

Adherence Behavior Among Adolescents with Type I Insulin-Dependent Diabetes Mellitus: The Role of Cognitive Appraisal Processes

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Guided by a transactional stress and coping model, this study examined the contribution of cognitive appraisal processes to diabetes adherence behavior among adolescents 12 to 18 years old ($n = 40$). Multiple hierarchical regression analyses indicated that esteem related to physical appearance accounted for a significant 16% of the variance in checking one's blood sugar. Perceived control when ill and attributional style for negative events each accounted for significant increments of variance as well (10 and 6%, respectively), yielding a total of 32% of the variance explained by appraisal processes. Results suggest that adolescents who (a) have a negative perception of their bodies, (b) perceive little internal control over health when ill, and (c) have an external attributional style for negative events were at greatest risk for poor compliance as indicated by less frequent checking of blood sugar.

KEY WORDS: Type I insulin-dependent diabetes; adherence; adolescents; chronic illness.

Type I insulin-dependent diabetes (Type I IDD), one of the most prevalent chronic diseases in childhood, results from pancreatic failure to produce sufficient endogenous insulin. Long-term prognosis improves when the affected individual

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follows a complex and demanding treatment regimen (Diabetes Control and Complication Trial [DCCT], 1993). Treatment typically consists of insulin injection, strict dietary control, exercise, and monitoring of blood glucose levels through blood sampling. Failure to accurately balance these demands may lead to short-term (e.g., hypoglycemia) and long-term consequences (e.g., retinopathy, cardiac and renal complications).

By adolescence, most youngsters have developed the requisite skills necessary for adequate self-care (e.g., injecting insulin, reading a glucometer). Families and physicians often are eager to transfer the primary responsibility for care from the parent to the adolescent. However, not all adolescents are equally competent at managing the complex balancing act and decision making that defines good adherence (Iannotti & Bush, 1993; Ingersoll, Orr, Herrold, & Golden, 1986).

Research suggests that in spite of developmental gains adolescents with diabetes have more difficulty with adherence to a medical regimen than do children (Anderson, Auslander, Jong, Miller, & Santiago, 1990; Johnson, Freund, Silverstein, Hansen, & Malone, 1990). Further, a prospective study of adolescents newly diagnosed with diabetes suggests that most cases of serious noncompliance emerge in midadolescence (Kovacs, Goldston, Obrosky, & Iyengar, 1992). Moreover, these difficulties tend to continue (Kovacs et al., 1992). The above findings suggest that adolescence is a singularly critical time to stay adherence problems since (a) adolescents are at risk for poor compliance, and (b) poor compliance habits tend to persist. Thus, identifying factors that affect adherence behavior in adolescence offers the opportunity to improve health across the lifespan.

Investigators have identified several factors within the child/adolescent that may facilitate or inhibit adherence. Iannotti and Bush (1993) enumerated several developmental processes that contribute to a youngster's ability to comply with treatment demands including perception of time, understanding causal relationships (termed cognitive maturity), social awareness and self-esteem. Others have described barriers to adherence behavior including forgetting, poor planning, social interference, knowledge deficits, and the health care provider's communication skills with the youngster (cf. Johnson, 1988, 1994).

In another vein, scientist-practitioners have examined the role of the social environment, including characteristics of families and peers that affect adherence. Findings indicate that family functioning variables such as cohesion, organization, and support, facilitate better adherence and glycemic control (Anderson, Miller, Auslander, & Santiago, 1981; Hanson, Henggeler, & Burghen, 1987; Weist, Finney, Barnard, Davis, & Ollendick, 1993). Peers also may play a pivotal role in facilitating adolescent adherence behavior. La Greca et al. (1995) suggest that peers provide critical emotional support for adolescents with dia-

betes and thus may serve as “supportive companions” for illness tasks such as diet and exercise.

While the investigation of developmental processes, cognitive skills, and the social environment has made an important contribution to our understanding of adherence behavior, relatively little attention has been paid to the role of adolescent appraisal processes. Yet, Lazarus and Launier (1978) suggest that subjective appraisals of an event (termed primary) and appraisals of one’s resources to manage the event (termed secondary) are strongly related to adjustment and adaptation.

The present study seeks to expand current knowledge by examining the role of cognitive appraisal processes in predicting adolescent adherence behavior. Part of an ongoing effort to explain variability in health and psychological outcomes among those with a chronic illness, the current study builds on an established adaptational model (e.g., Thompson, Gustafson, George, & Spock, 1994). The transactional stress and coping model views the presence of an illness as a potential stressor to which the adolescent and family system must adapt.

Health and psychological outcomes result from transactions between (a) demographic parameters (gender, age, SES) and illness parameters (e.g., type, severity), which define the context in which adaptation occurs, (b) social ecological variables such as family functioning and parental adjustment, and (c) psychological adaptational processes, particularly appraisals and coping efforts. The model consistently has demonstrated the critical role of primary stress appraisals and coping in explaining psychological adjustment among affected mothers and children, particularly those living with cystic fibrosis or sickle cell anemia (Thompson et al., 1994). However, work remains to be done with respect to model specificity. Although this model recognizes that illness type and course play a role in adaptation, it has yet to be determined which secondary appraisal processes in the context of which illnesses produce the best outcomes. Early work suggests that different appraisal processes may be more strongly related to adjustment as a function of illness type. For example, Bennett Murphy (1995) reported that while stress appraisals appear central to adjustment among adolescent with IDD, self-esteem has a stronger relationship to adjustment among adolescents with CF. The present study examines the moderating role of primary stress appraisals and secondary appraisals including attributional style, self-esteem, and locus of control as they relate to checking one’s blood sugar.

Earlier work with this model found that among adolescents with Type I IDD coping and adherence behavior (checking one’s blood sugar) alone predicted glycemic control (HbA1C) (Bennett Murphy, 1995). Neither primary stress appraisals nor secondary appraisals explained significant variability in glycemic control. This study then attempts to clarify if the primary stress appraisals and secondary self-appraisals might act directly on adherence behavior.

The aforementioned appraisal processes were selected for inclusion in this model because they have demonstrated utility in explaining variability in psychological adjustment as well as in glycemic control. For example, Delamater, Kurtz, Bubb, White, and Santiago (1987) found that adolescents in poor glycemic control identified diabetes as a stressor more frequently than did those in good control. Further, adolescents in poor control more often appraised diabetes as limiting or inhibiting them. Although adolescents in poor control clearly thought about diabetes differently than did those in good control, it remains to be seen whether this affected behavior, particularly adherence.

A few studies have examined the relationship between attributional style and glycemic control. Kuttner, Delamater, and Santiago (1990) reported that a learned helpless style was significantly related to poor glycemic control. In contrast, Brown, Kaslow, Sansbury, Meacham, and Culler (1991) found that an internal attributional style for negative events was associated with better glycemic control. While the relationship between attributional style and glycemic control is unclear, there is even less information about how attributional style affects adherence behavior.

Finally locus of control and self-esteem both have been related to glycemic control (Anderson et al., 1981; Weist et al., 1993) such that higher perceptions of external control and esteem are related to better glycemic control. And yet Brand, Johnson, and Johnson (1986) reported that children with an internal locus of control have worse glycemic control. Again, the role of locus of control and self-esteem in predicting adherence behavior is unknown. The present study seeks to determine whether these adolescent appraisal processes are related to behavioral response, or adherence with checking one's blood sugar.

The study hypotheses were as follow: First, it was predicted that adolescent cognitive appraisal processes would contribute to the adherence behavior of checking one's blood sugar, over variance accounted for by demographic and family functioning variables. Support for this hypothesis would contribute to the current state of knowledge by demonstrating that the adolescent's cognitive processes affect not only adjustment but also are linked directly to compliance with treatment. Second, it was hypothesized that both primary stress appraisals and appraisals about self (causal attributions, self-esteem, locus of control) would make significant contributions in explaining variability. Finally, it was believed that adolescents who viewed diabetes management tasks as less stressful, made external attributions for negative events, and had higher self-esteem and a high sense of control would demonstrate the best adherence behavior as indicated by more frequent checking of one's blood sugar. It was hypothesized that youngsters who did not assume blame for negative events but still maintained the belief that they could control their health would exhibit the best compliance with checking their blood sugar. This model provides a conceptual framework in which to examine the combination of variables that place an

adolescent at risk for poor adherence. The empirical selection of these risk variables then allows for a judicious allocation of preventative resources to those adolescents at highest risk for noncompliance.

METHOD

Participants

Participants included 40 adolescents with Type I insulin-dependent diabetes who were receiving ongoing treatment at the Duke University Medical Center diabetes outpatient clinic. Participants ranged in age from 12 to 18 years ($M = 14.6$, $SD = 1.4$). The sample was 58% male and 42% female; 78% of the participants described themselves as Caucasian, 17% African American, and 5% Native American. For analysis purposes subjects were identified as being a member of the dominant or nondominant ethnic group.

The average age of diagnosis for this sample was 8.0 years. All subjects were at least 6 months postinitial diagnosis. SES was calculated using United States census data. This sample was at the 66th percentile for all Americans based on paternal occupation. Exclusion criteria included (a) the presence of a comorbid chronic illness; (b) psychiatric hospitalization within the last 3 years; (c) mental retardation; (d) inclusion in other medical research protocols; (e) active Department of Social Services abuse/neglect investigations, and (f) placement in a group home or institution.

Measures

Stress Appraisals. A brief semistructured interview was utilized to assess adolescent appraisals of stress. This instrument is based on the work of Moos and Tsu (1977) and asks respondents to rate their perceptions of stress in response to illness tasks. For the purposes of this study, adolescents made ratings on the dimension of managing diabetes symptoms and treatment demands. Ratings ranged from 1 (*not stressful at all*) to 100 (*very stressful*) (Cronbach $\alpha = .75$). This measure has demonstrated good predictive utility regarding psychological distress in past pediatric research (e.g., Thompson et al., 1994).

Self-Esteem. Esteem was assessed by the 80-item Piers-Harris Children's Self-Concept Scale (1984) which yields a global esteem score as well as domain specific scores. Internal consistency for this measure has been demonstrated to be high (alpha coefficients range from .88 to .93) and has good test-retest reliability with a global index of .71 (Piers, 1984). Alpha coefficients for this sample ranged from .67 to .69 across domains. In this study the global self-esteem score and the physical appearance domain score were used. The appear-

ance domain score was included based on evidence that esteem related to appearance is associated with taking less care of one's health (Sussman, Dent, Stacy, Burton, & Flay, 1995).

Attributional Style. Attributional style was measured using the Children's Attributional Style Questionnaire (KASTAN; Kaslow, Tannenbaum, & Seligman, 1978). This device includes 48 items asking adolescents to choose from one of two possible causal explanations for positive and negative events. This measure yields scores on dimensions of internality, stability, and specificity for positive events, negative events, and an overall composite. Data suggest acceptable internal consistency for the composite scores (alpha coefficients range from .50 to .73), and good stability over time (reliability .71 for positive events and .66 for negative events) (Seligman et al., 1984). Alpha coefficients for this sample were .70 for the positive events score, .75 for the negative events score, and .70 for the overall composite score.

Locus of Control. Control beliefs were assessed through a semistructured interview based on items from the Children's Health Locus of Control Scale (Parcel & Meyer, 1978) and the Diabetes Health Locus of Control Scale (Ferraro, Price, Desmond, & Roberts, 1987). This shortened measurement approach was developed for this study due to time constraints in the clinic. Not all subjects were able to complete all questionnaires, thus it was decided to only assess perceptions of internal control. The three control questions examined the subject's beliefs about the extent to which (s)he has personal (internal) control over the diabetes when well, ill, and overall perceived control. Cronbach alpha coefficients for these three control dimensions were .68, .69, and .68, respectively. Further, factor analyses were conducted to assess whether the multiple dimensions of the measures of self-efficacy, control, attributional style, and self-esteem were reflective of four distinct underlying constructs. A principal components factor analysis with a promax rotation suggested four discrete factors with eigenvalues greater than 1.0 reflecting each of the four measures. The factor loadings for the control dimensions were 0.93, 0.52, and 0.99, respectively.

Family Functioning. The Family Environment Scale (FES) consists of 90 true-false items that form 10 subscales (Moos & Moos, 1981). Three higher order FES factors have been delineated and replicated with families with chronically ill children (Kronenberger & Thompson, 1990). Cronbach alpha coefficients for the supportive, conflict, and control factors were .68, .73, and -3.7 , respectively. The control factor was included in this study because it has demonstrated the most consistent relationship with adherence behavior (Anderson et al., 1990; La Greca, Follansbee, & Skyler, 1990; Weist et al., 1993).

Adherence. Compliance is best considered a multifaceted construct. Yet for the purpose of this study one dimension of adherence was selected as it was the only dimension that could be measured objectively. Frequency of checking one's blood sugar over the past 7 days as indicated by glucometer readings was used as

the indicator of adherence. Readings of the glucometer with memory chip were completed by the primary investigator. To establish the validity of the assumption that checking one's blood sugar has a relationship with health, we examined the association between checking blood sugar and glycemic control. Adherence and glycosylated hemoglobin levels were significantly correlated ($r = -.39, p = .02$). Further, subjects were classified in adherence groups. Those who checked their blood sugar on average more than twice a day were considered to have "good" adherence. Those who checked their blood sugar one to two times a day were said to be in the "adequate" adherence group. Finally those who averaged less than one check per day were in the "poor" adherence group. Sixty-five percent of the subjects fell into the expected cells (good adherence/good control, adequate adherence/good control, poor adherence/poor control). Notably, only one adolescent with poor adherence maintained good glycemic control. Clearly, although checking one's blood sugar levels is not sufficient for good disease control, it may be a necessary condition for long-term health maintenance and a reliable indicator of one's attention to health management tasks. Finally our data suggest that those adolescents with good adherence were significantly and clinically different than those with poor adherence, $t(1, 27) = 4.50, p = .04$. Those in the poor adherence group had higher glycosylated hemoglobin levels ($\chi = 10.00, \sigma = 1.20$) than those in the good adherence group ($\chi = 8.64, \sigma = 1.53$).

Procedure

Prior to data collection, patients received a letter explaining the study and requesting their participation. Patients then were approached at their next scheduled outpatient visit and invited to participate. Informed written consent was obtained from both adolescent and parent. Of the 44 adolescents with Type I IDD approached, 2 met exclusion criteria and 3 declined to participate. Adolescents and parents independently completed the self-report questionnaires and interview during the clinic visit. Medical data regarding adherence and disease control were obtained by the primary investigator from the patient's glucometer with memory chip and medical record respectively.

Analysis Plan

Variable means and correlations are summarized in Tables I and II. Hierarchical multiple regression analyses were used to identify those psychological processes that made a significant contribution in accounting for the variance in adolescent adherence behavior. To test the transactional model, demographic variables (age, ethnicity, gender) were forced to enter the model first. Family functioning (control dimension) was forced to enter the model next. Through a

Table I. Variable Means

Variable	<i>M</i>	<i>SD</i>	Range
Age	14.5	1.47	12–18
Family functioning (control)	119.7	24.10	63–176
Stress appraisal	41.7	23.95	3–100
Control When ill	78.4	22.97	10–100
When well	70.4	28.40	1–100
Overall	79.1	22.82	5–100
Attributional style	13.8	3.19	8–21
Positive events			
Negative events	7.1	2.68	1–13
Overall	6.7	4.53	–5–16
Global self-esteem	57.6	9.78	38–79
Self-esteem (appearance)	57.1	9.01	34–69
Adherence (checking blood sugar)	13.7	6.13	0–24
HbA1C	8.9	1.46	5.8–12.4

forward stepwise selection procedure the adolescent variables (stress appraisal, attributional style, self-esteem, and locus of control) were allowed to compete for entry into the model. A significance level of .05 was set for entry and retention in the model.

RESULTS

The model accounted for a total 76% of the variability in adherence, $F(7, 23) = 10.55, p = .0001$ (Table III). Demographic variables and family functioning made a significant contribution to the variability in checking one's blood sugar. Age, sex, ethnicity, and family control accounted for 44% of the variance in outcome. When appraisal processes were allowed to compete for entry into the model, self-esteem related to physical appearance entered the model first accounting for 16% of the variability. Perceived control when ill and attributional style for negative events each entered the model accounting for an additional and significant 10 and 6% of the variance, respectively.

The results suggest that older adolescents demonstrated poorer compliance. Further, minority youth checked their blood sugar less often. Adolescents whose mothers rated the family as low on the controlling factor of the FES were less compliant. This factor reflects a family's emphasis on control, ethical or religious values, achievement orientation, and a lack of independence (Kronenberg & Thompson, 1990).

With respect to adolescent cognitive appraisal processes, those adolescents

Table II. Correlation tables

Variable ^a	2	3	4	5	6	7	8	9	10	11
1. FC	.08	-.15	-.19	-.09	-.15	.01	-.11	-.24	-.27	-.10
2. SA	—	-.20	-.24 ^b	-.26 ^b	-.23	.12	-.23	-.27 ^b	-.35 ^c	-.38 ^b
3. CI	—	—	.59 ^d	.81 ^d	.23	-.21	.29 ^b	.16	.27 ^b	.15
4. CW	—	—	—	.55 ^d	.25 ^b	-.19	.28 ^b	.33 ^c	.51 ^d	.34
5. GC	—	—	—	—	.18	-.09	.19	.29 ^c	.39 ^c	.17
6. AS+	—	—	—	—	—	-.19	.81 ^d	.23 ^b	.32 ^c	.16
7. AS-	—	—	—	—	—	—	-.72 ^d	-.09	-.23	-.36 ^b
8. GAS	—	—	—	—	—	—	—	.21	.36 ^c	.30 ^b
9. SEA	—	—	—	—	—	—	—	—	.71 ^d	.42 ^c
10. GSE	—	—	—	—	—	—	—	—	—	.39 ^b
11. Adh	—	—	—	—	—	—	—	—	—	—

^aKey: FC = family control, SA = stress appraisal, CI = perceived control when ill, CW = perceived control when well, GC = overall perceived control, AS+ = attributional style for positive events, AS- = attributional style for negative events, GAS = global attributional style, SEA = self-esteem related to appearance, GSE = global self-esteem, Adh = no. of times checked blood sugar in last week.

^b $p < .05$.

^c $p < .01$.

^d $p < .0001$.

Table III. Results of the Hierarchical Multiple Regression Analyses in Relation to Adherence^a

Variable	Regression coefficient	SE	R ²	Partial R ²	df	F	p-value
Model			0.76		7	10.55	.0001
Demographics				0.44			
Age	-2.71	0.50				28.74	.0001
Gender	1.00	1.49				0.45	.5085
Ethnicity	8.72	2.60				11.23	.0028
Family functioning (control)	0.06	0.03				4.09	.0548
Self-esteem (appearance)	0.32	0.08		0.16		10.15	.0039
Control when ill	0.15	0.05		0.10		7.97	.0094
Attributional style (negative events)	-0.71	0.30		0.06		5.51	.0279

^aAlpha = .05. All variables met this level for entry and retention in the model. Variables that did not enter the model: Stress appraisal; Perceived control when well; Overall perceived control; Attributional style for positive events; Overall attributional style composite score; Global self-esteem.

with a more negative perception of their appearance were less likely to check their blood sugar. Adolescents with lower perceptions of internal control when their disease status is poor were less likely to check their blood sugar. Finally, those with an external causal attributional style for negative events demonstrated poorer adherence. These findings support the hypothesis that an adolescent's cognitive style affects adherence behavior. Cognitive appraisals account for variability beyond that explained by demographic and family functioning variables. In addition, secondary appraisals about self appear to be more critical for good adherence than do stress appraisals about diabetes management.

DISCUSSION

Complying with treatment demands is a challenge for some youngsters with Type I IDD and serious compliance problems often arise during adolescence (Kovacs et al., 1992). Yet, the development of health behaviors in adolescence may arrest the onset of short- and long-term consequences that impede healthy development.

The present study examined the utility of a transactional model in predicting those adolescents at risk for poor compliance with one element of the complex diabetes regimen. Further, this study empirically identifies what may be some of the underlying mechanisms for poor adherence. Finally, because these variables all are amenable to change, this study indicates appropriate targets for psychological intervention and prevention efforts.

Cognitive Appraisal Processes in Relation to Adherence

The results indicate that while demographic and family factors account for a large and significant proportion of variance, those youth who (a) have a negative perception of their bodies, (b) perceive little internal control over health when ill, and (c) have an external attributional style for negative events were at greatest risk for poor adherence as indicated by less frequent checking of blood sugar.

These findings are consistent with those reported elsewhere, yet make a new contribution in two important ways. First, this study examines four adolescent cognitive processes in the context of an adaptational model. Each of these processes separately has been identified as affecting adjustment and disease control. However, the effects often are small or nonsignificant. The relationship of these variables within the context of other adaptive processes may be a more meaningful way in which to represent the impact of these processes on the individual. Further, few have examined the relationship of these processes to adherence. For example, Anderson et al. (1981) reported that self-esteem is related to glycemic control, such that lower self-esteem was associated with poor control. The present study suggests adherence is the mechanisms through which esteem affects control.

In terms of health locus of control, we found those adolescents who feel little control when ill were less likely to check their blood sugar. Findings with respect to locus of control beliefs have been mixed. Some have found that external orientation is the most significant predictor of glycemic control (Weist et al., 1993). For the purposes of this study however, we specifically were interested in how the adolescent's beliefs about her(him)self affected behavior. Brand et al. (1986) found that youth with an internal orientation had worse glycemic control than did externally oriented youngsters when confronted with negative life events. Johnson (1984) argued that internally oriented children may react to uncontrollable aspects of their diabetes with distress which then affects health status. The present findings however suggest that those who feel unable to alter their health status when their blood sugar is out of control respond by avoidance, or not checking their blood sugar. This apparent "double-bind" poses a challenge for patients, parents, and health care providers. Youngsters must have belief in their ability to affect positive change when their blood sugar is nonoptimal in order to *act* to correct matters. However, taking too much blame or responsibility for this event may lead to distress which adversely influences blood sugar. Developing a sense of mastery with the understanding that fluctuations will occur is an important goal in transferring the responsibility for care to the adolescent. Yet these findings point to the possibility that the psychological processes that foster one positive outcome (adherence) may adversely affect another (glycemic control).

In the current study adolescents with an external attributional style for

negative events were less likely to check their blood sugar. Reports on the role of attributional style in chronically ill youth also have been mixed. Some have reported learned helplessness is related to depression and poor glycemic control (Kuttner et al., 1990) whereas others have found an internal attributional style to be associated with better glycemic control (Brown et al., 1991). Brown et al. hypothesized that those who hold themselves responsible engage in better compliance. The present study supports that hypothesis. Although the present study did not assess the direct relationship of attributional style on glycemic control, the findings indicate that internal attributions for negative events promotes adherence which may then positively impact health and functional status.

Glasgow and Anderson (1995) proposed that different psychosocial processes may underlie the multiple tasks of diabetes adherence. This study identifies several that are associated with checking one's blood sugar. These processes, self-esteem, perceptions of control, and attributional style point to the complexity of the developmental issues involved when one considers the multiple pathways to adherence. Compliance involves not only implementation of specified behaviors, such as injection of insulin, but also a cognitive orientation toward mastery. The process of transferring care must be graduated to foster a sense of competency while providing the comfort of a familial "safety net."

Demographic and Familial Factors in Relation to Adherence

The results also suggest that adolescents in particular demographic groups are at heightened risk for poor compliance. In this sample, older adolescents were more likely to have adherence problems. This finding is consistent with what has been reported by Kovacs et al. (1992). Again, age differences may reflect a developmental tendency for parents to provide less support (La Greca et al., 1995) and to relinquish control as the child ages (Anderson et al., 1990; La Greca et al., 1990) It also may be a function of increasing social interference (Johnson, 1988).

With respect to ethnicity, minority youth were less likely to check their blood sugar. In this sample, three families of color had a history significant for family disruptions. Given the small number of African American and Native American families in this study, the extent to which family disruption as opposed to ethnic/cultural differences accounts for adherence differences is unclear. Further studies are needed to clarify whether the influence of race was specific to this sample or reflects broader cultural differences in adherence.

Finally, our results indicate that adolescents from families low in control were less adherent. These findings are consistent with others (Anderson et al., 1990; La Greca et al., 1990; Weist et al., 1993). While common practice sup-

ports the transfer of care from the parent to the adolescent, research has consistently demonstrated that adolescents with "too much" independence and responsibility are at risk for poor compliance. Clearly there is a tension between the natural process of encouraging adolescents to take charge of their care while recognizing that youths from families high in control demonstrate the best compliance. La Greca et al. (1995) outlined several ways in which families can assist with self-care without assuming primary responsibility. These interventions must be evaluated empirically and then communicated to providers. Another necessary task for pediatric psychologists is to identify which of the many components of adherence need the most support from parents and which the adolescent can reasonably assume. For example, with respect to checking one's blood sugar, parents may need to facilitate carrying out the behavior, but with guidance the adolescent may be able to determine what course of action to take (e.g., selecting the appropriate amount of insulin).

In conclusion, the present study empirically identifies some of the psychosocial mechanisms that underlie adherence behavior. Several strengths of this study should be noted. The project is based on a conceptual model and provides further support for the utility of the transactional model in explaining within group differences. Past research has demonstrated the effectiveness of this model in accounting for variability in psychological functioning. This study indicates that the model also contributes to our understanding of variability in adherence behavior. Second, recruitment was based on consecutive patients attending outpatient visits which enhances representativeness. Finally, the psychological variables measured all are appropriate targets for intervention. As this study may delineate the underlying cognitive mechanisms that support adherence behavior, it allows for specific early intervention efforts that may restructure defeating cognitive patterns.

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