared to GE parents and a trend was seen indicating that CST children showed greater improvement in life satisfaction than GE children. Effect sizes for this short term follow-up period were small, but group participants were receptive to the intervention and reported positive gains.

Conclusion—In these preliminary results, CST and GE were more similar than different across multiple measure of psychosocial adaptation, although CST showed promising statistical trends for more adaptive family functioning and greater life satisfaction. Longer term follow up is underway.

Keywords

Psychosocial Adaptation; Diabetes Mellitus (Psychology); Behavior Therapy; Child; Randomized Control Trial

Introduction

Type 1 diabetes (T1D) is the most common severe chronic disorder of childhood, affecting 1 in every 400 individuals under the age of 20 and over 176,000 American children and adolescents (1). The treatment regimen is complex and negotiating management demands

for shared responsibility challenges the parent-child relationship. The degree of parent involvement/supervision changes over the course of the child's development, and typically declines over time (2). Even so, it has been shown that decreased parental involvement in diabetes management is associated with poorer adherence and metabolic control, particularly in adolescence (3,4), whereas adolescents whose parents remain active in T1D management have better metabolic control (5). Thus, maintaining ongoing parent-child collaborations over the course of a child's development may result in better metabolic control (6).

Considerable attention has focused on the relationship between family functioning and adjustment to T1D as it relates to cooperative family efforts. Good family communication and problem-solving skills are related to better metabolic control in adolescents (7,8). On the other hand, lower levels of expressiveness and higher child- and parent-reported conflict have been shown to be related to poor metabolic control and a more rapid rate of deterioration in T1D management (4,8,9). More family cohesion, more diabetes-specific support, positive family communication, and less family conflict are related to better psychosocial adjustment in children with T1D (6,8,10). Furthermore, conflicts around T1D management have been shown to negatively affect children's quality of life more than the actual intensity of treatment (11-13).

While there is strong evidence of a relationship between family functioning and children's adjustment to T1D, relatively little research has focused on parental adaptation to children's T1D. Research supports that, after a period of initial adjustment (14,15), there may be an increase in parental depressive symptoms and overall psychological distress with duration of illness (16). Parental anxiety and depression have been associated with psychosocial distress in children with chronic conditions, (17,18); thus, it is likely that parents' distress associated with managing T1D can result in poorer adaptation for children.

Taken together, these findings underscore the need for family-based, psychosocial interventions (19). Indeed, several have been successful in reducing diabetes-related conflict and improving metabolic control, particularly in adolescents (4,20-22). Our research group developed and tested coping skills training (CST) – originally for adolescents (ages 12-20 years), and found improvements in metabolic control, psychosocial adjustment, and quality of life compared to a group education (GE) condition (12,23). In this study, we extended the CST intervention to parents and younger children with T1D. Since little research has focused on interventions for school-aged children (8-12 years) and their parents, the aim was to equip them early on with the skills to better negotiate the shared responsibilities of T1D management, and thus, minimize adolescent conflict, while also improving management and metabolic control.

The overall purpose of this study is to evaluate the short-term efficacy and feasibility of CST intervention for school-aged children with T1D and their parents. The conceptual framework for the study was a stress-adaptation model (24) with CST hypothesized to improve physiological, psychosocial, and family adaptation. In this paper we report preliminary short-term effects of CST on child adaptation (HbA1c, coping, self-efficacy, quality of life, and diabetes family behavior) and on parent adaptation (coping, depressive symptoms), diabetes-related conflict, and family functioning as compared to child and parent GE.

Methods

A randomized, prospective two-group experimental design with follow up at 1, 3, 6 and 12 months post intervention is being conducted. We report data to 3 months follow-up in this paper. Eligible participants were recruited from the Yale Pediatric Diabetes Program. Children were eligible if they were: (1) between the ages of 8 and 12 years; (2) diagnosed

with T1D and treated with insulin for at least 6 months; (3) free of other health problems; and, (4) in school grade appropriate to within 1 year of age. All clinicians were blinded to study group assignment.

Children and parents interested in participating in the study completed the consent/assent process approved by the Yale School of Nursing Human Subjects Research Review Committee as well as baseline questionnaires. Participants were randomized initially by a sealed envelope technique and later by computer, to either the CST or group education (GE). Parents and children who endorsed high levels of depressive symptoms were referred for follow-up, but not excluded from the intervention unless either required hospitalization. Of those assessed for eligibility, approximately 58% agreed; of the 79 excluded from the study, 43.1% expressed interest and asked to be approached later when they expected their schedule to open up, 50.6% declined (e.g., too busy) and 6.3% were ineligible. Figure 1 summarizes participants' progress through the trial thus far, in keeping with the CONSORT (Consolidated Standards of Reporting Trials) criteria for clinical trials (25). On average, those randomized to CST attended 4.6 sessions (range=1-6; $SD = 1.21$), while those in GE attended on average 3.3 (range=1-4; $SD = .75$). Attrition has been low with only 8 participants dropping out or lost to follow up after completing either intervention (9%). All follow up data were collected by trained research assistants. Average length of follow-up was 4.2 ± 1.5 months.

Interventions

Coping Skills Training (CST)—The overall framework for CST was formulated by the senior author (MG) based on the work of Forman (26). The primary goal of CST is to increase children's and their respective parents' sense of competence and mastery by retraining inappropriate or non-constructive coping styles and forming more positive styles and patterns of behavior. Emphasis was placed on learning to deal better with day-to-day problems that arise, rather than on management of T1D. Specific coping skills that were addressed included communication, social problem solving, recognition of associations between thoughts, feelings, and actions and guided self-dialogue, stress management, and conflict resolution. Six sessions were conducted with small groups of 2-5 children; parents met simultaneously, but separately. Both parents were free to attend, although only one completed questionnaires. At the end of each session, children and their parents shared salient issues and discussed possible connections between group themes and family concerns. Each 1.5 hour session was facilitated by a mental health professional. All CST groups were audiotaped and reviewed for treatment fidelity to ensure that the intervention was delivered as intended and remained true to the underlying theory and goals of this research.

Group Education (GE)—An equal-attention GE program was provided by a nurse practitioner dealing with updates in T1D care as the control condition. Age-appropriate topics covered included intensive insulin regimens (multiple daily injections or pump); carbohydrate counting; sports and sick days; and questions and answers. All sessions were audiotaped to ensure that GE was implemented consistently to all participants. The GE program focused on providing specific information on what to do in multiple diabetes-related situations, whereas CST emphasized the broader social context in which these situations occur (e.g., managing the thoughts, feelings and behaviors that get generated as a child and family fit T1D care into their daily life).

Instruments

Child Measures—Disease-related variables were collected from each child's medical chart including duration of T1D and treatment regimen (injection/pump). Additionally,

glycosylated hemoglobin (HbA1c) was measured using the Bayer Diagnostics DCA2000® (Tarrytown, NY, normal range = 4.2-6.3%).

The Issues in Coping with IDDM- Child scale (16,28) is a self report measure of children and adolescents' perceptions of how hard or difficult to handle (14 items; total score 0-42) and how upsetting (12 items; total score 12-36) issues are related to their T1D management. Higher scores indicate more difficulty or upset. The authors report adequate 6 month (.65 and .52) and strong 12 month (.75 and .78) reliability for hard and upset scales, respectively. In these data, Cronbach's alpha coefficients were comparable at 0.64 and 0.67 for the hard and upset subscales, respectively.

The Self-Efficacy for Diabetes Scale (29) is a self report measure of the self-perceptions or expectations held by persons with diabetes regarding their personal competence and confidence in their ability to successfully manage their T1D. Items are distributed across three subscales: diabetes-specific self-efficacy (24 items; total score 24-120); medical situations self-efficacy (5 items; total score 5-25); and, general situations (6 items; total score 6-30). Higher scores indicate *less* self efficacy. Reliability data provided by the authors are .92, .70 and .60 for the diabetes specific, medical situations and general subscales respectively. In these data, Cronbach's alpha coefficients were comparable at 0.90, 0.71 and 0.70 for the diabetes, medical and general subscales, respectively.

The Diabetes Quality of Life Scale for Youth (DQOL) (30) is a modification of the Diabetes Quality of Life Scale (31) used to assess children's and adolescents' perceptions of the impact of intensified regimens on their general satisfaction with life, and on diabetes-related concerns over social, school and peer relationships. Three subscales measure Disease Impact (21 items; total score 21-84), Disease-related Worries (8 items; total score 8-32) and Diabetes Life Satisfaction (18 items; total score 18-72). Higher scores indicate greater negative impact and worry (poor quality of life), but better life satisfaction. The authors report strong reliability exceeding .82 for each subscale. In our data, alpha coefficients were comparable at 0.84, 0.80 and 0.92 for the impact, worry and satisfaction subscales, respectively.

The Diabetes Family Behavior Scale (DFBS) is a self-report measure of diabetes-specific family support behaviors thought to be important in helping or hindering a child or adolescent's diabetes management developed by McKelvey and colleagues (32). It consists of two subscales: guidance-control (15 items; total score 15-75) and warmth-caring (15 items; 15-75) as reported by the child. Higher scores indicate higher support behaviors. Cronbach alpha coefficients reported by the authors were high at .81 for guidance-control, and .79 for warmth-caring. In our data, these coefficients were 0.64 and 0.75 for the guidance-control and warmth-caring subscales, respectively.

Parent Measures—Demographic information was completed by each parent including sociodemographic data, child's gender and age.

The Issues in Coping with IDDM- Parent scale (28,33) is a self-report measure of parent's perceptions of how hard or difficult to handle (25 items; total score 0-100) and how upsetting (32 items; total score 0-128) issues are related to their child's T1D management. Higher scores indicate more difficulty or upset. The authors report adequate reliability, although specific statistics were unavailable. Cronbach's alpha coefficients were 0.82 and 0.74 for the hard and upset subscales, respectively.

The Center for Epidemiologic Depression Scale (CES-D) is a brief, self-report screening measure of depressive symptoms developed by the National Institutes of Mental Health

(34,35). A total score is calculated from 20 items and ranges from 0-60; 16 serves as a clinical cut-off indicating the need for further evaluation. This measure is widely used with both clinical samples and community surveys with reliability ranging from .85 to .90. Cronbach's alpha coefficient was comparable here at 0.89 for the total score.

The Diabetes Responsibility and Conflict Scale (36) is a self-report measure designed to evaluate the distribution of diabetes-related responsibilities across parent and child (15 items; total score 15-75) and the degree of diabetes-related conflict encountered by parent and child (15 items; total score 15-75). Higher scores reflect greater parent responsibility and more parent-child conflict, respectively. It is widely used in diabetes-related research with internal consistency exceeding .85. In these data, Cronbach's alpha coefficients were 0.87 and 0.94 for the handle and upset subscales.

The Family Adaptability and Cohesion Scale (FACES II) (37) assesses two aspects of family functioning: cohesion or emotional bonding within a family (16 items; total score 16-90) and adaptability or ability for the family to alter its role relationships and power structure in response to situational and developmental stress (14 items; total score 14-60). Reliability estimates provided by the authors for Adaptability and Cohesion were .78 and .87, respectively. In these data, alpha coefficients were lower at .58 and .33.

Data analytic methods

All data were double entered in a database and checked for accuracy. Analyses were performed on all participants who attended the intervention and completed baseline data, 1 and 3 month follow up data, using SAS (v. 9.1, Cary, NC) and SPSS (v. 13.0, Chicago, IL) statistical packages. Measures were assessed for normality; log transformation was applied appropriately to correct skewed distributions. Mixed model repeated measures ANOVA was used to test the hypothesis that school age children (and parents) who received CST had better metabolic control and psychosocial adaptation than those who received GE. The model included a group term as main effect to account for the significant difference in group means at baseline. Effect sizes (Cohen's d) were calculated separately for significant time main effects and group $\times$ time interactions to reflect the magnitude of the mean differences and departure from the null hypothesis (38). To make these calculations for time main effects we used total group means for baseline and 3 months, and pooled the standard deviations of the two groups; for the group $\times$ time interactions, the interaction term from the model was divided by the standard error of the interaction term multiplied by the $\sqrt{N}$. The effect sizes reported in the data tables correspond to the significant F-ratio for that variable.

Results

As shown in Table 1, a comparison of all attenders (both CST and GE interventions) to those who enrolled, but did not receive either intervention, demonstrated that they were comparable, although there was a higher likelihood for White families and mothers with higher educational levels to actually complete the intervention. Table 2 illustrates that despite discrepant group size, randomization procedures succeeded in yielding experimental and control groups that were generally comparable across demographic variables. Families were predominantly White and of upper middle income, which is consistent with the overall clinic composition. On average children had been living with diabetes for nearly 4 years and most were on pump therapy with HbA1c levels comparable with the American Diabetes Association's recommendations for age.

In terms of acceptability of the intervention, 88.6% of the 44 CST children who completed satisfaction surveys said they would both take the group again and recommend it to a friend. Their ratings of how enjoyable and helpful the groups were ranged from 3-5, with a mean of

4.64 $\pm$.61 and 4.32 $\pm$.71 respectively on a scale from 1-5 with 5 being the most helpful. Of the individual sessions, social problem solving was rated by 44.5% of the children as the most helpful. Of the 41 completed CST parents' surveys, 87.8% would take it again and 100% would recommend it to a friend. Their ratings for how enjoyable and helpful the groups were ranged from 3-5 (mean of 4.71 $\pm$.51) and 1-5 (mean of 4.24 $\pm$ 1.04), respectively.

The data in Table 3 demonstrate that the CST and GE groups were comparable at baseline on most outcome measures; significantly discrepant pretreatment scores were controlled in the mixed-model analyses. Regarding the primary hypothesis, CST did not have a differential effect on HbA1c or any of the child's psychosocial outcome variables compared to GE at 3 months from baseline. However, a trend toward greater improvement in life satisfaction over the 3 months was seen for children who participated in CST compared to those in GE whose scores declined ($p=.07$; effect size (ES)=0.19). The effect size is small and may be affected by the significant baseline discrepancy. Furthermore, 3 month scores were similar for both groups. Multiple time main effects and trends indicate improvement in nearly all of the psychosocial outcome measures, especially those assessing self efficacy for diabetes management.

With respect to parents, in Table 4 it can be seen that the randomization process resulted in groups that were generally comparable on most pretreatment measures; significantly discrepant baseline scores were controlled. As with the children's data, the primary hypothesis was not supported in that parents who participated in CST showed few statistically significant improvements across the psychosocial outcome variables compared to GE. There was a trend toward greater improvement over time in parents' perception of family adaptability in the CST group compared to the GE ($p=.09$; ES=0.15), although the difference in slope or rate of change is tempered by the finding that at 3 months their scores were comparable. Once again, multiple time main effects demonstrate improvement in psychosocial outcomes across both interventions.

Discussion

The aim of this preliminary report is to describe the short term treatment benefits and feasibility of a CST program modified for school-age children. This study expands behavioral intervention studies in youth with T1D to school-age children with T1D. Our findings indicate high satisfaction with this intervention by this younger school-age cohort, although more modest gains were observed than in their adolescent counterparts with whom CST was originally evaluated (5). In this study, CST parents reported more change regarding flexibility in family roles than GE parents, and CST children reported gains in life satisfaction while GE children showed declines. Given the relatively small sample size, unequal group sizes and baseline differences in some variables, these results need to be interpreted with caution. The direction of positive growth, however, suggests that CST could be a useful adjunct to usual patient care in this age group and warrants replication and longer follow-up to ensure that changes are not related to regression to the mean. Anderson et al., (4) assert that early intervention may help parents and children negotiate cooperative partnerships that will help lead to better health in adolescents. The ongoing follow-up of this cohort will determine if these effects are maintained and can reliably be attributed to the intervention.

The lack of group-by-time effects may indicate that CST was insufficient to impact these outcomes in this relatively well-adjusted sample. Alternatively, perhaps receiving more T1D specific education in a group format was equally as beneficial in the short term as instruction in CST given that there is so much to learn for successful management of T1D in a maturing

child whose needs change over time. The latter is consistent with the multiple time effects reported here for both the CST and GE groups, especially in the general and diabetes specific areas of self-efficacy. Such improvements in confidence are in keeping with Bandura's social cognitive theory on which the CST intervention is based (39). This pattern was similar in the early studies of CST in adolescents, where self-efficacy was noted to improve more in the CST group after changes in other outcomes (HbA1c, quality of life) were demonstrated (40). It is unclear whether CST will sustain changes differentially in personal mastery over 6 and 12 month follow-up in this younger cohort. Additionally, the control condition was designed so evident treatment effects could be attributed to CST and its content, not simply the supportive nature of the group process or differential attention. In reality, anecdotal reports from families in the GE group indicated that GE incorporated a fair amount of supportive group process besides the diabetes-specific information it was designed to deliver. Consequently, it is apparent that even though the GE lacked the content of CST, it likely offered more social support than anticipated.

These preliminary results should be viewed in light of several limitations. Recruitment was lower with this younger cohort than with our previous adolescent sample, although attrition was comparable in these similar studies. Parents reported that competing after school activities and work schedules made it difficult to commit to attending the groups. Furthermore, participants were recruited from the same southern New England practice, and while reflective of its composition, are fairly homogenous, and not necessarily representative of the larger population of school-age children with T1D. To that end, the high number of children doing well in this study might in part be attributed to the fact that a large number of them utilize pump therapy, which has been positively linked with quality of life (41). Further studies replicating such behavioral interventions should use a wider participant pool and design methods to help families from more diverse ethnic and socioeconomic backgrounds complete the intervention for which they were initially enrolled. Finally, several subscales had less than acceptable internal consistency reliability in this population, leading to increased variance associated with measurement than would have been desirable and more room for regression to the mean to impact change in short-term scores. Longer-term follow-up will be critical to deciphering treatment effects and better understanding causal patterns between CST and adaptation.

In sum, the findings of this preliminary study indicate that both CST and GE contributed to modest positive changes in many areas of psychosocial adaptation. CST showed promise for more specifically improving parent-reported family functioning and child-reported satisfaction with quality of life. Baseline data suggested that this cohort was generally functioning well. Ongoing follow-up of this cohort will help determine if being introduced earlier to CST will enhance outcomes and help prevent the deterioration in glycemic control and increased family conflict that is so often witnessed over time.

Acknowledgments

This study was supported by grants funded by the National Institute for Nursing Research (NIH, 1&2R01NR004009). The results were presented in part at the Scientific Sessions of the American Diabetes Association, June, 2005.

References

1. National Institute of Diabetes and Digestive and Kidney Disorders (NIDDK). Diabetes in America. Bethesda, MD: NIH Publication; 2002. p. 02-3892.
2. Schilling LS, Knafl KA, Grey M. Changing patterns of self-management in youth with type 1 diabetes. *J Pediatr Nurs*. 2006; 21:412–424. [PubMed: 17101399]

3. Wysocki T, Taylor A, Hough BS, Linscheid TR, Yeates KO, Naglieri JA. Deviation from developmentally appropriate self-care autonomy: Association with diabetes outcomes. *Diabetes Care*. 1996; 19:119–125. [PubMed: 8718430]
4. Anderson BJ, Vangsness L, Connell A, Butler D, Goebel-Fabbri A, Laffel LM. Family conflict, adherence, and glycaemic control in youth with short duration type 1 diabetes. *Diabet Med*. 2002; 19:635–642. [PubMed: 12147143]
5. Grey M, Boland EA, Davidson M, Yu C, Sullivan-Bolyai S, Tamborlane WV. Short-term effects of coping skills training as adjunct to intensive therapy in adolescents. *Diabetes Care*. 1998; 21:902–908. [PubMed: 9614605]
6. Whittemore, R.; Kanner, S.; Grey, M. The influence of family on physiological and psychosocial health in youth with type 1 diabetes: A systematic review. In: Melnyk, B.; Fineat-Overholt, E., editors. *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice*. Philadelphia, PA: Lippincott Williams & Wilkins; 2004. p. CD22-73-CD22-87.
7. Lewin AB, Heidgerken AD, Geffken GR, et al. The relation between family factors and metabolic control: The role of diabetes adherence. *J Pediatr Psychol*. 2006; 31:174–183. [PubMed: 16467317]
8. Wysocki T. Associations among teen-parent relationships, metabolic control, and adjustment to diabetes in adolescents. *J Pediatr Psychol*. 1993; 18:441–452. [PubMed: 8410569]
9. Jacobson AM, Hauser ST, Lavori P, et al. Family environment and glycemic control: A four-year prospective study of children and adolescents with insulin-dependent diabetes mellitus. *Psychosom Med*. 1994; 56:401–409. [PubMed: 7809339]
10. Hanson CL, Henggeler SW, Harris MA, Burghen GA, Moore M. Family system variables and the health status of adolescents with insulin-dependent diabetes mellitus. *Health Psychology*. 1989; 8:239–253. [PubMed: 2737175]
11. Anderson BJ, Auslander WF, Jung KC, Miller JP, Santiago JV. Assessing family sharing of diabetes responsibilities. *J Pediatr Psychol*. 1990; 15:477–492. [PubMed: 2258796]
12. Grey M, Boland EA, Yu C, Sullivan-Bolyai S, Tamborlane WV. Personal and family factors associated with quality of life in adolescents with diabetes. *Diabetes Care*. 1998; 21:909–914. [PubMed: 9614606]
13. Laffel LM, Connell A, Vangsness L, Goebel-Fabbri A, Mansfield A, Anderson BJ. General quality of life in youth with type 1 diabetes: Relationship to patient management and diabetes-specific family conflict. *Diabetes Care*. 2003; 26:3067–3073. [PubMed: 14578241]
14. Kovacs M, Feinberg TL, Paulauskas S, Finkelstein R, Pollock M, Crouse-Novak M. Initial coping responses and psychosocial characteristics of children with insulin-dependent diabetes mellitus. *J Pediatr*. 1985; 106:827–834. [PubMed: 3998926]
15. Northam E, Anderson P, Adler R, Werther G, Warne G. Psychosocial and family functioning in children with insulin-dependent diabetes at diagnosis and one year later. *J Pediatr Psychol*. 1996; 21:699–717. [PubMed: 8936898]
16. 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]
17. Beardslee WR, Versage EM, Gladstone TR. Children of affectively ill parents: A review of the past 10 years. *Journal of the American Academy of Child & Adolescent Psychiatry*. 1998; 37:1134–1141. [PubMed: 9808924]
18. Turner SM, Beidel DC, Costello A. Psychopathology in the offspring of anxiety disorders patients. *Journal of Consulting & Clinical Psychology*. 1987; 55:229–235. [PubMed: 3571678]
19. Hanson CL, De Guire MJ, Schinkel AM, Kolterman OG. Empirical validation for a family-centered model of care. *Diabetes Care*. 1995; 18:1347–1356. [PubMed: 8721936]
20. Harris MA, Greco P, Wysocki T, White NH. Family therapy with adolescents with diabetes: A litmus test for clinically meaningful change. *Families, Systems & Health*. 2001; 19:159–168.
21. Satin W, La Greca AM, Zigo MA, Skyler JS. Diabetes in adolescence: Effects of multifamily group intervention and parent simulation of diabetes. *J Pediatr Psychol*. 1989; 14:259–275. [PubMed: 2754576]

22. Wysocki T, Greco P, Harris MA, Bubb J, White NH. Behavior therapy for families of adolescents with diabetes: Maintenance of treatment effects. *Diabetes Care*. 2001; 24:441–446. [PubMed: 11289465]
23. Grey M, Boland EA, Davidson M, Li J, Tamborlane WV. Coping skills training for youth with diabetes mellitus has long-lasting effects on metabolic control and quality of life. *J Pediatr*. 2000; 137:107–113. [PubMed: 10891831]
24. Pollock SE. Adaptation to chronic illness: A program of research for testing nursing theory. *Nurs Sci Q*. 1993; 6:86–92. [PubMed: 8502440]
25. Moher D, Schulz KF, Altman D, CONSORT Group (Consolidated Standards of Reporting Trials). The CONSORT statement: Revised recommendations for improving the quality of reports of parallel-group randomized trials. *JAMA*. 2001; 285:1987–1991. [PubMed: 11308435]
26. Forman, SG. Coping Skills Interventions for Children and Adolescents. San Francisco: Jossey-Bass; 1993.
27. Silverstein J, Klingensmith G, Copeland K, et al. Care of children and adolescents with type 1 diabetes: A statement of the American Diabetes Association. *Diabetes Care*. 2005; 28:186–212. [PubMed: 15616254]
28. Kovacs M, Brent D, Steinberg TF, Paulauskas S, Reid J. Children's self-reports of psychologic adjustment and coping strategies during first year of insulin-dependent diabetes mellitus. *Diabetes Care*. 1986; 9:472–479. [PubMed: 3769717]
29. Grossman HY, Brink S, Hauser ST. Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. *Diabetes Care*. 1987; 10:324–329. [PubMed: 3595399]
30. Ingersoll GM, Marrero DG. A modified quality-of-life measure for youths: Psychometric properties. *Diabetes Educ*. 1991; 17:114–118. [PubMed: 1995281]
31. Jacobson AM, de Groot M, Samson JA. The evaluation of two measures of quality of life in patients with type I and type II diabetes. *Diabetes Care*. 1994; 17:267–274. [PubMed: 8026281]
32. McKelvey J, Waller DA, North AJ, et al. Reliability and validity of the diabetes family behavior scale (DFBS). *Diabetes Educ*. 1993; 19:125–132. [PubMed: 8458308]
33. Kovacs M, Iyengar S, Goldston D, Obrosky DS, Stewart J, Marsh J. Psychological functioning among mothers of children with insulin-dependent diabetes mellitus: A longitudinal study. *Journal of Consulting & Clinical Psychology*. 1990; 58:189–195. [PubMed: 2335636]
34. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
35. Radloff LS. The use of the center for epidemiologic studies depression scale in adolescents and young adults. *Journal of Youth and Adolescence*. 1991; 20:149–166.
36. Rubin RR, Young-Hyman D, Peyrot M. Parent-child responsibility and conflict in diabetes care. *Diabetes*. 1989; 38:7A1.
37. Olson, D.; McCubbin, H.; Barnes, H.; Larsen, A.; Muzen, M.; Wilson, M. Family Inventories. St. Paul, MN: Family Social Science; 1982.
38. Cohen, J. Statistical Power Analysis for the Behavioral Sciences. Second. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1988.
39. Bandura, A. Self-Efficacy: The Exercise of Control. New York: W. H. Freeman; 1997.
40. Grey M, Boland EA, Davidson M, Yu C, Tamborlane WV. Coping skills training for youths with diabetes on intensive therapy. *Applied Nursing Research*. 1999; 12:3–12. [PubMed: 10048236]
41. Mednick L, Cogen FR, Streisand R. Satisfaction and quality of life in children with type 1 diabetes and their parents following transition to insulin pump therapy. *Children's Health Care*. 2004; 33:169–183.

Figure 1.
CONSORT Table: Subject Participation Flow Chart

Table 1
Group Comparison of Nonattenders and Attenders

	Nonattenders (N=24)	Attenders (N=87)	Chi-square or t	p
Income			1.58	.45
Low	35%	25%		
Middle	25%	27%		
High	35%	49%		
Race/Ethnicity			4.86	.03
White	67%	86%		
Nonwhite	33%	14%		
Pump	71%	72%	0.02	.90
Gender (female)	61%	50%	0.93	.33
HbA1c	7.13 ± .91	7.02±1.25	0.41	.68
Child age (years)	10.00±1.57	9.91±1.44	0.27	.79
Age at diagnosis(years)	7.22±2.61	6.59±2.93	0.94	.35
Mother's education(years)	14.42±2.65	15.49±2.27	-1.97	.05
Parent's age (years)	38.95±6.15	40.01±5.40	-0.81	.42
Duration (years)	3.12±2.49	3.71±2.91	0.88	.38

Table 2
Group Comparison of Study Entry Demographic and Clinical Data

Variable	Coping Skills Group (54)	Control Group (33)	Chi-square or t p-value
Age (years)	9.91 ±1.48	9.91 ±1.40	p=1.0
Parent's age (years)	39.27 ±4.87	41.18 ±6.02	p=.13
Diabetes duration (years)	3.66 ±2.75	3.80 ±3.20	p=.83
Gender			
Girls	55.6 %	69.7%	p=.19
Parent's Relationship (mother)	92.6%	97.0%	p=.65
Ethnic group			
White	81.5%	90.9%	p=.43
Black/Hispanic	18.5%	9.1%	
Family Income			
<\$9,999	14.3%	6.0%	p=.48
\$10,000-79,999	22.5%	24.3%	
\$80,000	63.2%	69.7%	
Treatment regimen at study entry			
Pump	72.2%	72.7%	p=.96
HbA _{1c}	6.98 ±1.32	7.08 ±1.15	p=.75

Table 3
Mixed Model Comparisons with Children (8-12 years old) at Baseline, 1 and 3 Months

	Experimental CST Group (n=54)			Control Educational Group (n=33)		
	Baseline	1 Month	3 Months	Baseline	1 Month	3 Months
HbA1C (range 4-14)	6.99 ±1.32	7.04 ±1.29	7.19 ±1.03	7.08 ±1.15	7.30±1.23	7.39 ±1.20
Coping						
Hard [/] (range 0-42)	18.35±4.30	17.41±4.30	17.54 ±4.00	17.77±3.89	16.83±3.79	16.35±4.12
Upset [/] (range 12-36)	17.93±3.67	17.33±3.55	17.17±3.89	16.88±3.03	17.01±3.06	16.41 ±3.56
Self-efficacy						
General (range 6-30)	13.23±3.89	11.82±3.20	11.79±3.62	13.00±3.70	12.55±3.57	12.16±4.19
Diabetes [/] (range 24-120)	55.74±13.20	50.95±11.32	51.61±13.19	52.04±13.18	49.58±13.06	47.55±15.64
Medical (range 5-25)	11.85±2.62	11.06±3.38	11.48±3.60	10.70±3.26	9.81 ±2.57	9.71±3.59
Quality of Life						NS
Impact ^{*/} (range 1-84)	36.76±9.70	35.42 ±8.90	34.45±8.56	31.97±4.93	33.46±6.93	31.09±4.81
Satisfaction ^{*2} (range 1-72)	57.50±7.46	57.02±9.01	59.63±9.18	62.50±4.83	60.29±6.74	60.84±10.04
Worry ^{*/} (range 1-32)	12.49±4.93	11.64±3.35	11.06±3.26	10.13±2.01	10.26±2.29	10.26±2.44
Family Behavior						
Guidance/Ctrl [*] (range 15-75)	47.65±6.33	47.05±7.27	47.91±7.29	46.50±6.13	45.20±6.35	45.18±7.06
Warmth/Caring ^{*2} (range 15-75)	57.68 ±7.99	57.55 ±7.63	57.50 ±8.19	61.30 ±6.50	60.92 ±6.21	59.98 ±6.61

Data are means ± SD

* Significantly different at baseline;

[/] log transformation of scores;

z reverse scored and then log transformed

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 4
Mixed Model Comparisons with Parents of Children (8-12 years old) at Baseline, 1 and 3 Months

	Experimental CST Group (n=47)			Control Educational Group (n=27)			GroupxTime/Time (d for F-ratio)
	Baseline	1 Month	3 Months	Baseline	1 Month	3 Months	
Coping							
Hard ¹ (range 0-84)	28.87±7.16	27.98±7.38	27.31±6.94	28.03±10.3	27.00±9.63	24.85±5.53	F _{Time} =11.1, p=.00 (0.29)
Upset ¹ (range 0-120)	45.68±10.3	45.96±10.6	43.73±10.7	43.06±11.6	42.42±12.5	40.25±9.65	F _{Time} =11.3, p=.07 (0.21)
Depression¹ (range 0-60)	12.42±8.54	12.62±8.39	12.60±7.91	9.88±7.47	9.30±6.90	8.74±5.12	NS
Diabetes Conflict							
Handle/responsibil. ¹ * (range 15-75)	51.31±8.59	50.77±8.92	48.15±8.53	47.68±9.26	47.18±9.49	46.25±9.28	F _{Time} =30.62, p<.00 (0.28)
Argue/hassle ¹ * (range 15-75)	29.40±12.8	29.07±12.9	27.81±9.92	23.81±9.98	24.71±6.70	24.42±10.3	NS
Family Functioning							
Adaptability ² * (range 14-60)	47.37±6.16	47.34±6.17	48.12±6.37	50.38±5.55	50.16±5.46	48.65±4.81	F _{GroupxTime} =6.77, p=.01 (0.28)
Cohesion ² (range 16-80)	66.67±8.12	67.22±7.35	66.02±6.94	67.03±7.33	66.71±7.39	65.71±7.68	F _{Time} =5.97, p=.02 (0.12)

Data are means ± SD

* Significantly different at baseline;

¹ log transformation of scores;

² reverse scored and then log transformed