Validity and Reliability of an Adolescent and Parent Rating Scale of Type 1 Diabetes Adherence Behaviors: The Self-Care Inventory (SCI)

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Objective Accurate assessment of diabetes regimen adherence behaviors in youth is a challenging endeavor and is limited by a paucity of empirically supported measures. The purpose of this research is to further demonstrate the validity and reliability of the Self-Care Inventory (SCI), a youth and parent report measure of adherence with diabetes self-care behaviors. The SCI was chosen given its ease of implementation, applicability to multiple diabetes regimens, and dual parent/youth formats.

Methods Participants were 164 youth with type 1 diabetes and a parent. Measures were administered at regular office visits to a tertiary care diabetes clinic.

Results The SCI has strong psychometric properties, including adequate internal consistency, parent–youth agreement, and test-retest agreement. Relations between the SCI and a structured interview of diabetes adherence (the Diabetes Self-Management Profile; DSMP) and hemoglobin A1c (HbA1c) were strong.

Conclusions In addition to demonstrating strong psychometrics, this research provides independent support for the SCI. Thus, the SCI is consistent with recent criteria proposed by Quittner et al. (Journal of Pediatric Psychology, 33, 916–936) for an empirically supported measure of regimen adherence. Although other methods of accessing adherence may provide more comprehensive assessments, the brevity, ease-of-implementation, and robustness for multiple regimens makes the SCI an ideal tool for clinicians and researchers.

Key words adherence; children; self-care inventory; type 1 diabetes.

Children and adolescents with type 1 diabetes are often nonadherent with physician recommendations (Anderson, Soren, & Laffel, 2007; Greening, Stoppelbein, Konishi, Jordan & Moll, 2007; Holmes et al., 2006; Weissberg-Benchell et al., 1995). The extent of nonadherence to the diabetes regimen is variable, ranging from 20% to 93% (Kovacs, Goldston, Obrosky, & Iyengar, 1992; La Greca & Mackey, in press; Rapoff, 1999; Wysocki, Buckloh, Lochrie, & Antal, 2005). Each year, nonadherence with the treatment regimen leads to medical complications, hospitalizations and consequently higher healthcare costs; estimated costs of non-adherence in the United States are estimated to be as high as $300 billion per year (La Greca & Bearman, 2003). Poor adherence adversely impacts health often resulting in increased morbidity and mortality, as well as excessive use of health care services (La Greca, 1990; Lemanek, Kamps, & Chung, 2001; Quittner, Espelage, Ievers-Landis, & Drotar, 2002). Nonadherence is a significant concern not only for medical providers but also for mental health providers. For example, in an analysis of 91 psychological consultations received from a pediatric diabetes clinic,
Despite breakthroughs in diabetes treatment technology (e.g., insulin pumps, electronic blood-glucose meters) and empirical support for intensive insulin regimens, the benefits of these advances may be diminished when recommendations are not followed. For instance, nonadherence can negatively impact clinical decisions made by health care providers, e.g., prescribing insulin doses based on the available information may be problematic, if full insulin needs are not known due to undisclosed nonadherence. Furthermore, the demands of the diabetes regimen can be burdensome to children and their families—often psychosocial interventions aiming to improve diabetes self-care are unsuccessful (see Anderson et al., 2007 for a review). Thus, as children and adolescents receive increasingly intensive and complex medical regimens, it becomes even more critical to have psychometrically robust assessment methodology to monitor their regimen adherence.

There is no universal agreement on explicit standards for measuring adherence; measures of adherence range on a continuum from direct to indirect, each offering several advantages and limitations (for reviews, see: La Greca & Bearman, 2003; La Greca & Mackey, in press; Quittner, Modi, Lemanek, Ievers-Landis, & Rapoff, 2008; Wysocki, 2006). To summarize, although direct observation of regimen behaviors can provide a highly specific, unconfounded method of assessment, the approach is impractical and cost prohibitive. Twenty-four hour recall interviews (Johnson, 1993; Johnson, Silverstein, Rosenbloom, Carter, & Cunningham, 1986) may offer the most comprehensive, multidimensional alternative. However, despite associations with hemoglobin A1c (HbA1c) (Freund, Johnson, Silverstein, & Thomas, 1991; Johnson et al., 1992; Reynolds, Johnson, & Silverstein, 1990), the procedure can be difficult to implement in many healthcare settings due to resources and costs required to conduct multiple interviews and analyze complex data (McNabb, 1997). A structured interview, such as Diabetes Self Management Profile (DSMP; Harris et al., 2000) offers cost-effective and efficient alternatives for assessing adherence. However, although the DSMP is easier to administer than the 24 h recall, it still requires 20–40 min of the patient and parent’s time. Additionally, given the semi-structured nature of the DSMP interview, interviewers must possess a comprehensive knowledge of the diabetes regimen to accurately and reliably administer the measure. For application within our prior research, clinicians required 5–15 h training prior to scoring reliably with senior clinicians.

Consequently, a more efficient tool for assessing diabetes adherence is necessary. Youth or parental-report of adherence, via paper-and-pencil administration, offers an alternative to the interview format (Anderson, Auslander, Jung, Miller, & Santiago, 1990; Wysocki, 2006). However, in a recent analysis of empirically based assessment for adherence, only 11 measures were found for all pediatric medical conditions (Quittner et al., 2008). Alarmingly, only four measures met the criteria for “well-established”, which was defined as, “at least two research teams have published sufficient information evaluating the measure and establishing its strong psychometric properties” (Quittner et al., 2008, p. 918).

One promising such adherence measure is the Self Care Inventory (SCI), a 14-item self- and parent-report measure of behaviors associated with the self-care of type 1 diabetes (La Greca, Swales, Klemp, & Madigan, 1988; La Greca & Bearman, 2003). The measure was developed by a pediatric psychologist with expertise in type 1 diabetes (Annette M. La Greca, PhD) for clinical and research purposes. Versions are available for adolescents and parents with appropriate wording for each (identical item content). Respondents report on their behavior over a 2-week interval using a 5-point Likert scale. Items on the SCI reflect the main components of the type 1 diabetes regimen, including: monitoring and recording glucose, administering and adjusting insulin, regulating meals and exercise, and keeping appointments. Although the SCI was developed prior to the Diabetes Control and Complications Trial; DCCT, 1993), the same core regimen components remain at present (Silverstein et al., 2005). However, psychometric properties of the SCI have yet to be examined in a sample of youth on more recent, intensive regimens.

Given the paucity of empirically based adherence assessment tools in pediatric populations, the aim of the current study was to evaluate the psychometric properties of the SCI with adolescents. Studies of the SCI with adults have been promising (Weinger, Butler, Welch, & La Greca, 2005) however, detailed and readily available psychometric data for adolescents and parents are lacking. This study examines the reliability of the SCI, including internal consistency, test-retest data, and parent–child agreement. The validity of the SCI is also examined through comparisons with a previously established adherence measure (DSMP interview), frequency of blood-glucose monitoring, and metabolic control (HbA1c). Reliability and validity in a subset of the sample on intensive regimens will also be examined. Overall, this research sought to conduct an extensive analysis of the SCI’s psychometric properties by an...
independent research group\(^1\) with expertise in pediatric diabetes with the aim of solidifying the SCI as an empirically “well-established” measure of adherence.

**Method**

**Participants and Procedure**

This study was approved by the institutional review board (IRB) for health sciences research. Participants were 164 youth with type 1 diabetes (60% female; ages 11–18 years, Mean (M) = 14.6 years, standard deviation (SD) = 2.9 years) and a primary caregiver (77% mothers, 15% fathers, 8% other). (“Parent” will be used to describe the primary caregiver in this study.) The ethnic distribution was 72% Caucasian, 16% African American, 9% Hispanic, and 3% representing other ethnic groups. On average, participants had been diagnosed with diabetes for 4.7 years (SD = 3.6; range: 1–18 years), had a mean HbA1c of 8.7% (SD = 2.0; range 5.0–14.0), and average frequency of blood glucose monitoring (BGM) was 4.0 times/day (SD = 0.94; range 1.2–6.7). The sample was from a predominantly middle to lower-middle class background (median income = $49,000 ± 25,100; 40% of youth had at least one parent who completed college).

Seventy-five youth (45.7%) were on intensive regimens: 23 youth were on continuous subcutaneous insulin infusion (CSII; i.e., the insulin pump) and 52 were on glargine regimens. The recruitment site was a southeastern university-based pediatric endocrinology tertiary care clinic (University of Florida Health Science Center, Gainesville, Florida, USA).

Recruitment criteria included diagnosis with diabetes (for at least 12 months), patient age between 11 and 18 years, and the ability to read/understand study materials. Signed informed consent was obtained from each participant. Each family received $10 for their participation. Refusal rate was 7.5% (14 families); of these, most cited time restriction and many agreed to participate at a future appointment; no demographic differences (age, gender, and ethnicity) were identified between study participants and those youth who declined. Questionnaires and the structured adherence interview (DSMP, see below) were administered by one of the authors (ABL, GRG, LBW, DCD, or EAS), each with five or more years experience with these instruments.

\(^1\)Dr La Greca’s participation was limited to professional consultation at the time of manuscript preparation; research design, implementation and data analyses were conducted independently at the University of Florida Health Science Center, Gainesville, FL.

Order of the interview and questionnaires were counter-balanced (no differences in scores were noted). Blood work was obtained by trained clinic staff as part of the routine clinic visit.

Two-week test-retest data were collected for 20.1% (n = 33) of parents and 21.3% of the adolescents (n = 35) participating in this research. Every third participant was asked to complete test-retest data; two refused, citing time constraints as their reason. Thus, ~60% of participants whom were asked to complete test-retest data and agreed returned the measures within 1 and 2 weeks. Data postmarked outside of that window were excluded to minimize error in an effort to most closely overlap the retest administration with the time period of the clinic-administered SCI. Parents and adolescents were instructed to complete their forms independently (preferably in separate rooms) and were provided with individual, stamped and addressed envelopes for return to the research team. Re-administration was authorized by the overarching informed consent (obtained initially in the clinic).

**Measures**

**Self-Care Inventory (SCI)**

The SCI (La Greca et al., 1988) is a 14-item self-report measure, assessing patients’ perceptions of their adherence to diabetes self-care recommendations over the previous 1–2 weeks. There are 14-item versions for adolescents and their parents (wording varies slightly between parent and child forms; content is identical), and the measures take ~5 min to complete. SCI assesses four domains of adherence behaviors (monitoring, insulin, diet, and exercise). Respondents report on adherence behaviors using a 5-point scale (e.g., 1 = “never do it”; 5 = “always do this as recommended without fail”) and “non-applicable” is provided as a response option. The SCI has been used in prior research with children and adolescents with type 1 diabetes (Davis et al., 2001; Greco et al., 1990). Items on the SCI appear robust to variation in individual diabetes regimens. For example, the wording of items is appropriately vague (e.g., items on insulin dosing could be applied to patients on continuous subcutaneous insulin infusion, insulin aspart/lispro and glargine, NPH/regular, or pre-mixed insulin). Additionally, the SCI focuses on behaviors across all regimens (e.g., glucose and ketone checking, exercise) and does not require separate forms for different regimens. Finally, the SCI instructs the respondent to rate behavior in comparison to their prescribed regimen (as opposed to anchor points) and allows for a non-applicable response. Scores were summed (the total score and each subscale) and divided...
by the total number of items in each scale (subtracting the number of items marked “Not Applicable” from the dominator); values were then multiplied by 10 to provide a more conventional metric. Higher scores reflect more optimal adherence. The SCI was developed by Dr. Annette La Greca and can be obtained from her at alagreca@miami.edu.

Diabetes Self-management Profile (DSMP)
The DSMP (Harris et al., 2000) is a 23-item structured interview with an administration time of ~20–30 min. Questions assess insulin administration/dose adjustment, blood-glucose monitoring, exercise, diet, and management of hypoglycemia. Strong psychometric properties have been reported (Diabetes research in children network study group [DirecNet, 2005; Harris et al., 2000; Lewin, Geffken et al., 2005; Lewin, Storch, Geffken, et al., 2005]). Items were responded to in an open-ended manner and interviewers were conducted by study authors (each with over 5 years experience using the DSMP). All items summed to produce a total adherence score with higher scores suggesting more optimal adherence. Acceptable internal consistency was found for both parent ($\alpha = .76$) and child ($\alpha = .74$) administrations in our sample.

Blood Glucose Monitoring Frequency
Average daily frequency of blood glucose monitoring was obtained from the patient’s clinic chart based on meter download. Extant research suggests that blood glucose monitoring frequency is strongly related to metabolic control (Hood, Butler, Volkening, Anderson, & Laffel, 2004; Levine, Anderson, Butler, Brackett, & Laffel, 2001).

Measurement of Glycemic Control
HbA1c provides an estimate of glycemic control over the previous 2–3 months (American Diabetes Association, 2005). Higher scores reflected poorer glycemic control. Blood samples were analyzed using a Bayer DCA 2000+ (calibrated daily) and were collected as part of the patient’s routine medical care. Reference range for the instrument (in normal healthy individuals) is 4.3–5.7. DCA 2000 assays are concordant with laboratory processed blood samples (Tamborlane et al., 2005).

Demographics
Child and parent demographic information (including income and parent education) were obtained on a parent-report form.

Data Analysis
Internal consistency of the SCI-Adolescent and SCI-Parent was evaluated using Cronbach’s $\alpha$ coefficient (Cronbach, 1951). Correlations were computed to evaluate 1–2 week test-retest and convergent validity. Given the ordinal nature of the SCI, Spearman’s correlations were used in analyses; p-values less than .05 were interpreted. Intraclass Correlation Coefficients (ICC) was reported for parent–child agreement. T-tests were used to examine mean differences between parent and adolescent rated adherence and ANOVA was used to examine differences in SCI scores across different treatment regimens. MANOVA was utilized to identify potential differences in sample characteristics between the test-retest group and the overall sample. Hierarchical regression was used to examine incremental validity of the SCI.

Results

Reliability

Internal Consistency
Adequate internal consistency was found for both the SCI-Parent ($\alpha = .72$) and SCI-Adolescent ($\alpha = .80$) (Cronbach, 1951).

Parent–Child Agreement
A moderate correlation was found between parent and adolescent SCI administrations (ICC = .47) for the overall sample. This was comparable to the correspondence between the parent and adolescent versions of the DSMP (ICC = .47) from this study. Mean adherence scores did not differ between parents and adolescents with the exception of adolescents reporting slightly higher adherence with exercise behaviors (for means and standard deviations, see Table I).

Test–Retest Reliability
MANOVA was used to analyze differences between participants completing test-retest data and participants

### Table I. Mean Differences in SCI Adherence Ratings Between Parents and Youth

<table>
<thead>
<tr>
<th>SCI Scale</th>
<th>Rater</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Parent</td>
<td>37.0</td>
<td>7.5</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>36.9</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>Parent</td>
<td>9.5</td>
<td>3.1</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>9.2</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Insulin</td>
<td>Parent</td>
<td>12.0</td>
<td>3.1</td>
<td>.97</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>11.7</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td>Parent</td>
<td>10.6</td>
<td>4.9</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>9.9</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>Parent</td>
<td>6.3</td>
<td>2.5</td>
<td>–2.1*</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>6.8</td>
<td>2.3</td>
<td></td>
</tr>
</tbody>
</table>

Note: SCI: Self Care Inventory.

*p < .05.
in overall sample who did not complete the test-retest data; there were no significant group differences, suggesting that completers of the test-retest data did not differ from the overall sample on: HbA1c, age, BGM, CSII status, clinic-based DSMP Parent and Child results, clinic-based SCI-Parent and SCI-Adolescent scores, duration with diabetes, family income, or parent education. Strong, positive correlations between the original administration and the retest administration were identified for SCI-Adolescent ($r = .91$, $p < .001$) and for SCI-Parent ($r = .86$, $p < .001$). Similar to the initial administration, excellent internal consistency (Cronbach’s $\alpha$ coefficient) of SCI scores were identified: SCI-Adolescent ($\alpha = .81$); SCI-Parent ($\alpha = .84$). Parent–child agreement remained strong (ICC = .46).

**Validity**

**Convergent Validity**

Moderate to strong correlations (coefficients ranging from .41–.59) were found between the SCI and the DSMP (see Table II).

**Construct Validity**

As expected, negative correlations were found between both parent and adolescent administrations of the SCI and the adolescent’s HbA1c ($r = -.36$ and -.30 respectively; see Table II). Of note, associations between SCI and HbA1c are consistent with DSMP-HbA1c associations ($r = -.30$ to -.55). Fisher’s $r$–$z$ tests did not demonstrate significant differences in the magnitude of the correlations between the SCI and HbA1c versus the DSMP and HbA1c ($z = .6$, $p = .5$). Strong correlations were also obtained between blood-glucose monitoring frequency and the SCI-Parent and SCI-Adolescent ($r = .34$, $p < .001$ and $r = .31$, $p < .001$ respectively).

**Validity and Reliability with Intensive Regimens**

Mean adherence scores on the SCI-Parent, $F(2,163) = 1.9$, $p = .16$, and SCI-Adolescent, $F(2,163) = 2.1$, $p = .11$, did not differ on the basis of whether the child was on either of the following intensive regimens, glargine-lispro/aspart or CSII, in comparison with the reminder of the sample [SCI-Parent: $M = 38.3$, $SD = 6.3$ (intensive) versus $M = 36.0$, $SD = 8.3$ (non-intensive); SCI-Adolescent: SCI-Parent: $M = 37.9$, $SD = 6.1$ (intensive) versus $M = 36.0$, $SD = 6.9$ (non-intensive)]. Similarly, correlations between SCI scores and (a) HbA1c and (b) DSMP scores were consistent across regimens (see Table III). Fisher’s $r$–$z$ tests did not demonstrate significant differences in the magnitude of these correlations.

**Incremental Validity**

The SCI did not predict additional variance in HbA1c above and beyond the DSMP [$R^2 = .01$; $F(2, 157) = 1.1$, $p = .14$ and $R^2 = .01$; $F(2, 155) = .08$, $p = .33$. for the SCI-Parent and SCI-Adolescent respectively]. However, the SCI-Parent predicted 3.1%, $F(2,159) = 3.9$, $p = .04$, and SCI-Adolescent predicted 4.6% $F(2,159) = 4.4$, $p = .03$ additional variance in BGM frequency above and beyond the variance predicted by the DSMP. The DSMP did predict additional variance in HbA1c above and beyond the SCI [$R^2 = .23$; $F(2, 157) = 46.5$, $p < .001$ and $R^2 = .09$; $F(2, 155) = 14.5$, $p < .001$ for the parent and adolescent administrations, respectively].

**Discussion**

The purpose of this study was to validate the parent and adolescent-report versions of the SCI, a measure of adherence to type 1 diabetes care. Results are promising in that the SCI shows satisfactory internal consistency and strong test-retest reliability. Parent–adolescent agreement

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**Table II. Correlations between Parent & Adolescent Administrations of the SCI, DSMP Adherence Interview, and Hemoglobin A1c Laboratory Results**

<table>
<thead>
<tr>
<th></th>
<th>(1) SCI-Parent</th>
<th>(2) SCI-Adolescent</th>
<th>(3) DSMP Parent</th>
<th>(4) DSMP Adolescent</th>
<th>(5) HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) SCI-Parent</td>
<td>1</td>
<td>.47***</td>
<td>.59***</td>
<td>.41***</td>
<td>1</td>
</tr>
<tr>
<td>(2) SCI-Adolescent</td>
<td>.47***</td>
<td>1</td>
<td>.43***</td>
<td>.47***</td>
<td>1</td>
</tr>
<tr>
<td>(3) DSMP Parent</td>
<td>.59***</td>
<td>.41***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) DSMP Adolescent</td>
<td>.41***</td>
<td>.43***</td>
<td>.47***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>(5) HbA1c</td>
<td>–.36***</td>
<td>–.30***</td>
<td>–.55***</td>
<td>–.37***</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: SCI: Self Care Inventory; DSMP: Diabetes Self Management Profile; HbA1c: Hemoglobin A1c.

**Table III. SCI Intercorrelations Across Prescribed Regimens**

<table>
<thead>
<tr>
<th>SCI</th>
<th>SCI-DSMP</th>
<th>SCI-HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCI-Parent</td>
<td>SCI-Parent</td>
<td>SCI-Adolescent</td>
</tr>
<tr>
<td>Glargine regimens</td>
<td>.50***</td>
<td>.44***</td>
</tr>
<tr>
<td>(N = 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSII regimens</td>
<td>.47***</td>
<td>.40***</td>
</tr>
<tr>
<td>(N = 52)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remainer of sample</td>
<td>.49***</td>
<td>.61***</td>
</tr>
<tr>
<td>(N = 89)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N: Number of subject; SCI: Self Care Inventory; DSMP: Diabetes Self Management Profile; HbA1c: Hemoglobin A1c.

*p < .05; **p < .01; ***p < .001.

Alphas remained acceptable for SCI-Parent (.71) and SCI-Adolescent (.76).
(ICC = .47) is of moderate strength (Cohen, 1988), consistent with parent–adolescent agreement on the DSMP interview in this sample and in previous studies (e.g., \( r = .42, \ p < .001 \), Lewin et al., 2006; \( r = .54, \ p < .001 \), Lewin, Storch, Geffken, et al., 2005). Furthermore, strong validity of the SCI is demonstrated by associations with the DSMP interview, BGM and HbA1c. Relations between adherence (as measured by the SCI) and HbA1c are consistent with or better than extant findings (Johnson et al., 1992; Quittner et al., 2008).

This study also suggests initial support for the reliability and validity of the SCI for assessing adherence with youth prescribed present-day, intensive regimens. Specifically, correlations between the SCI and (1) HbA1c and (2) the DSMP remain strong among youth on intensive regimens. Furthermore, internal consistency and parent–adolescent agreement is consistent with youth on less intensive regimens. Although potential criticisms of the SCI include that it (1) was developed before common prescription of intensive regimens and (2) lacks alternate forms for multiple regimens, data from this study suggest that the SCI compares favorably with the DSMP (a relatively new measure with alternate formats to account for differences in regimens; DirecNet, 2005). Perhaps the broadness of the SCI allows for robustness to variation in individual diabetes regimens (e.g., by allowing a non-applicable response and through an appropriate vagueness in certain items to allow for multiple regimens to apply). Although not sufficient for evaluating the validity of the SCI, a study by Wysocki et al. (1999) suggests that the SCI is sensitive to behavioral intervention in youth on post DCCT-regimens. Future studies should more closely examine this measure in the context of specific treatment regimens (e.g., insulin pump users versus multiple insulin injections). Additionally, development and normalization of self-report measures with optional items tailored to specific regimen components (e.g., pump care, carbohydrate counting, applying correction factors, and using insulin-to-carbohydrate ratios) may add to predicting health status outcomes.

While the SCI did not predict additional variance in metabolic control (HbA1c) above and beyond the DSMP structured interview, SCI-HbA1c and DSMP-HbA1c correlations were highly concordant. Although the authors are not suggesting that self-report questionnaires are superior to structured interviews, data from this study suggest that the information produced from the SCI is comparable with more intensive methods for assessing adherence behaviors. Given that adherence is often inferred from health status indicators (e.g., HbA1c) or by single ratings by medical staff (Johnson, 1993), the SCI presents a psychometrically-valid, time and cost effective alternative. Finally, the SCI was predictive of statistically significant variance in BGM above and beyond the DSMP. Although the difference is small, it is clinically relevant given that the DCCT documented that keeping near-normal glucose levels as early as possible in the disease course may delay or prevent long-term complications of type one diabetes (Anderson et al., 2007; DCCT, 1993). Obtaining interview data from parents should also be considered given that the DSMP-Parent predicted a higher percentage of the variance in HbA1c above and beyond the SCI-Parent.

Although psychometric examination of the SCI appears promising, this research should be considered in the context of several additional limitations. First, although we obtained ratings from multiple informants, the potential for response bias should be considered. Johnson (1992) cautions that youth may attempt to appear favorable to their health care providers. Sample characteristics must also be considered. Participants were from a wide age range of youth (11–18 years). Families were predominately from a low to lower-middleclass socioeconomic status and 72% Caucasian, potentially limiting generalizability of these findings to more diverse populations. The test-retest data should be interpreted with caution given that only 21% of the sample participated in the retest procedure and retest administration was conducted outside of the clinic. However, the following bolsters support for the retest data (1) procedural elements were implemented to reduce confounds (separate envelopes, maximum timeframe) and (2) parent–adolescent correlations in the retest administration remained consistent with the initial clinic administration. Additionally, even in the absence of the clinician and with the potential for parental presence and other confounds, the test-retest correlation is high. The DSMP was not given during the SCI re-administration and consequently SCI-DSMP associations at retesting are not available. In addition, the validity of the SCI should be further tested by examining relations between adherence and other regimen-related family behaviors (e.g., parenting stress, responsibility, conflict, problem-solving; Anderson et al., 2007; Lewin, Storch, Silverstein, et al., 2005; Wiebe et al., 2005; Wysocki et al., 2008).

The present study provides further support of the SCI’s psychometric properties. Of available paper-and-pencil formats, the SCI was selected given that (1) it assesses the key elements of the diabetes care regimen including diet, exercise, blood-glucose monitoring, insulin administration, and attending medical appointments, (2) items are sufficiently broad allowing the scale to be used for individuals on varying insulin regimens.
(including the insulin pump), and (3) the format allows for easy administration at brief clinic visits or during research studies. Specifically, the scale’s length allows for administration and scoring by office/check-in staff and could be scored before the medical staff sees the patient. The SCI could be of particular utility during brief, time-limited office visits, which are becoming increasingly more commonplace. Furthermore, as diabetes care expands into underserved areas (e.g., rural communities) or via telehealth formats (Adkins et al., 2006; Heidgerken et al., 2006), the SCI can be used as a screening instrument for endocrinologists and other members of the treatment team.

This research complements prior data from La Greca and colleagues (Davis et al., 2001; La Greca et al., 1988) which suggested initial support for the SCI. As an independent research program with expertise in the behavioral health of youth with type 1 diabetes, we provided a comprehensive analysis of the psychometric properties of the SCI. It appears that the SCI meets criteria for an empirically supported adherence measure as described by Quittner and colleagues (2008).

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