Psychometric Findings for a Spanish Translation of the Diabetes Self-Management Profile (DSMP-Parent-Sp)

Running Head: Spanish Translation of DSMP-Parent

Jessica M. Valenzuela, PhD (1); Michelle Castro Fernandez, MSEd (2); Olivia Hsin, MS (3); Michael A. Harris, PhD (4); Cortney Taylor, MS (3); Annette M. La Greca, PhD (3); Alan M. Delamater, PhD (5)

1. Cincinnati Children’s Hospital Medical Center, Division of Behavioral Medicine & Clinical Psychology
2. University of Miami, Department of Educational & Psychological Studies
3. University of Miami, Department of Psychology
4. Oregon Health & Science University, Department of Pediatrics
5. University of Miami, Department of Pediatrics

Corresponding Author:
Jessica M. Valenzuela,
Email: Jessica.Valenzuela@cchmc.org

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Research Design and Methods: Hispanic families of youth (M = 13.7 years old) with type 1 diabetes were recruited from three clinics in South Florida and represented a wide range of nationalities and acculturation levels. One hundred and twenty-seven parents reported on their child’s self-management behaviors using either the original DSMP-Parent (59.8%) or the DSMP-Parent-Sp (40.2%). In addition, youth reported their self-management using the original DSMP in English, and physicians rated their perceptions of the youth’s self-management. Glycemic control was indexed by HbA1c in the past 3 months, and collected from medical chart review.

Results: Item analysis confirmed that the DSMP-Parent-Sp items related to the overall composite score in expected ways, and internal consistency estimates were adequate. Paired correlations demonstrated strong parent-child concordance and a significant relationship with physician perceptions of self-management. Evidence of concurrent and convergent validity, as well as “strict factorial invariance” was demonstrated.

Conclusions: These preliminary findings indicate that the DSMP-Parent-Sp is a reliable and valid parent-report measure of Hispanic youths’ diabetes self-management behaviors. In addition, there is preliminary evidence that the translated measure may be considered equivalent to the original English measure when used to measure self-management in Hispanic youth with diabetes.
Hispanics make up the nation’s largest minority group at approximately 15% of the total U.S. population (1). In addition, they are the fastest growing and youngest minority group in the U.S. with projections indicating that 133 million Hispanics will reside in the U.S. by the year 2050. There is corresponding evidence of an increase in the rate of type 1 diabetes among Hispanic youth in some US cities (2), and 13.8 of every 100,000 U.S. Hispanic children between 10 and 19 years of age are diagnosed with the disease (3). Despite their increasing numbers, Hispanic youth have been underrepresented in pediatric research (4) and, more specifically, in the type 1 diabetes literature. The dearth of data regarding this growing population exists in part due to a lack of validated measures available for families with limited English proficiency. The present study provides psychometric data on a Spanish translation of a parent-report diabetes self-management measure that has significant potential to impact the literature in this area.

The existing diabetes literature points to the important role that parents play in diabetes care (5-7), and recent work suggests that Hispanic parents have a significant impact on youth’s self-management (8). However, non-English speaking individuals, especially parents, are often excluded from research in healthcare settings (9). While there is evidence that Hispanic youth in the U.S. often develop English language skills rapidly, parents of Hispanic youth may have limited English proficiency (10). In addition to language barriers, Hispanic caregivers face multiple risk factors that may impact their children’s diabetes outcomes, including socioeconomic status and health literacy limitations (11). Therefore, it is important for pediatric diabetes researchers to overcome language barriers and find ways to incorporate Hispanic parents with limited English proficiency in their research and intervention initiatives.

It is especially important to include Hispanic families of youth with type 1 diabetes given recent epidemiologic data from the SEARCH for Youth with Diabetes Study Group (3) that illustrates the disproportionate health burden and poor glycemic control evidenced in U.S. Hispanic youth with type 1 diabetes. In addition, studies comparing Hispanic youth and adults with type 1 diabetes to their White, non-Hispanic counterparts have demonstrated significant disparities in both glycemic control and risk for long-term complications associated with diabetes (3, 12, 13). Given the disparities, researchers have called for further investigation targeting the underlying processes that lead to poorer outcomes in Hispanic youth (14). To date, only one published study has examined adherence in Hispanic youth with type 1 diabetes (12). Additionally, no validated Spanish measures of diabetes self-management for parents have been described in the literature.

In order to address the current absence of Spanish diabetes self-management measures, we have developed a Spanish translation of the Diabetes Self-Management Profile for parent-report (DSMP-Parent-Sp). The Diabetes Self-Management Profile (DSMP) was originally developed and validated in a predominantly non-Hispanic, Caucasian sample (15). The most recent version of the measure includes both a Conventional and Flexible form (16). The Flexible Form is a revision of the earlier Conventional Form developed for specific use with youth who are prescribed regimens that include carbohydrate counting. In the present psychometric evaluation of the translation, we present preliminary findings on the psychometric properties of the DSMP-Parent-Sp and its equivalence to the original English DSMP-Parent. First, we examined internal
consistency of the measure. Second, to support the validity of the measure, we examined its relationship to other reports of youth self-management (i.e., child and physician report), as well as its relationship to youths’ age and glycemic control. Based on previous findings, it was expected that parents’ ratings of their child’s self-management on the DSMP-Parent-Sp would be inversely associated with age, with older youth reported to have poorer self-management. Parent ratings indicating better youth self-management were also expected to correspond with lower HbA1c levels in youth, reflecting better glycemic control. Finally, given the diversity that exists in Hispanic families’ English proficiency, it is important that the new measure can be used alongside the original English version. Therefore, we examined the equivalence of concepts in the DSMP-Parent-Sp and the original English measure through tests of factorial invariance.

RESEARCH DESIGN AND METHODS

As part of a larger diabetes study, families were approached by research assistants during a routine visit at one of three pediatric specialty clinics. The requirements of the research study were described to both youth and their caregivers, and families were further screened for inclusion and exclusion criteria. After completing informed consent and assent procedures, a research assistant interviewed the caregiver and youth together for demographic information. Then, two trained research assistants, at least one of whom was fully bilingual, were available to complete the DSMP structured interviews with the caregiver and youth individually. Parent interviews took place in English or Spanish depending on the caregiver’s preference. All child interviews were conducted in English. Both parent and child interviews took approximately 20 to 30 minutes to complete, and families were not provided with any material incentive to participate. Following the clinic visit, physicians reported on each child’s prescribed regimen and their perception of the child’s self-management. Medical chart review was used to collect data on glycemic control. This research protocol was approved by the University’s Institutional Review Board and the Institutional Review Boards at each participating site.

Participants. Eligibility criteria included: 1) youth with type 1 diabetes disease duration of at least 12 months, 2) primary diabetes care at one of three pediatric specialty clinics where recruitment was conducted, 3) ethnicity identified as Hispanic by family, 4) caregiver fluency in either English or Spanish, and 5) child fluency in English (which limited the inclusion of 6 Hispanic families from the 3 pediatric specialties). The only exclusion criterion was the diagnosis of a concurrent medical condition, developmental disability, or psychiatric disorder that would be an obstacle in completing the structured interview. Nine families were excluded from the larger study based on this criterion primarily due to diagnoses of Autism or Down’s syndrome. Of the 212 families who met criteria and were approached, 12 families chose not to participate because of lack of interest, time restraints, or participation in other studies making the participation rate of the larger study 94.3%.

Of the 200 families enrolled in the larger research study, there were 135 Hispanic caregiver-child pairs. Of these, 127 are included in the present study because they completed either the original English DSMP-Parent (n=76, 59.8%) or the translated DSMP-Parent-Sp (n=51, 40.2%). These caregivers were primarily biological mothers (83.5%) or fathers (14.2%) of youth with type 1 diabetes (53.5% female) between 10 and 17 years of age ($M = 13.7, SD = 2.10$). Other caregivers (2.4%) included one stepmother, stepfather, and grandmother. Youth with type
1 diabetes were asked to complete the interview in the original English version in order to examine concordance between the parent translation and the original youth self-report measure. The 127 youth with type 1 diabetes who participated were a diverse group of Hispanic youth who were first generation/foreign-born (14.2%), second generation/U.S. born with at least one foreign-born parent (53.5%), and third generation or beyond/U.S. born with both U.S. born parents (30.7%). Children and adolescents who were born outside of the continental U.S. had lived in the U.S. from 2 to 13 years and were born in Cuba (47.4%), South America (26.3%), Puerto Rico (15.8%), Central America (5.3%) or Spain (5.3%). Spanish was the primary language spoken in the home of 48.8% of participants. The sample was also diverse in terms of parent’s socioeconomic status and family composition. Families reported the following caregiver education levels: 6.5% had not completed high school, 64.5% had completed high school, 22.6% had at least one caregiver with a college education, and 6.5% had some graduate level studies. The median household annual income was $40,000, and 33.1% of the sample identified as living in a single-parent household. In terms of health insurance, 58.9% of families had public insurance covering some of the youth’s diabetes care, 30.6% had private insurance, and 10.5% had no health insurance coverage.

The 127 youth in the current study had diabetes for a mean of 6.3 years ($SD = 3.6$). Their mean standardized HbA$_{1c}$ was 8.5% ($SD = 2.0$%). However, there was a wide range of HbA$_{1c}$ (4.2% to 15.4%). Insulin pump therapy was prescribed to 25.8% of youth in the present study. Of the 74.2% of youths prescribed insulin injections, 37.9% were prescribed insulin glargine (i.e., Lantus).

**Instruments**—*Interview for Sociodemographic and Disease Information*. Research assistants interviewed caregivers and youth together to obtain information including the youth’s age and gender, as well as parental educational attainment, occupation, household income, and whether they lived in a one or two-parent home. In addition, information about countries of origin and the primary language spoken in their home were obtained. Caregivers were also asked about the youth’s diagnosis month and year, in order to calculate disease duration. Alternatively, for families that could not recall the exact month and year, medical chart review was used to determine disease duration.

**Self-Management.** The DSMP (15) is a structured interview developed to assess self-management in youth with diabetes over the past three months. Both the youth and parent versions of the interview have two forms, the DSMP Conventional Regimen Form and the DSMP Flexible Regimen Form (16). Research assistants interviewed both youth and caregivers individually using one of the two forms; the Flexible Regimen Form was only administered to participants whose prescribed regimen includes carbohydrate counting (i.e., youth prescribed either insulin pump therapy or a basal/bolus insulin regimen with adjustment based on carbohydrate counting). Each form consists of 25 items measuring one of five domains of self-management: exercise (3 items), management of hypoglycemia (4 items), diet (5 items), blood glucose monitoring (9 items), and insulin administration/dose adjustment (4 items). Twenty-one of the questions are identical on both the Conventional and Flexible Regimen forms, with the remaining four items differing only by the mention of an insulin bolus.

Harris and colleagues’ original validation of the measure revealed adequate internal consistency ($\alpha = 0.76$ for parents and adolescents), test-retest reliability ($r = 0.67$), and inter-rater reliability ($r = 0.94$) for the DSMP Conventional Form total score. The
DSMP Flexible Regimen total score was also found to have adequate internal consistency (α = 0.70 for parents and 0.65 for adolescents) by the DirecNet Study Group (16). In addition, scores on the DSMP, both Conventional and Flexible, have had a significant negative relationship to glycemic control measured by HbA1c assay (Conventional r = -0.28; Flexible r = -0.20) (15, 16). However, individual subscales making up the youth and parent DSMP forms have been demonstrated to have Cronbach’s alpha coefficients below .50 and are not considered individually reliable (15).

_Translation of the DSMP._ The DSMP-Parent interview, both Conventional and Flexible, was translated for caregivers who preferred to respond to a Spanish language interview. The Spanish translation (DSMP-Parent-Sp) was created using an iterative process of forward and back-translation by the first and second author in collaboration with a bilingual pediatric psychologist who was also a native Spanish speaker. This process was used to promote the continued face and content validity of the measure following translation. All three translators had considerable experience conducting research with children and adolescents diagnosed with type 1 diabetes and were familiar with the DSMP interview. Because of differences in language across different Hispanic nationalities, it was advantageous that translators represented two of the largest subgroups in the present study (Cuban and South American nationalities). In addition to this iterative process, a certified Spanish-language translator reviewed and provided feedback at multiple time points to improve the translation’s fluency and grammar.

_Prescribed Regimen and Physician Ratings._ Physicians completed a brief instrument that asked about every aspect of prescribed treatment in type 1 diabetes (e.g., type of insulin, number of injections, etc.). The instrument was developed by modifying an existing measure, the Prescribed Treatment Plan (PTP), designed in a cystic fibrosis population and previously modified for use in asthma (17).

Physicians were also asked to rate their perceptions of the youth’s self-management on eight items. Six of the items targeted specific self-care behaviors: 1) administration of injections/boluses, 2) frequency of blood glucose testing, 3) adjustment of insulin, 4) following a prescribed diet, 5) management of hypoglycemia, and 6) clinic attendance. Physicians rated the youth’s management on each of these items from 1 (“poorest 5% of youth with diabetes”) to 5 (“best 5% of youth with diabetes”) with 3 representing “about average”. In addition, physicians rated two global adherence items (i.e., “Overall, this youth adheres well to the prescribed regimen;” “Overall, this child is capable of adhering to a complex regimen”) responding on a scale from 1= strongly disagree to 5 = strongly agree (with 3 = neutral) to each item. The average of these eight items is used in the present study as a measure of physician’s perceptions of self-management, with higher scores indicating better perceived self-management. Internal consistency in the present sample was excellent (Cronbach’s α = 0.95).

_Glycemic Control._ The most recent HbA1c value within 3 months of each participant’s recruitment date was obtained using medical chart review at each of the recruitment sites. Assays varied at the three different clinics and for the different laboratories used by participants’ private insurance companies. The upper limit of normal for these assays ranged from 6.0 to 6.4. Therefore, HbA1c values were converted to standard scores so that they could be analyzed and compared across participants. Specifically, following procedures in other studies (18), the upper limit of normal (ULN)
for each assay was subtracted from the participant’s HbA1c value; the result was then divided by the assay’s ULN.

**Data Analysis.** T-tests were first conducted in order to examine any differences in disease variables that might exist between families where parents completed the original English DSMP-Parent and those where parents completed the DSMP-Parent-Sp. Then, several analyses were conducted in order to address the primary study goals. First, internal consistencies of the original DSMP-Parent and DSMP-Parent-Sp were evaluated using Cronbach’s α-coefficients, and item-total correlations were computed. Second, concurrent validity was examined by calculating Pearson correlation coefficients for the DSMP-Parent-Sp total score and both youth’s age and HbA1c. In addition, convergent validity was examined by calculating paired Pearson correlation coefficients for the DSMP-Parent-Sp total score and both youth-report on the original DSMP and physician perceptions of youths’ self-management. Finally, a combination of exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and multi-group CFA was used in the present study to evaluate factorial invariance of the new DSMP-Parent-Sp. Initially, EFA was used because there is only one study to date that has examined the factor structure of the DSMP, and that study consisted of a largely White, non-Hispanic sample (19). Overall, these analyses are considered preliminary due to the small sample size available. Analyses were conducted using Mplus 5.2 (20). The estimation procedure used throughout the analyses was weighted least squares estimation (WLSMV) with delta parameterization. Two multi-group models were tested using definitions from Meredith (13): 1) “strong factorial invariance” where factor loadings, intercepts, and thresholds are fully invariant and 2) “strict factorial invariance” where, in addition to the three parameter estimates above, residual variances of the indicators are fully invariant.

**RESULTS**

**Descriptive Statistics.** Means and standard deviations for youth’s age, mother’s highest grade of school, household income, diabetes duration, standardized HbA1c, and youth- and parent-report of self-management were calculated separately for families where caregivers completed the original DSMP and those that completed the DSMP-Sp-P (see Table 1). In addition to the mean and standard deviation for household income, the median is provided given that household income was significantly positively skewed in the present sample (Skewness = 3.44, SE = 0.22; Kurtosis = 14.85, SE = 0.44). Finally, Table 1 also provides information about the frequency and percentage of families at each level of health insurance status (private, public, or no insurance), youth generational status (first, second, third generation and beyond), and regimen classification for the DSMP forms (Conventional Regimen, Flexible Regimen). Mean diabetes self-management scores were not significantly different (Parent-report, \( t(124) = .15, p = ns \); Youth-report, \( t(117) = .35, p = ns \)). In addition, the two groups did not differ on any disease-related variables measured (i.e., disease duration, insulin regimen, or HbA1c). As would be expected, the groups do differ across specific sociocultural variables including the youth’s generational status, health insurance status, and household income.

**Reliability and Validity Estimates.** Item-total correlations were calculated separately for each of the 25 parent-report items across both the DSMP-Parent and the DSMP-Parent-Sp. All item-total correlations were in the expected directions. They ranged from 0.12 to 0.62 (\( M = 0.41, sd = 0.12 \)) in the original DSMP-Parent; and from 0.05 to 0.72 (\( M = 0.41, sd = 0.16 \)) in the DSMP-Parent-Sp.
Cronbach’s alphas were acceptable at 0.76 for the original DSMP-Parent and 0.80 for the DSMP-Parent-Sp. Internal consistencies for the five parent-report subscales ranged from .36 to .71 in the present sample. These five subscales were not internally reliable in the original measure and are not meant for individual subscale interpretation (15).

Pearson correlations were calculated in order to examine associations between parent-report on the DSMP-Parent ratings (both English and Spanish versions) and youth’s age and HbA1c, physician perceptions of adherence, and youth DSMP self-report as evidence for concurrent and convergent validity. The original DSMP-Parent was significantly related to all of these variables in the expected directions. Older youth ($r = -.31$, $p<.01$) and youth with higher HbA1c’s ($r = -.38$, $p<.01$) had lower DSMP-Parent scores. Higher scores on both physician perceptions of adherence ($r = .40$, $p<.01$) and youth-report of self-management ($r = .74$, $p<.01$) were related to higher scores on the DSMP-Parent report. Similarly, the DSMP-Parent-Sp was significantly related to both youth-report on the original DSMP ($r = .65$, $p<.01$) and physician perceptions of adherence ($r = .29$, $p<.05$) in the expected direction. However, it was not significantly related to youth’s age ($r = -.19$, $p = ns$) or HbA1c level ($r = -.31$, $p = ns$), although the magnitude of the latter relationship was similar to that found with the original DSMP-Parent and also similar to the original validation of the DSMP measure (15, 16).

**Preliminary Examination of Factor Invariance.** Exploratory factor analyses (EFA) were conducted separately for the original DSMP-Parent and the DSMP-Parent-Sp. These analyses resulted in scree plots indicating a possible 3-, 4-, or 5- factor structure. Geomin rotation (oblique) solutions did not reveal a clear interpretation. At this point, a binary item from the hypoglycemia subscale was dropped from further analysis given its limited variability among parents who completed the DSMP-Parent-Sp (96.1% reported that they kept something handy in case of a low blood sugar).

Given our inability to determine a baseline factor structure using EFA, confirmatory factor analyses (CFA) were conducted to examine an “a priori” 5-factor structure which consisted of each subscale identified as a factor. Two factors, the hypoglycemia and blood glucose testing subscales, were highly correlated and resulted in a Heywood case (i.e., a correlation estimated at >1.00). Therefore, a 4-factor solution was examined combining these two factors. In the case of the Spanish translation, the residual variance of one of the items in the exercise subscale was negative. Because this parameter was not significantly different from zero, it was constrained to be zero in the Spanish translation model. The model then converged and the resulting baseline model had good overall fit for both the original DSMP-Parent ($\chi^2(37)=46.29$, $p=.14$; RMSEA=0.05) and the DSMP-Parent-Sp items ($\chi^2(29)=26.36$, $p=.61$; RMSEA=0.00).

Multi-group CFA was conducted to examine factor invariance. Model fit was good ($\chi^2(63)=56.92$, $p=.69$; RMSEA=0.00) when factor loadings, intercepts and thresholds were constrained to be equal across groups. In addition, model fit did not significantly worsen when residual variances of the indicators were constrained to be equal across groups (DIFFTEST analysis: $\Delta\chi^2(16)=14.95$, $p=.53$), suggesting “strict factorial invariance” of the factors examined in the present study.

**CONCLUSIONS**

The present study provided preliminary support for the reliability, concurrent and convergent validity, and factor invariance of a Spanish translation of the Diabetes Self Management Profile (DSMP-
Spanish Translation of DSMP-Parent

Parent-Sp) for use with parents with limited English proficiency. Support for internal consistency was revealed by an acceptable Cronbach’s α-coefficient for parent and child reports, as well as by the directions and means of item-total correlations.

Preliminary support for criterion-related validity with HbA1c was demonstrated with a moderate correlation similar to that found in the English version, and similar to the original published relationship with a largely White, non-Hispanic sample (15). However, this relationship did not meet statistical significance in the present sample, and needs to be examined in a larger sample of Hispanic families. Of note, the DSMP-Parent-Sp, completed by parents who preferred a Spanish language interview, was not related to youth’s age in the present sample. The limited data available on Hispanic youth with type 1 diabetes make it difficult to interpret this finding. This may reflect differences in the developmental trajectory of adherence in Hispanic families, particularly those with limited English proficiency and possibly less acculturated to US culture. This finding is consistent with Streisand and others (21) who examined the relationship between age and various aspects of self-management using 24-hour recall interviews in Puerto Rico. As in the present study, they found no relationship between age and self-care behaviors including injection regularity, injection-meal timing, or glucose testing frequency in their Hispanic sample.

As described by Weinger and colleagues (22), this study and others are limited by the “lack of a ‘gold standard’ comparison” for self-management behaviors. However, support for concurrent validity was provided by examination of relationships with child-report on the original English measure as well as physician perceptions of self-management. High concordance with child self-report was found for the translated measure as expected based on earlier published studies of the original DSMP (15, 16). In addition, the parent-report DSMP-Parent-Sp measure was significantly related to a brief scale measuring physician perception of self-management. Future research should further examine the validity of the measure using multiple methods, including recall interviews, electronic monitoring of blood glucose testing, and brief report on paper and pencil measures such as the Self Care Inventory (23, 24).

While forward and back translation were used to maintain semantic equivalence, demonstration of factorial invariance was necessary to achieve conceptual equivalence, evidence that a measure continues to capture the intended construct (25). Equivalence of these measures would allow for comparisons across Hispanic youth whose caregivers complete the Spanish translation as well as those who complete the original English measure, which is important given the diversity in the English fluency of U.S. Hispanic caregivers. Despite the limited sample size available, we found preliminary support for strict factorial invariance, suggesting that concepts in the original and Spanish versions of the DSMP-parent have similar meanings for Hispanic caregivers. Replication of this finding with larger samples is needed given the difficulty in replicating factor structures that were found with a small sample size. Further, although the utility of the translated measure is promising, continued psychometric evaluation of this translation is needed to demonstrate that “self-management” indeed carries the same cultural meaning in English and Spanish. This may be accomplished through cognitive interviewing, pilot testing, and focus groups.

Our sample size limits our discussion of the variability that exists between different Hispanic subgroups (e.g., those with varying acculturation, as well as those who identify
different nationalities and countries of origin). The scope of the present study did not allow for tailoring the measure’s translation or examining the translation’s validity across multiple Hispanic subgroups. In addition, families with a Spanish language preference and those with an English language preference varied across multiple sociocultural factors. Future research is needed further examining the DSMP-Parent-Sp with Hispanic subgroups underrepresented in our sample.

Given the scarce number of validated diabetes self-management measures available in Spanish, the DSMP-Parent-Sp provides an important alternative to assist researchers in systematically assessing self-management in Hispanic youth with type 1 diabetes. This preliminary study’s findings suggest that the DSMP-Parent-Sp upholds the validity and reliability of its English counterpart, and will be a valuable tool for much needed research in this population.

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Disclosure. Authors have no relevant conflict of interest to disclose.
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Spanish Translation of DSMP-Parent

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Table 1  *Descriptives by Parent’s Preferred Language for DSMP*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>English (n = 76)</th>
<th>Spanish (n = 51)</th>
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<tr>
<td></td>
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<tr>
<td><strong>Health Insurance Status</strong></td>
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<tr>
<td>Third Generation and Beyond</td>
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<tr>
<td>Conventional Regimen Form</td>
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</tr>
<tr>
<td>Flexible Regimen Form</td>
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<td>56.6%</td>
</tr>
<tr>
<td><strong>Child’s Age in Years (M, SD)</strong></td>
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<td>2.18</td>
</tr>
<tr>
<td><strong>Mother’s Highest Grade (M, SD)</strong></td>
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</tr>
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<td>Household Income (M, SD)*</td>
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<tr>
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<tr>
<td><strong>Duration of Diabetes in Years (M, SD)</strong></td>
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<tr>
<td><strong>Standardized HbA1c % (M, SD)</strong></td>
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<tr>
<td><strong>Parent-report DSMP Total (M, SD)</strong></td>
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<td>12.34</td>
</tr>
<tr>
<td><strong>Child-report DSMP Total (M, SD)</strong></td>
<td>59.31</td>
<td>12.18</td>
</tr>
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</table>

*Mother’s highest grade is presented in Hollingshead categories ranging from 1 to 7 with 1 equal to <8th grade education and 7 equal to graduate training (e.g., 5 is equivalent to some college or vocational training).*

*The median is provided for household income because of significant skewness.

*HbA1c is standardized as follows (HbA1c score - Upper Limit of Normal) / Upper Limit of Normal