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Parental Problem-Solving Abilities and the Association of Sickle Cell Disease Complications with Health-related Quality of Life for School-age Children

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Abstract

Children with sickle cell disease (SCD) are at risk for poor health-related quality of life (HRQOL). The current analysis sought to explore parent problem-solving abilities/skills as a moderator between SCD complications and HRQOL to evaluate applicability to pediatric SCD. At baseline, 83 children ages 6–12 years and their primary caregiver completed measures of the child HRQOL. Primary caregivers also completed a measure of social problem-solving. A SCD complications score was computed from medical record review. Parent problem-solving abilities significantly moderated the association of SCD complications with child self-report psychosocial HRQOL ($p = .006$). SCD complications had a direct effect on parent proxy physical and psychosocial child HRQOL. Enhancing parent problem-solving abilities may be one approach to improve HRQOL for children with high SCD complications; however, modification of parent perceptions of HRQOL may require direct intervention to improve knowledge and skills involved in disease management.

Keywords

Pediatric sickle cell disease; Problem-solving skills; Health-related quality of life

Children with sickle cell disease (SCD) are at risk for poor health-related quality of life (HRQOL) (Palermo, Schwartz, Drotar, & McGowan, 2002b) due to medical, sociodemographic and psychosocial factors (Kral, Brown, & Hynd, 2001). Palermo and colleagues (2002a) found that children and adolescents with SCD were rated by their caregivers to have lower physical, psychological, and social HRQOL, with associated limitations in self-esteem, school and social participation, and general psychological

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adjustment compared to healthy peers. Consistent with this finding, HRQOL among children with SCD has been rated as significantly lower based on caregiver and child report compared to normative samples (Panepinto, O'Mahar, DeBaun, Loberiza, & Scott, 2005). Lower physical HRQOL has been associated with pain episode frequency (Dampier et al., 2010; Fisak, Belkin, von Lehe, & Bansal, 2012), disease severity (Panepinto, et al., 2005), other SCD complications (Panepinto, Pajewski, Foerster, Sabnis, & Hoffmann, 2009), and family and neighborhood distress (Palermo, Riley, & Mitchell, 2008) as well as being female and older in age (Palermo, et al., 2002a).

The most common complications of SCD are vaso-occlusive pain episodes caused by blockage of red blood cells (Rees, Williams, & Gladwin, 2010) and acute chest syndrome, a lung infection and inflammation due to the buildup of deoxygenated red blood cells (Platt, 2000). Additional complications include chronic anemia, increased risk of infection, splenic enlargement, delayed growth, retinal injury, kidney damage, and priapism (Rees et al., 2010; Wethers, 2000). Perhaps the most debilitating complication is stroke due to occlusion of arteries in the brain or intracranial hemorrhage, which results in impairments in neurocognitive functioning (Adams et al., 1998; Berkelhammer et al., 2007). Effective disease management and adherence to prescribed treatments are expected to lead to improvements in adaptation for children with SCD (Fuggle, Shand, Gill, & Davies, 1996; Palermo, et al., 2002b; Thompson, Gil, Burbach, Keith, & Kinney, 1993). For example, effective disease management involving behavioral interventions, focused on symptom monitoring and goal setting, reinforcement through rewards, contingency contracting, and problem-solving skills training, are associated with greater adherence to prescribed medications (Dean, Walters, & Hall, 2010). However, adherence to prescribed treatment has been associated with both poorer HRQOL in a study examining adherence to standard recommendations for pain and fever and to follow-up care (Barakat, Lutz, Smith-Whitley, & Ohene-Frempong, 2005) and better HRQOL in a study examining engagement in self-care behaviors (Fisak, et al., 2012).

Family functioning, defined as caregiver coping, caregiver distress, caregiver well being, may promote or limit child adaptation including HRQOL for children with SCD (Panepinto, Hoffmann, & Pajewski, 2010; Thompson, et al., 1993). Importantly, Mitchell and colleagues (2007) reported that caregivers endorse wanting more effective approaches to meet the medical and psychosocial needs of their children with SCD including parenting interventions, and parenting interventions demonstrate improved health behaviors for minority populations (Kitzman-Ulrich et al., 2010). These findings highlight the need to understand family-based components of effective disease management interventions, in addition to adherence to prescribed treatment, that promote optimal HRQOL.

While empirical studies support cognitive-behavioral pain management in terms of clinical efficacy (Chen, Cole, & Kato, 2004; Gil et al., 2001; Walco, Sterling, Conte, & Engel, 1999) and cost-effectiveness (Thomas, Gruen, & Shu, 2001), adaptive disease management strategies applicable across the range of SCD complications have yet to be identified (Anie & Green, 2012). Based on the literature with adults with chronic health conditions, problem-solving skills interventions, a type of evidence-based cognitive-behavioral intervention, is indicated as a possible protective mechanism for addressing disease-related problems and improving HRQOL (Elliott, Berry, & Grant, 2009; King et al., 2010; Malouff, Thorsteinsson, & Schutte, 2007; Nezu, Nezu, & Jain, 2008). Problem-solving skills interventions result in improved HRQOL by teaching a positive problem-solving framework, believing that efforts to resolve problems can result in successful solutions, and specific skills to successfully resolve disease-related challenges.

In the pediatric literature, family-based clinical trials interventions have linked positive family problem-solving abilities to improved diabetes adherence (Wysocki, et al., 2006), better self-management among children with traumatic brain injury (Wade, Carey, & Wolfe, 2006; Wade, Walz, Carey, & Williams, 2009), and higher HRQOL for children with asthma (Seid, Varni, Gidwani, Gelhard, & Slymen, 2010). Child-focused problem-solving skills interventions have resulted in improved self-management for adolescents with diabetes (Mulvaney et al., 2011), bolstered disease knowledge and problem-solving skills for children with asthma (Pulgaron, Salamon, Patterson, & Barakat, 2010), and decreased perceptions of the impact of illness and decreased loneliness among children with cystic fibrosis (Christian & D'Auria, 2006).

To evaluate the potential protective role of problem-solving abilities in management of a broad range of SCD complications including pain, we examined parent problem-solving as a moderator of the association between SCD complications and child self-report and parent-report of child HRQOL. Consistent with the problem-solving theory and findings from problem-solving skills interventions, connecting positive problem-solving orientation and rationale problem-solving style to adaptive outcomes, we expected that SCD complications would impact HRQOL differently depending on the problem-solving abilities of the parent (Fairchild & MacKinnon, 2009). For parents who use a positive problem-solving approach to manage SCD complications, we expected the association of complications to HRQOL would not be significant. In contrast, for parents who underutilize positive problem-solving approaches, we expected lower child HRQOL as SCD complications increased. Understanding mechanisms by which disease management, through the application of problem-solving abilities, results in improvement in HRQOL among children with SCD will indicate targets for intervention.

Methods

The data presented in this manuscript represent baseline data from a study of a family-based problem-solving skills intervention for school-age children with SCD (Smith, Patterson, Szabo, Tarazi, & Barakat, 2013). Participants were children with SCD between the ages of 6 and 12 and a caregiver. Children with any sickle cell hemoglobinopathy and from English-speaking families were eligible. Exclusion criteria included presence of a developmental disability or significant neurocognitive deficits based on the medical record. Eligible families were approached during clinic visits at two East Coast sickle cell centers. Parents and patients were provided with a letter from the center director and a flyer explaining the study. If the family expressed interest in participating, the research coordinator contacted the family via telephone to schedule a baseline assessment either at the family's home or in the clinic setting.

Of 209 families approached, 173 agreed to participate and 36 refused. The most common reasons for refusal included schedule too busy ($n = 7$) and intervention viewed as not needed ($n = 10$). Of the 173 families that agreed to participate, 79 passively refused (e.g., did not return telephone messages, deferred participation) and we were unable to locate 11 families after initial recruitment. Rates of enrollment are similar to prior clinical trials in pediatric SCD: 51% enrollment (Barakat, Schwartz, Salamon, & Radcliffe, 2010); 29% enrollment (Wynn et al., 2010) and other pediatric chronic health conditions such as asthma (50% enrollment) (Williams, Wharton, Falter, French, & Redd, 2003). The final study sample consisted of 83 children ranging in age from 6 to 12 years ($M = 8.47$, $SD = 2.11$) and ranging in grade from kindergarten to eighth grade (median grade = 3). Medical chart review indicated that the majority of children were diagnosed with HbSS (60%), followed by HbSC (29%), HbS β^+ thalassemia (7%), HbS β^0 thalassemia (1%), SJ Baltimore (1%), and SO Arab (1%). Caregivers consisted of primarily mothers (90%; 6% fathers, 4% other), of whom

26.5% had graduated from high school and 40% attended some college. Most of the sample reported monthly family income under \$3,333. Based on the 2012 federally defined poverty level of total monthly income of less than \$1,920 for a family of four, over 31.3% of our sample fell below the poverty level (U.S. Department of Health and Human Services, 2012). The majority of participants identified as Black or African American and Non-Hispanic (94%). Refer to Table 1 for sample characteristics.

Measures

Demographic and Medical Variables—A *General Information Form* was completed by the primary caregiver to assess basic demographic information (age, gender, ethnicity, education, and income) of participants and parents. Information on sickle cell genotype, average hemoglobin, SCD complications, and healthcare utilization over the past year were obtained by *medical record review* conducted by trained research assistants using a structured file review form. To describe recent and long-term SCD impact on the child's physical health, the SCD Complications variable was comprised of the total number of acute complications noted in the medical record in the past year (e.g., pain episodes, transfusions, acute chest syndrome, surgeries for tonsil/adenoid removal or splenectomy, iron overload, enuresis, and other SCD complications) and chronic SCD-related conditions (e.g., stroke, asthma or reactive airway disease). For healthcare utilization, noted in the medical record over the past year, number of emergency department visits and inpatient hospitalizations for pain or fever, prescription for hydroxyurea (if yes coded as 1), and number of transcranial doppler/magnetic resonance imaging scans completed were recorded. Summary of disease-related complications, and summary healthcare utilization, have been used previously to estimate disease severity in patients with SCD (Barakat et al., 2007; Daniel, Grant, Kothare, Dampier, & Barakat, 2010).

Health-related Quality of Life—The *Pediatric Quality of Life Inventory* (PedsQL) (Varni, Seid, & Kurtin, 2001) is a 23-item parent-proxy report with a parallel child-report form used to assess the child HRQOL in four areas of functioning: physical, emotional, social, and school. The generic core version was used for this study; with specific focus on the physical and psychosocial health summary scores. Items ask the child or parent to identify how much of a problem the child has had with specific physical/psychosocial items over the past month, for example: "I have low energy" or "I feel angry." The measure has been validated in children with SCD (Panepinto, Pajewski, Foerster, & Hoffmann, 2008). In addition, based on a sample of 810 children with SCD (18 years of age) and their caregivers from the sickle cell centers, preliminary analyses suggest adequate internal consistency/reliability (Dampier, et al., 2010). Inter-item reliabilities for this sample were: child physical health $\alpha = .72$, parent physical health $\alpha = .88$, child psychosocial health $\alpha = .84$, parent psychosocial health $\alpha = .85$.

Parent Problem-Solving Abilities—The *Social Problem Solving Inventory Revised Short Form (SPSI-R:SF)* (D'Zurilla & Nezu, 1990; Hawkins, Sofronoff, & Sheffield, 2009) is a 25-item parent self-report measure assessing problem-solving ability on a 5-point Likert-type scale consisting of five subscales including positive problem orientation, negative problem orientation, rational problem-solving style, impulsive/carelessness style, and avoidance style. The total score was used for this study, $\alpha = .86$, to reflect parents use of positive problem-solving orientation and rational problem-solving style. Higher total scores indicate more constructive parent problem-solving skills and orientation. Making a plan when faced with a challenge is an example of positive problem-solving while avoiding the problem is an example of negative problem-solving.

Procedures

The research coordinator arranged a baseline assessment conducted at clinic or in the family's home based on family preference after the family agreed to study participation. During the baseline assessment, two research assistants obtained parent informed consent/permission and child assent. Then, one research assistant worked with the parent to complete study measures and the other research assistant conducted a brief psycho-educational assessment with the child in addition to the measures described above.

Research assistants participated in an intensive two-day training in recruitment, assessment, and intervention procedures that included role-plays and didactics. The training also included an overview of SCD to improve basic knowledge of pediatric SCD and its associated complications, cultural sensitivity with African American families, and procedures specific to the research study. The study team regularly supervised the work of the research assistants. The protocol was reviewed and approved by the appropriate Institutional Review Boards.

Data Analysis

All variables were found to be normally distributed when examined for skew and kurtosis. Child age, gender, dichotomous genotype, household income, and parent education were examined for their relationships to primary study variables of parent/child report on PedsQL physical and psychosocial subscales, parent SPSI Total Score using Pearson correlations and independent samples t-tests. For genotype, more severe genotypes of SCD-SS and HBSCD-S β^0 thal were coded as 1 and all other genotypes were coded as 0. Pearson correlations were used to examine the associations among disease variables, problem-solving skills, and HRQOL. Power analysis indicated that with a medium effect size and alpha set at .05, power for Pearson correlations was 0.99 and power for the hierarchical regression with five predictors was 0.83 (Faul, Erdfelder, Lang, & Buchner, 2007).

Parent SPSI Total Score was examined as a moderator of the relationship between SCD complications and HRQOL according to the method set forth by Baron and Kenny (1986). SCD complications, parent problem-solving skills, child age, and parent education were mean centered. That is, to reduce the threat of multicollinearity, variables are subtracted from the sample mean to make a distribution centered around a mean of 0 before entry into the models. To understand parent problem-solving skills as a moderator, a hierarchical regression was conducted using the covariates of child age and parent education in step one, parent problem-solving skills and SCD complications in step two, and the interaction between problem-solving skills and SCD complications in step three to predict parent and child report of HRQOL (physical HRQOL and psychosocial HRQOL). For interaction terms with $p < .10$, post-hoc probing was conducted using Holmbeck's (2002) method, which further evaluates the significance of the interaction term by determining the significance of simple slopes.

Results

Descriptive Analyses

Table 2 presents the means and standard deviations for all study variables. Parents' total problem-solving skills scores were consistent with normative values for the measure (SPSI normative group range = 86–114). Parent and child reported psychosocial and physical PedsQL scores were similar to previously reported levels in children with SCD and suggest moderately impaired HRQOL (Panepinto, et al., 2008). Pearson correlations among study variables are presented in Table 2.

Covariates

Parent education, household income, and child age, gender, and genotype were examined as potential covariates. As depicted in Table 2, child age was significantly correlated with parent problem-solving skills and child report psychosocial HRQOL and was included in subsequent analyses as a covariate. Child age was not significantly correlated with other study variables. Also represented in Table 2, parent education was significantly correlated with parent problem-solving skills, but not other study variables, and was included in regression models as a covariate. Study variables did not differ by child gender [Total SPSI: $F(1, 81) = 0.25, p = .619$; Parent Psychosocial HRQOL: $F(1, 81) = 0.01, p = .917$; Parent Physical HRQOL: $F(1, 81) = 0.21, p = .649$; Child Psychosocial HRQOL: $F(1, 79) = 1.33, p = .253$; Child Physical HRQOL: $F(1, 80) = 2.09, p = .152$] or genotype [Total SPSI: $F(1, 81) = 1.46, p = .231$; Parent Psychosocial HRQOL: $F(1, 81) = 1.11, p = .296$; Parent Physical HRQOL: $F(1, 81) = 0.00, p = .987$; Child Psychosocial HRQOL: $F(1, 79) = 0.38, p = .540$; Child Physical HRQOL: $F(1, 80) = 1.01, p = .319$], or household income (Table 2).

Parent Problem-Solving Skills as a Moderator

The full model for child self-report physical HRQOL was not significant; the moderation variable demonstrated a p value of .069 (Table 3). Post-hoc probing for child self-report physical HRQOL indicated that the relationship between child self-report physical HRQOL and SCD complications was not significant for families with positive parent problem-solving abilities [$t(81) = .81, p = .418$], but it was significant for families with negative parent problem-solving abilities [$t(81) = -2.14, p = .035$]. For families with negative parent problem-solving skills, as SCD complications increased, HRQOL significantly decreased (Figure 1).

The full model for child self-report psychosocial HRQOL was significant ($p = .006$); both child age ($p = .027$) and the moderation variable ($p = .006$) were significant independent predictors. Post-hoc probing indicated that the simple slope for the relationship between child self-report psychosocial HRQOL and SCD complications was not significant for positive parent problem-solving abilities [$t(81) = 1.95, p = .055$] but was significant for negative parent problem-solving abilities [$t(81) = -2.85, p = .006$]. For families with negative parent problem-solving abilities, as SCD complications increased, HRQOL significantly decreased (Figure 2).

Parent problem-solving abilities did not moderate the relationship between SCD complications and parent proxy report of child physical and psychosocial HRQOL (Table 3). The full models for parent proxy child physical HRQOL and for parent proxy child psychosocial HRQOL were not significant. In both models, SCD complications emerged as a significant independent predictor, $p = .005$ and $p = .012$, respectively.

Discussion

Problem-solving abilities have been associated with positive disease management and health-related outcomes among adults and children with chronic health conditions, and problem-solving skills training has been incorporated into child and family-focused interventions to improve HRQOL (e.g., Pulgaron, et al., 2010; Wade, Walz, Carey, & Williams, 2009; Wysocki et al., 2006). To evaluate the applicability of problem-solving skills interventions to enhance HRQOL among children with SCD, this study sought to investigate whether parent problem-solving ability has a protective effect in mitigating the association of SCD complications with HRQOL in a sample of school age children. The most consistent finding was that SCD complications had a direct association with parent

proxy report of physical and psychosocial HRQOL. The hypothesis regarding a moderating effect of parent problem-solving was supported only for child-report HRQOL.

The association of SCD complications with psychosocial, but not physical HRQOL, and varying findings across child self- and parent proxy report of HRQOL provide confirmation for the literature maintaining that HRQOL is a broad, multidimensional concept. As a result, predictors of HRQOL have been identified for children with SCD at different levels of their social ecology from proximal child characteristics and disease severity to more distal family functioning, parenting stress, and neighborhood distress (Barakat et al., 2008; Palermo, Riley, & Mitchell, 2008). Moreover, child and parent perspectives of HRQOL are different, perhaps because identification of complications may vary. For example, children and parents diverge in their evaluation of SCD pain and parents rely on observable evidence of complications (Barakat, Schwartz, Simon, & Radcliffe, 2008). For this study, regression equations accounted for 6–19% of the variance in HRQOL, underscoring the importance of evaluating additional contributors to HRQOL.

Findings provide partial confirmation of the protective role of positive problem-solving abilities but results were not consistent across reporters of HRQOL (Varni et al., 2001). It is possible that measurement of problem-solving should be more specific to SCD management or specific SCD complications. While partial support of a moderating effect for overall positive problem-solving directs us to a class of strategies with potential benefit, it does not allow for determination of specific behavioral or cognitive problem-solving abilities that promote HRQOL. In addition, parent evaluation of HRQOL may be directly linked to current SCD complications whereas children's perspective may be broader and incorporate other aspects of well-being. A limitation of this study that may account for the inconsistent findings is the manner by which the SCD complications variable was computed. This approach applies a measure of objectivity in that it relies on the medical record, advances understanding of severity beyond genotype differences, and has been used in prior pediatric SCD studies (Barakat, et al., 2007; Casey, Brown, & Bakeman, 2000; Daniel, et al., 2010). However, it does not account for complications perceived by the child or parent as severe, complications that may not be directly modifiable, or clear differentiation of complications from number of procedures/health care utilization.

Moreover, the mechanisms by which problem-solving abilities support improved HRQOL among those with higher complications is unclear. This effect might be through improved direct disease management (such as accessing appropriate pain medication), increased attention to addressing child emotional distress associated with complications, decreased parenting stress, or parent assistance of child's use of adaptive coping strategies (Marsac, Donlon, Hildenbrand, Winston, & Kassam-Adams, in press), all of which may result in improved HRQOL particularly from the child's perspective. Strong parent problem-solving abilities may characterize parents who have strong parenting skills, adaptive coping and well-being, most likely resulting in children with better HRQOL regardless of SCD complications.

Consistent with prior studies of HRQOL (Panepinto, et al., 2008), children with SCD and their parents reported moderately impaired HRQOL, particularly in the psychosocial domains. Self-reported problem-solving strategies among parents were in the average range. Findings suggest that development of interventions to improve HRQOL among children with SCD can be focused on disease management to address the complications that reduce HRQOL (Anie & Green, 2012). Given that SCD affects primarily children of ethnic minority status, interventions that target HRQOL of children with SCD should be culturally appropriate (Schwartz, Radcliffe, & Barakat, 2007). Problem-solving skills training presents a clear, direct approach for problem resolution, and may therefore yield improved HRQOL

and fit for African American families (Boyd-Franklin, 1989). The challenge is that because SCD symptoms are episodic and medical treatments are primarily preventive (such as prophylactic penicillin to prevent infection, hydration to prevent pain, chronic transfusion treatment to prevent stroke), relevance of problem-solving abilities to specific and salient SCD complications may depend on their presence at the time of problem-solving skills intervention. An approach that can address issues of feasibility and acceptability and bring problem-solving abilities to bear at the time of complications is to introduce brief interventions during inpatient admissions, transfusion treatment, or clinic visits.

Prior studies identified child age and gender (Palermo, et al., 2002a), as well as socioeconomic status and neighborhood distress (Palermo et al., 2008), as important sociodemographic variables to consider when evaluating the HRQOL of children with SCD. Although we controlled for child age, and examined child gender, these variables did not play a role in the associations of SCD complications with HRQOL, including moderation by parent problem-solving abilities, nor did parent education or family income influence these associations. Because our sample was limited to a narrow period in child development, school-age, this may have limited the evaluation of these variables. Alternatively, it may be that gender and age are more important factors for HRQOL for adolescents and young adults with SCD for whom this chronic health condition may pose increased barriers to HRQOL. An additional limitation of the study is that parent problem-solving abilities were measured as a general coping approach; it was not assessed in the context of SCD management. Prospective accounting for parent, child, and family problem-solving abilities as moderators of the association of SCD complications with HRQOL will be important to accurately determining moderation. Although this study had a multi-informant approach to measurement of HRQOL that highlighted differences in associations based on self- versus parent proxy report, we were unable to incorporate multiple perspectives on child or family problem-solving skills. For assessment of child problem-solving abilities, the dearth of developmentally appropriate measures that adequately assess problem-solving skills in children is a barrier to evaluating efficacy of problem-solving skills training interventions.

Findings of this study highlight the importance of clinical efforts to improve disease management and HRQOL among children with SCD. Improved understanding of the host of predictors of HRQOL, particularly for parent proxy report, is central to the establishment of effective approaches to enhancing HRQOL and well-being (Barakat et al., 2007). In addition, research that compares the efficacy of problem-solving skills interventions to improve HRQOL among children with SCD to direct knowledge and skills-based approaches is a critical next step. Targeting these family-based interventions, in which parent problem-solving and child self-management skills are fostered, to children with severe SCD is likely to emerge as the most feasible and cost effective method (Barakat, et al., 2010).

Informed Consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent/permission was obtained from all parent participants and child assent from patient participants for being included in the study.

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Figure 1. Parent problem-solving abilities as a moderator between SCD complications and child self-report physical HRQOL, controlling for child age and parent education.

Figure 2.

Parental problem-solving abilities as a moderator between SCD complications and child self-report psychosocial HRQOL, controlling for child age and parent education.

Table 1

Sample Characteristics

Demographic Variables (N = 83)	N (%)
Gender, Male	42 (50.6)
Child Ethnicity, Non-Hispanic	78 (94.0)
Child Race, African American	78 (94.0)
Genotype	
HbSS	50 (60.2)
HbSC	24 (28.9)
HbS β ⁺	6 (7.2)
HbS β ⁰	1 (1.2)
Other	2 (2.4)
Primary Caregiver	
Mother	75 (90.4)
Father	5 (6.0)
Grandmother	1(1.2)
Great-Grandmother	1(1.2)
Great-Aunt	1(1.2)
Monthly Income	
\$0 – \$833	5 (6.0)
\$834 – \$1,666	21 (25.3)
\$1,667 – \$2,449	15 (18.1)
\$2,500 – \$3,333	24 (28.9)
\$3,334 – \$4,166	3 (3.6)
\$4,167 – \$4, 999	5 (6.0)
\$5,000 – \$5,833	5 (6.0)
Over \$5,834	5 (6.0)
Highest Level of Education (Primary Caregiver)	
Some High School	9 (10.8)
High School Graduate	22 (26.5)
Some College/Vocational School/Associates Degree	33 (39.8)
Bachelor's Degree	12 (14.5)
Professional School/Graduate School	7 (8.4)

Table 2**Study Variable Descriptives and Pearson Correlations**

Variable	1	2	3	4	5	6	7	8	9	M (SD)
1. Child Age	-	-.14	-.16	-.20	-.26*	-.01	-.07	-.15	-.32**	8.47 (2.11)
2. Parent Education		-	.47**	.06	.24*	.15	-.04	.08	-.02	1.83 (1.08)
3. Household Income			-	-.15	.16	.21	-.11	.17	-.19	Table 1
4. SCD Complications				-	.15	-.28**	-.11	-.23*	-.09	6.03 (4.18)
5. SPSI Total Score					-	.12	.03	.16	-.10	109.29 (13.06)
5. PedsQL Parent proxy report Physical						-	.22*	.63**	-.01	71.05 (22.65)
6. PedsQL Child self-report Physical							-	.16	.62**	74.89 (16.10)
7. PedsQL Parent proxy report Psychosocial								-	.17	69.60 (16.89)
8. PedsQL Child self-report Psychosocial									-	64.53 (19.55)

*
 $p < .05$;**
 $p < .001$

Table 3

Parent Problem-solving Regression

Predictor	Child Psychosocial HRQOL β	Child Physical HRQOL β	Parent Psychosocial HRQOL β	Parent Physical HRQOL β
<i>Step 1</i>				
Child Age	0.32***	0.07	-0.14	0.02
Parent Education	0.03	-0.03	0.06	0.16
<i>Step 2</i>				
Child Age	0.31***	0.07	-0.16	-0.01
Parent Education	0.04	-0.04	0.04	0.14
Parent Problem-solving	-0.02	0.07	0.14	0.14
SCD Complications	-0.03	-0.10	-0.28**	-0.31***
<i>Step 3</i>				
Child Age	0.25*	0.02	-0.15	-0.01
Parent Education	0.05	-0.03	0.03	0.14
Parent Problem-solving	0.04	0.12	0.14	0.14
SCD Complications	-0.03	-0.10	-0.28**	-0.31***
Parent Problem-solving X SCD Complications	0.31**	0.22*	-0.04	0.01
<i>F</i>	3.53***	1.01	2.02*	2.25*
<i>R</i> ²	.19	.06	.12	.13

N = 82 for child analyses and 83 for parent analyses; Parent Problem-solving X SCD Complications denotes the interaction term/moderator variable.

*
p < .10;

**
p < .05;

p < .01