Development and Validation of the Collaborative Parent Involvement Scale for Youths with Type 1 Diabetes

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Objective To develop and test a youth-report measure of collaborative parent involvement in type 1 diabetes management. Methods Initial item development and testing were conducted with 81 youths; scale refinement and validation were conducted with 122 youths from four geographic regions. Descriptive statistics, Cronbach’s α, and factor analyses were conducted to select items comprising the scale. Correlations with parenting style and parent diabetes responsibility were examined. Multiple regression analyses examining associations with quality of life, adherence, and glycemic control were conducted to assess concurrent validity. Results The measure demonstrated strong internal consistency. It was modestly associated with parenting style, but not with parent responsibility for diabetes management. A consistent pattern of associations with quality of life and adherence provide support for the measure’s concurrent validity. Conclusions This brief youth-report measure of parent collaborative involvement assesses a unique dimension of parent involvement in diabetes management associated with important youth outcomes.

Key words adherence; diabetes; parenting; quality of life.

Introduction

Type 1 diabetes is a common pediatric chronic disease, occurring in approximately 1 in every 400–600 children (National Institute of Diabetes and Digestive and Kidney Diseases, 2005). The disease occurs due to autoimmune destruction of the insulin-producing β-cells of the pancreas, resulting in a complete loss of the ability to produce insulin, a hormone necessary for survival. Treatment consists of multiple daily insulin injections or use of an insulin pump, blood glucose checking several times daily, regulation of carbohydrate intake, and correction of blood glucose fluctuations. Short-term complications of type 1 diabetes include diabetic ketoacidosis, requiring hospitalization, as well as episodes of hypoglycemia that can require emergency care. Long-term complications include increased risks of damage to the heart, kidneys, nerves, eyes, blood vessels, and other organs (National Diabetes Data Group, 1995).

Onset of type 1 diabetes most commonly occurs during childhood or early adolescence (National Institute of Diabetes and Digestive and Kidney Diseases, 2005). As such, parents initially have primary responsibility for the diabetes regimen, and then children assume progressively greater responsibility for diabetes management throughout the preadolescent and adolescent years. This transition is a crucial process that occurs gradually across many years, usually beginning in late childhood and occurring throughout adolescence. The provision of responsibility beyond the child’s capability or without sufficient parental support contributes to the decline in adherence generally observed during this time (Anderson, Auslander, Jung, Miller, & Santiago, 1990; Hamilton & Daneman,
et al., 2007) expands on the construct of instrumental support, assessing parent monitoring of tasks regardless of who assumes responsibility for them. Measures addressing a combination of instrumental and affective support include the Diabetes Family Behavior Checklist (Schaf, McCaul, & Glasgow, 1986), the Diabetes Family Behavior Scale (McKelvey et al., 1993), and the Diabetes Social Support Interview (LaGreca et al., 1995).

While these measures all represent important aspects of parental involvement in diabetes management, none were designed to measure behaviors indicative of a collaborative style of involvement. As opposed to measuring quantity of involvement, such a measure would assess quality of involvement, with an emphasis on behaviors that facilitate the development of the youth’s diabetes management skills. Optimal parenting across the transition from preadolescence through adolescence is characterized by a shift from a directive role to a more collaborative role. It also requires that parents adjust the type and level of their assistance behaviors to their child’s needs, which will vary from day to day as well as over time. This role transition allows for the expression of normal developmental strivings for increased autonomy while providing youth with needed assistance, facilitating the development of higher-level management skills, and maintaining a diabetes management safety net.

This transition in parenting behavior is consistent with the parental transfer of control that occurs across many domains from preadolescence through young adulthood (Holmebeck, Paikoff, & Brooks-Gunn, 1995). Despite a developmental decline in the degree of direct parental assistance with life tasks, effective parenting is marked by continued provision of guidance and assistance in the development of decision-making and problem-solving skills, which facilitates the child’s capability to handle life situations. This allows the parent to facilitate psychological autonomy in their child, while continuing to provide structure, monitoring, and warmth, which promote positive adolescent adjustment (Barber & Harmon, 2002; Holmebeck et al., 1995; Holmebeck, Shapera, & Hommeyer, 2002; Steinberg, 1990). Further, when parents provide appropriate autonomy and regard for their child, their efforts to manage behavior through assistance or instruction are more likely to be effective (Kerr & Stattin, 2000; Kerr, 2003; Steinberg, 1990).

Given the importance of this transition in the parenting role, the development of an instrument specifically measuring collaborative involvement independent of the quantity of assistance with specific diabetes management tasks would have both research and clinical utility. Indeed, collaborative involvement may remain high despite the
increase in assistance with specific regimen tasks that occurs with development. Alternatively, parents may demonstrate emotional support without providing the actual collaborative assistance needed for the child to develop competence in diabetes management. To our knowledge, only one existing measure addresses collaborative parental behavior in diabetes management. A structured interview assessing maternal involvement in the child’s coping with diabetes stress, specifically uninvolved, collaborative, controlling, and supportive maternal behavior during stressful diabetes-related events, was developed by Wiebe and colleagues (2005). While findings from research using this structured interview document the importance of collaboration in promoting adherence and glycemic control (Wiebe et al., 2005), the measure itself is limited to parent behavior during stressful events, as opposed to day-to-day events, and the time and interviewer burden of a structured interview limits the measure’s utility in future research and practice.

The aim of this study was to develop and test a measure of collaborative parent involvement for youths with type 1 diabetes. Given the likely influence of social desirability bias on parent report of this construct, we elected to develop a youth-report measure of collaborative parent involvement. This study was conducted in two phases. Phase 1 consisted of initial item development based on previous research supplemented by semi-structured in-depth interviews, with piloting of the items in a sample of adolescents with type 1 diabetes from two endocrinology practices in one geographic area. Phase 2 consisted of scale refinement and testing with a second, larger sample of adolescents with type 1 diabetes from four diabetes centers in different geographic areas.

Evidence of convergent validity was assessed by examining the relationship of the scale with general parenting style. A moderate correlation with parenting style would provide evidence of convergent validity, as authoritative parenting theory would predict that positive parenting style would be associated with more optimal-specific parenting behaviors. To determine whether the measure addressed a dimension of parenting behavior beyond parent degree of responsibility, the relationship of the scale with parent degree of responsibility for diabetes management tasks was examined. A modest correlation with parent diabetes responsibility would indicate that the scale measures a substantively unique construct, not just reflecting overall degree of parent responsibility. Support for concurrent validity was assessed by examining the relationship of the scale with the health outcomes of quality of life, adherence, and glycemic control. We hypothesized that the scale would be modestly associated with both adherence and quality of life, as this style of parenting would be expected to improve the youth’s diabetes management skills, promoting adherence, and increase psychosocial adaptation to the illness, improving quality of life. Given that only a modest relationship is generally observed between measures of adherence and hemoglobin A1c (HbA1c), no predictions were made regarding the relationship of the scale with HbA1c. We also hypothesized that the effect of collaborative parent involvement on outcomes may be greater for older youth or for youth who have a greater level of responsibility for diabetes management, as these parenting behaviors facilitate the youth’s ability to appropriately manage a transition in diabetes management responsibility.

Phase 1: Item Development and Pilot Testing

Methods

The first phase of the study, detailed below, consisted of initial scale developing and pilot testing. Descriptive statistics, Cronbach’s $\alpha$, and factor analyses were conducted to select items comprising the scale prior to refining and testing it with a larger sample.

Item Development

Item development was guided by previous published research on parenting of youths with diabetes supplemented by additional qualitative data collection. After an in-depth review of the literature, semi-structured interviews were conducted with nine youths with type 1 diabetes (ages 8–18) and their parents to further explore perceptions regarding relevant parent behaviors as well as language used to describe them. The goal was to determine parent behaviors related to diabetes management that reflected parent–child collaboration. Common themes included assisting the youths with problem-solving efforts, facilitating autonomy with diabetes management tasks while preventing excessive independence, promoting positive emotional adjustment to diabetes, and serving as an advocate for the youth to ensure that diabetes-related needs are met. These conceptual dimensions were used to generate a pool of 48 items addressing collaborative parent involvement. The items were developed by two of the investigators (T.N., community/clinical psychology; D.H., developmental psychology). Response options were provided on a 1–4 scale, with 1 = almost never; 2 = sometimes; 3 = often; and 4 = almost all the time. All items were reviewed by a team of investigators in developmental psychology, clinical psychology, adolescent...
health behavior, and pediatric endocrinology for face validity.

Participants
The initial pool of items was piloted with a sample of 81 adolescents from two diabetes clinics. Inclusion criteria included diagnosis of type 1 diabetes for at least 1 year, 11.0–16.0 years of age, no other major chronic illness or psychiatric diagnosis, and able to read English. A total of 113 eligible youths were identified; 81 (72%) consented to participate. The mean age of the sample was 14 years; 56% were female. The majority (63%) used insulin pumps; the rest were on multiple daily injections. The sample was primarily Caucasian (88%), with 11% African-American and 1% Asian. Seventeen percent reported a household income under $30,000, 46% between $30,000 and $100,000, and 37% over $100,000. Sixty-two percent of households had at least one parent with a bachelor’s degree or higher.

Procedures
Participants were recruited from two urban pediatric endocrinology clinics in Baltimore, Maryland for a behavioral intervention pilot study; data used for this analysis were collected as part of the baseline assessment. The clinics serve a wide geographical area; thus, the patient population includes families from urban, suburban, and rural areas in Maryland, Delaware, and Pennsylvania. When attending routine clinic visits, the youths were invited to participate in the study and eligibility was confirmed. Informed written consent was obtained from parents and assent from youths. Assessments were conducted by trained interviewers in the home or other location of the family’s choosing. The study protocol was approved by the Eunice Kennedy Shriver National Institute of Child Health and Human Development Institutional Review Board and Western Institutional Review Board (for the clinical sites).

Analyses
Descriptive analyses (frequencies, means, and skewness) were conducted, and items with a skewness score >1.0 were eliminated. Because the sample size was judged to be smaller than optimal for use of factor analysis with the entire pool of items, items were then eliminated if their item-to-total correlation was <0.30. A principal components factor analysis was then conducted to determine whether the remaining items all loaded a single factor based on both the slope of scree plot as well as examination of the eigenvalues. Items loading <0.60 were eliminated. This factor loading was selected because the number of items remained high, and a brief, concise scale was desired. Finally, the panel of experts in developmental psychology, clinical psychology, adolescent health behavior, and pediatric endocrinology scrutinized the remaining items to determine whether any items were potentially problematic in terms of cognitive complexity or conceptual representation. Cronbach’s $\alpha$ and factor structure of the final scale was assessed.

Results
Of the 48 initial items, 15 items had a skewness score >1.0. Of the remaining 33 items, three had item-to-total correlations below 0.3 and were removed. Factor analysis of the 30 remaining items was then conducted; the scree plot indicated a one-factor solution, having an eigenvalue of 13.1 and accounting for 43.5% of the variance. A total of 20 items loaded >0.6 and were retained. Cronbach’s $\alpha$ of these 20 items was 0.95, indicating the scale could be further shortened without threatening internal consistency.

Phase 2: Scale Refinement and Testing with a Larger, Multi-Site Sample

Methods
Scale Refinement
While the scale as piloted demonstrated strong psychometric properties, the investigators believed that it could be improved from a conceptual standpoint. The initial pool of items focused on parent collaborative involvement pertaining to problem-solving, use of teachable moments, and tailoring of assistance based on the child’s needs. However, achieving collaborative involvement across the developmental transitions that occur with adolescence requires that the parent also maintain an awareness of the child’s needs and capability for autonomy, and also an awareness of the child’s behavior when not in the presence of the parent. We believed that these dimensions had not adequately been included in the initial item pool.
Therefore, seven additional items were generated that quired parental awareness of child diabetes management activities and processes. These items were then tested along with the previously retained nine items.

**Participants**

One hundred and twenty-two youths with type 1 diabetes from four diabetes centers in different US geographic regions who were enrolled in a multicenter behavioral intervention study participated; data were collected as part of the baseline assessment. Inclusion criteria included diagnosis of type 1 diabetes for at least one year, insulin dose at least 0.5 \( \mu \text{g/kg/day} \), mean HbA1c over the last 8 months <13.0%, 9.0–14.5 years of age, no other major chronic illness or psychiatric diagnosis, and able to speak English. A total of 167 eligible youths were invited to participate in the study. Of these, 132 (79%) initially agreed to participate. However, 10 of these families declined participation when contacted to schedule the baseline assessment, resulting in a final sample of 122 (73%), with 29–31 participants from each clinical site. The mean age of the sample was 12 years; 50% were female. The majority of the participants (68%) were on a flexible diabetes management regimen (either insulin pump or basal-bolus injection regimen); the rest used conventional multiple daily injections. The sample was 72% Caucasian, 12% African-American, 9% Hispanic, 1% Asian, and 6% mixed or other. This racial composition reflects national prevalence estimates, as diabetes is most common in non-Hispanic whites, followed by African-Americans and Hispanics (SEARCH for Diabetes in Youth Study Group, 2007). Twelve percent reported a household income under $30,000, 51% between $30,000 and $100,000, and 37% over $100,000. Fifty percent of households had at least one parent with a bachelor’s degree or higher.

**Procedures**

Eligible participants were identified and recruited to participate by trained research staff at each site. Prior to their scheduled clinic visits, a letter and brochure were sent to the families, inviting their participation. Informed written consent was obtained from parents and assent from youths. Assessments were conducted by trained interviewers in the home or other location of the family’s choosing within 4 weeks prior to their clinic appointment. The study protocol was approved by the Eunice Kennedy Shriver National Institute of Child Health and Human Development Institutional Review Board and the Institutional Review Boards of each clinical site.

**Measures**

Items tested for the Collaborative Parent Involvement (CPI) Scale included the previously retained nine items plus the seven additional items querying parental knowledge of child diabetes management activities and processes. Scores on the final CPI scale were calculated as the mean of all items. Additional measures were selected to determine the relationship of the CPI scale to relevant parenting behaviors and health outcomes. A measure of authoritative parenting style was selected as we hypothesized that authoritative parenting would be associated with higher CPI. A common measure of parent responsibility for diabetes management tasks was selected to determine whether the CPI tapped a different dimension than overall

<table>
<thead>
<tr>
<th>Item</th>
<th>Phase 1 Cronbach’s ( \alpha = .91 )</th>
<th>Phase 2 Cronbach’s ( \alpha = .91 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a parent/guardian who…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helps me plan my diabetes care to fit my schedule.</td>
<td>.77 .83</td>
<td>.52 .59</td>
</tr>
<tr>
<td>Knows when I need a little extra help with my diabetes.</td>
<td>.74 .81</td>
<td>.70 .76</td>
</tr>
<tr>
<td>Helps me figure out how to change my insulin or eating to fit the amount I exercise.</td>
<td>.67 .75</td>
<td>.63 .70</td>
</tr>
<tr>
<td>Helps me out when I am too tired or stressed to take care of my diabetes on my own.</td>
<td>.68 .75</td>
<td>.68 .74</td>
</tr>
<tr>
<td>Helps me learn how to take care of troubles I have with my diabetes.</td>
<td>.73 .82</td>
<td>.78 .84</td>
</tr>
<tr>
<td>Helps me plan how to spend time with my friends and still take good care of my diabetes.</td>
<td>.68 .75</td>
<td>.62 .68</td>
</tr>
<tr>
<td>Talks with me about how to adjust (change) my insulin, eating, and exercise.</td>
<td>.69 .77</td>
<td>.74 .80</td>
</tr>
<tr>
<td>Helps me with my diabetes when I need it.</td>
<td>.53 .62</td>
<td>.71 .77</td>
</tr>
<tr>
<td>Helps me take care of any problems I am having at school with taking care of my diabetes.</td>
<td>.68 .75</td>
<td>.61 .67</td>
</tr>
<tr>
<td>Knows what things are hard for me in taking care of my diabetes.</td>
<td>– –</td>
<td>.62 .68</td>
</tr>
<tr>
<td>Knows when to let me do more to take care of myself and my diabetes.</td>
<td>– –</td>
<td>.66 .72</td>
</tr>
<tr>
<td>Knows how I am taking care of my diabetes when I am with friends.</td>
<td>– –</td>
<td>.54 .60</td>
</tr>
</tbody>
</table>

Table I. Properties of the Collaborative Parent Involvement Scale Items
quantity of involvement or responsibility. Standard measures of adherence, quality of life, and glycemic control were selected as they represent important health outcomes. The Authoritative Parenting Index was used to assess parenting styles. The Authoritative Parenting Index, a youth-report measure, has two factors reflecting an authoritative parenting style, responsiveness (acceptance), and demandingness (behavioral control) (Jackson, Henriksen, & Foshee, 1998). Alphas in the current study were .76 (responsiveness) and .67 (demandingness). Higher scores indicate more optimal parenting.

The Diabetes Family Responsibility Questionnaire was used to measure the degree of parent responsibility for diabetes management tasks (Anderson et al., 1990). This 17-item measure was completed by both children (α = .76) and parents (α = .67). The sum of items was calculated, such that higher scores indicate greater parent responsibility.

The Diabetes Self Management Profile using either the conventional or flexible regimen versions (depending on the child’s diabetes management regimen) was used to measure diabetes treatment adherence (Diabetes Research in Children Network (DirecNet) Study Group, 2005; Harris et al., 2000). Trained interviewers completed these structured interviews with parents and children ages 11 and older. The measure has demonstrated adequate internal consistency (α = .76), parent–child agreement (r = .61), 3-month test–retest reliability (r = .67), and inter-interviewer agreement (r = .94). In this study, αs ranged from .66 to .76. Higher scores indicate greater adherence.

The Pediatric Quality of Life Inventory generic (Varni, Seid, & Kurtin, 2001) and diabetes modules (Varni et al., 2003) were administered to both children and parents to measure the child’s health-related quality of life. The 23-item generic module (αs = .89 child report and .88 parent report) measures physical, emotional, social, and school functioning, while the 28-item diabetes module (αs = .87 child report and .85 parent report) measures diabetes symptoms, treatment barriers, treatment adherence, worry, and communication with health professionals. Higher scores indicate greater quality of life.

Glycemic control was assessed by HbA1c, an indicator of blood glucose level over the previous 3 months. Blood samples were obtained by finger-stick at each clinic and samples were frozen for shipment as whole blood to the Joslin Diabetes Center Laboratory, a reference laboratory for this assay. The samples were processed using the Tososh 2.2 device (Tososh Corporation, Foster City, CA, USA).

Analyses
As done in Phase I, items with skewness score >1.0 or an item-to-total correlation of <0.30 were eliminated. A principal components factor analysis was conducted to determine whether the remaining items all loaded a single factor, and items loading <0.60 were eliminated. Cronbach’s α and factor structure of the final scale was assessed. Descriptive characteristics of the scale were assessed, and the Flesh-Kincaid grade level score was calculated to determine reading level required. Differences in scale scores by age group, gender, and regimen were tested using t-tests.

To assess evidence of convergent validity, correlation of the CPI scale with general parenting style was examined. To determine the degree of overlap with a widely used measure of parent involvement, correlation of the CPI scale with parent diabetes responsibility was examined. Support for concurrent validity was then assessed by examining the relationship of the CPI scale with diabetes-related quality of life, adherence, and glycemic control. Because these outcomes are known to be associated with child age, child age was included as a covariate. Multiple regression analyses were conducted, in which each outcome was regressed on age and CPI. To determine whether the effect of CPI was moderated by age or degree of parent responsibility, interactions of CPI by age and by parent responsibility were tested. Because multiple statistical comparisons were performed, the α-level for statistical significance was set at .025.

Results
All items from Phase I demonstrated adequate item properties. Cronbach’s α for the nine items tested in phase 1 was 0.89. Item-to-total correlations ranged from 0.53 to 0.77. Of the seven new items, three were eliminated due to skewness >1.0 and 1 was eliminated because it loaded <0.60 in the factor analysis. Cronbach’s α of the 12 total retained items was 0.91. Item-to-total correlations ranged from 0.52 to 0.78. Factor analysis of the 12 items (Table I) indicated a single-factor solution, with all items loading a single factor having an eigenvalue of 6.2 (all other factors had an eigenvalue of <1.0), accounting for 51.3% of the variance.

Mean score on the CPI was 3.3, with a SD of 0.6, and ranged from 1.5 to 4.0. The measure demonstrated a fourth grade reading level as assessed by the Flesh-Kincaid grade level score. There were no significant differences in scores by age group, gender, or regimen. The hypothesis for evidence of convergent validity was supported, as CPI was positively correlated with parenting.
style (responsiveness $r = .52$, $p < .001$; demandingness $r = .37$, $p < .001$). CPI was not associated with parent level of diabetes management responsibility (parent report $r = -.02$, $p = .85$; child report $r = -.04$, $p = .70$). Hypotheses for evidence of concurrent validity were partially supported. In regression analyses controlling for child’s age, CPI was significantly associated with both child and parent report of adherence, as well as with child report of both generic and diabetes-related quality of life, but not with parent report of quality of life or with HbA1c (Table II). Contrary to our hypotheses, no significant interactions of CPI by either age or parent responsibility were found.

### Discussion

This brief youth-report measure of collaborative parent involvement demonstrates good psychometric properties, applicability across the age range studied, and evidence suggestive of convergent and concurrent validity. The high internal consistency and replication of the factor structure across both samples suggest that parenting behaviors, such as assisting with problem-solving and responsively balancing provision of assistance and autonomy, form a parenting behavior construct that may be described as collaborative parent involvement. Findings from this study add to the body of evidence indicating that a collaborative parent–child partnership may promote greater adherence, glycemic control, and quality of life as the child progress through adolescence and into adulthood (Anderson et al., 1990, 1997; Wysocki, 1993; Wysocki & Greco, 1997). Furthermore, while much of the previous research has addressed parent involvement from the perspective of quantity of assistance with specific regimen tasks, results from this study extend that research, suggesting the importance of the quality of the parent–child relationship as it interfaces with diabetes management. The association of CPI with adherence (as reported by both child and parent) as well as both generic and diabetes-specific quality of life (as reported by the child) lend support to its utility as a potential predictor of important diabetes outcomes. The amount of variance accounted for by the CPI was modest; however, parenting behavior is only one of many factors that may influence adherence and quality of life, and therefore we did not hypothesize that the construct would account for a large proportion of the variance in these outcomes. While the CPI was associated with adherence, it was not significantly associated with HbA1c, suggesting that CPI does not have an indirect effect on glycemic control through adherence. In addition, it is plausible that CPI may show a bi-directional relationship with HbA1c over time, with parents of children who have a higher HbA1c increasing their involvement in an attempt to improve their health status.

### Table II. Multiple Regression Models of Collaborative Parent Involvement Scale on Diabetes Outcomes

<table>
<thead>
<tr>
<th>Variable*</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes adherence (C) ($R^2 = 0.07$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.23</td>
<td>2.39</td>
<td>.02</td>
</tr>
<tr>
<td>Child’s age</td>
<td>-.11</td>
<td>-1.14</td>
<td>.26</td>
</tr>
<tr>
<td>Diabetes adherence (P) ($R^2 = 0.12$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.25</td>
<td>2.88</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Child’s age</td>
<td>-.25</td>
<td>-2.88</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Quality of Life: Generic (C) ($R^2 = 0.20$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.43</td>
<td>5.19</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Child’s age</td>
<td>.11</td>
<td>1.36</td>
<td>.18</td>
</tr>
<tr>
<td>Quality of Life: Generic (P) ($R^2 = 0.07$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.07</td>
<td>0.71</td>
<td>.48</td>
</tr>
<tr>
<td>Child’s age</td>
<td>.01</td>
<td>0.11</td>
<td>.92</td>
</tr>
<tr>
<td>Quality of Life: Diabetes (C) ($R^2 = 0.13$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.36</td>
<td>4.24</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Child’s age</td>
<td>-.02</td>
<td>-0.24</td>
<td>.81</td>
</tr>
<tr>
<td>Quality of Life: Diabetes (P) ($R^2 = 0.05$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>.08</td>
<td>-0.90</td>
<td>.37</td>
</tr>
<tr>
<td>Child’s age</td>
<td>-.20</td>
<td>-2.26</td>
<td>.03</td>
</tr>
<tr>
<td>Hemoglobin A1c ($R^2 = 0.04$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative parent involvement</td>
<td>-.12</td>
<td>-1.36</td>
<td>.18</td>
</tr>
<tr>
<td>Child’s age</td>
<td>.16</td>
<td>1.78</td>
<td>.08</td>
</tr>
</tbody>
</table>

*Reporter indicated by (C) child or (P) parent.
The lack of association of CPI with overall level of parent responsibility for diabetes management tasks is notable. While some degree of association may be expected, it is desirable that a measure of parent collaborative involvement assess a dimension of parenting behavior that is not excessively associated with the level of responsibility for specific regimen tasks. Even as parents may hold less responsibility for the conduct of such tasks, their involvement in problem-solving, consulting, supporting, and providing a “safety net” should remain high. For example, a youth may be responsible for giving his/her own insulin, but the parent may help the youth problem-solve how to remember to take insulin before lunch at school or help the child decide how to adjust the insulin dose for an upcoming track meet. As such, the assessment of parent collaborative involvement as applicable to varying levels of parent responsibility is particularly relevant across the transition in diabetes management responsibility that occurs across preadolescence and adolescence. The hypothesis that the effect of CPI on outcomes may be greater for older youth or for youth who have a greater level of responsibility for diabetes management was not supported, indicating that the association of CPI with diabetes adherence and quality of life is equally associated across the ages and levels of youth responsibility present in this sample. However, it should be noted that the sample did not include older adolescents, so this question could not be fully addressed by this study.

The CPI scale demonstrated a moderate correlation with parenting style responsiveness and a small but significant correlation with parenting style demandningness. These findings are consistent with the literature on authoritative parenting. Current understanding of the mechanisms by which parenting style impacts youth development (Kerr et al., 2000; Kerr, 2003) suggests that general parenting style influences the effectiveness of specific parenting behaviors intended to foster healthy and adaptive youth behaviors; thus, a greater degree of collaborative parent involvement would be hypothesized in families demonstrating high responsiveness and demandningness. The CPI scale provides a useful measure beyond the constructs of responsiveness and demandningness in that it assesses a construct that is more likely to arise out of an authoritative parent style, but indicates specific collaborative behaviors related to diabetes management that are believed to foster improved management and quality of life. As such, the measure may be used both to advance our understanding of the role of the parent-child relationship in diabetes management, as well as the effectiveness of behavioral interventions designed to promote improved parent-child collaboration. Nevertheless, it would also be instructive to determine whether parents who show a high level of collaborative involvement in diabetes management also show a high level of collaborative involvement in other dimensions of their child’s life, such as school work or extracurricular activities.

Strengths of the development and testing of the CPI scale include the following: (a) preliminary interviews of age-appropriate respondents and their parents, not involved in subsequent assessment to supplement a review of the literature; (b) involvement of experts in diabetes management and adolescent development in identifying and evaluating items; (c) testing of the items with two independent samples of youths with type 1 diabetes from multiple diabetes care centers; (d) sample age range spanning preadolescence to middle adolescence, a critical period in parent-child interactions in managing diabetes; (e) creation of a short, efficient scale by eliminating items with potential ceiling effects; and (f) evaluation of convergent and concurrent validity.

Several limitations should also be noted. Due to potential social desirability bias in reporting parenting behavior, only a youth-report instrument was developed. As such, associations between CPI and quality of life may be inflated by shared method variance. In addition, there were insufficient numbers of minority youths to allow evaluation of the instrument separately among racial and ethnic minorities. Another possible limitation is that the sample consisted of families who had enrolled in a pilot and feasibility study for an intervention trial, and they may not have been representative of the broader diabetes clinic populations. However, several points lessen this concern. The preventive focus of the study, and the fact that participants were enrolling in a brief pilot study combine to make this sample different from that in many psychological intervention studies of clinically referred families. Importantly, though, the age range of participants was dictated by their appropriateness for the intervention studies being conducted; the CPI scale should be evaluated further in older adolescents who assume greater responsibility for diabetes management tasks and therefore might show a stronger effect of collaborative involvement.

Development and testing of a scale is only the initial step in understanding the utility of the scale and the construct it purports to measure. Future research will more fully determine the utility of the CPI scale. Notably, the evaluation of concurrent validity was based on a cross-sectional design, and additional research will be needed to establish prospective prediction of CPI with both adherence and quality of life. Replication of these findings using
a sample having a broader age range and without restriction on factors such as current metabolic control or comorbidity would be desirable. The lack of association with parent responsibility (rather than a modest correlation) merits additional study to clarify the relationship of these two constructs and their unique contributions to child outcomes. In addition, a more comprehensive assessment of concurrent validity would involve comparison with an objective measure of parenting behavior. Longitudinal analyses are required to more appropriately assess the potential relationship of CPI with HbA1c. Other future research questions include (a) determination of whether CPI interacts with overall level of parent assistance with tasks in predicting outcomes longitudinally; (b) potential differences in the relation of CPI with diabetes outcomes by race, gender, family composition, and socio-economic status; and (c) the degree to which CPI is modifiable via behavioral intervention. Should future research continue to support the utility of the CPI scale, it may be a useful clinical tool to identify families who are at risk for difficulties as their child develops greater responsibility for diabetes management. It might also help clinicians and parents identify specific areas in which parents may improve their involvement in diabetes management even as they allow their child to share or assume responsibility for regimen tasks.

This study provides a useful step in advancing our understanding of the nature of parent involvement in diabetes management, and the mechanisms by which parent behaviors may influence diabetes outcomes. Clearly, both the degree and the nature of parent involvement in diabetes management are important factors influencing both medical and psychosocial outcomes. Building on previous research addressing the degree of parent involvement in diabetes management tasks, the CPI provides a new tool to assess the collaborative nature of parent involvement in diabetes management.

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