Attributions of Adolescents With Type 1 Diabetes in Social Situations

Relationship with expected adherence, diabetes stress, and metabolic control

ANTHONY A. HAINS, PHD
KRISTOFFER S. BERLIN, MS
W. HOBART DAVIES, PHD
ELAINE A. PARTON, RN MA, CPNP
RAMIN ALEMZADEH, MD

OBJECTIVE — To examine the relationships among negative attributions of friend reactions (NAFRs) within a social context, anticipated adherence difficulties, diabetes stress, and metabolic control.

RESEARCH DESIGN AND METHODS — A sample of 104 adolescents with type 1 diabetes completed instruments measuring demographics, attribution of friend reactions, anticipated adherence, and diabetes stress. Metabolic control was measured by HbA_{1c} obtained during the clinic visit.

RESULTS — Path analysis demonstrated an excellent fit of a model depicting an indirect relationship between NAFRs and metabolic control through the mechanisms of expected adherence difficulties and diabetes stress.

CONCLUSIONS — Adolescents who make NAFRs are likely to find adherence difficult in social situations and have increased feelings of stress, with the latter associated with poorer metabolic control. Intervention efforts to address negative attributions may impact adherence behavior and feelings of stress, especially if specific contexts of self-care behavior are taken into account.

Diabetes Care 29:818–822, 2006

Adolescents with type 1 diabetes have been found to have more problems with adherence to their self-care than younger children, even though they possess greater diabetes knowledge (1,2). With the onset of adolescence, youths tend to spend increasing time with their friends. The adherence decisions made by adolescents with diabetes while with their friends reflect an interaction of situational circumstances and the nature and history of the relationships with particular peers. Furthermore, these factors likely affect the adolescents' expectations and attributions for the reactions they will receive from their friends if they follow their treatment regimens.

Adolescents may be aware of potential health complications from poor adherence but still have difficulty maintaining their regimen because they are apprehensive about being singled out by others (3,4). While adolescents demonstrate better problem solving regarding diabetes self-management issues than do children, adolescents become increasingly influenced by what they anticipate would be negative reactions or disapproval from friends in social situations that would require adherence behaviors (2). Decisions not to engage in self-care are misguided because the empirical work available suggests that friends tend to provide emotional support and encourage following the treatment regimen (4).

A social information–processing model of adjustment provides an explicit framework for viewing the role of cognitive processes in the problem behavior choices of youth (5). These cognitive processes include filtering only specific aspects of the situation, incorrectly appraising others' intentions, or assessing the situation as threatening in terms of potential consequences. This model may describe processes involved with adherence efforts around peers. The model suggests that adolescents with type 1 diabetes may perceive adherence behavior as difficult in social situations due to a fear of negative friend evaluations. Such attributions and anticipated adherence difficulties (AADs) (and likely poor adherence) are problematic not only because of the health impact but also because the adolescents are missing opportunities for friend support.

Other research has found negative attributions (e.g., focusing exclusively on the negative features of the situation, frequently expecting the worst to happen) to be associated with both diabetes-related stress and general feelings of stress (6). The impact of negative attributions on feelings of stress is consistent with cognitive-behavioral theory, which proposes that individuals respond primarily to cognitive representations of a situation rather than the event itself (7). Therefore, inaccurate interpretations of events could result in poor behavioral choices and/or emotional distress.

Negative attributions of friend reactions (NAFRs) are not likely to be related to metabolic control directly (6) but rather through the mechanisms of diabetes stress and expected adherence behavior. Diabetes stress has been found to have a direct association with metabolic control (6,8). Adherence efforts have not displayed a strong association with metabolic control, possibly due to a variety of measurement issues (9). It could be the case, however, that expected adherence difficulties in social situations may add to diabetes stress, which in turn is related to metabolic control.

From the University of Wisconsin-Milwaukee, Medical College of Wisconsin, Milwaukee, Wisconsin.
Address correspondence and reprint requests to Anthony Hains, Department of Educational Psychology, P.O. Box 413, University of Wisconsin-Milwaukee, Milwaukee, WI 53201. E-mail: aahains@uwm.edu.
Received for publication 28 September 2005 and accepted in revised form 17 December 2005.
Abbreviations: AAD, anticipated adherence difficulty; NAFR, negative attribution of friend reaction.
A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

This study sought to clarify the relationships among NAFRs, AADs, diabetes stress, and metabolic control. Using path analysis, we postulated that NAFRs by adolescents with diabetes would be associated with AADs and with diabetes stress. In turn, diabetes stress was expected to be related to metabolic control. AADs were not expected to be directly related to metabolic control, based on past research. Rather, adherence difficulties were expected to be the mechanism by which NAFRs affect diabetes stress. Given the absence of diabetes-specific peer attribution measures, a secondary goal of this study was to develop a questionnaire with adequate psychometric properties to test the proposed model.

RESEARCH DESIGN AND METHODS

— The study was approved by the institutional review board. Participants were adolescents between the ages of 11 and 18 who were receiving treatment for type 1 diabetes at Children's Hospital of Wisconsin. Written informed consent was obtained from parents and written assent was obtained from the adolescents. Of 131 adolescents who consented to participate, 104 completed the instruments for inclusion in the study. Mean (±SD) age of participants was 13.94 (±1.94) years. Forty-seven (45%) of the participants were female. The racial background of the sample was 93 European Americans, 8 African Americans, and 1 each of Asian-American, American-Indian, and Latino adolescents. Participants had been diagnosed with diabetes for an average of 6.3 (±3.76) years.

Once parents and adolescents provided consent to participate, adolescents were given a packet of instruments measuring demographic information, their attributions of peer reactions to self-care in social situations, and diabetes stress. Adolescents chose to complete the instruments at the clinic ($n = 19$) or take them home and return them by business reply envelope ($n = 85$). All adolescents received a gift certificate to a local shopping mall for their participation.

Measures

Demographic information. Questions about sex, race, age, grade, duration of diabetes, and whether they have told their friends about their diabetes were included on a cover sheet. Adolescents were also asked how many friends they have told using a 5-point scale (1, only one or two; 3, some of them; 5, most of them).

Attribution of friend reactions. Given the absence of diabetes-specific measures of AADs and NAFRs, the friend attribution questionnaire was developed for this study based on the social information processing model of adjustment (5). This questionnaire describes seven social situations involving friends where the adolescent is faced with an adherence situation. Four of these situations were adapted from an existing diabetes problem-solving measure (2) and rewritten to fit the focus of the instrument and reflect more current adherence regimen practice. The remaining three items were newly developed for this project by two psychologists with >20 years of combined clinical experience with adolescents who have diabetes, with input from the medical treatment team and a clinical psychology graduate student who has type 1 diabetes. The following is an example of an adherence situation: "It's Friday night and you and three or four friends are eating pizza at a friend's house. You know the pizza has a lot of fat and protein. With all the noise and excitement, you get the feeling it is going to be hard to keep track of how much pizza you are eating."

Each situation was followed by nine questions. Six of the questions asked to what extent the adolescents expected to have certain thoughts about the friends' reactions, with the adolescents responding on a 5-point scale (1, "I'm sure I would not think this"; 5, "I'm sure I'd think this"). Positively worded attributions (e.g., "I'd think my friends would understand and be supportive") were reverse scored. These items were summed to form the Negative Friend Attribution Scale. Two questions were asked about the ease and likelihood of adherence in these situations and were combined to form the AAD scale. As a validity check, a question regarding experience was included that asked adolescents to rate on a 5-point scale the extent to which they had ever been in each situation, with 1 and 5 representing "never" and "a lot," respectively. The full measure is available from A.A.H.

Diabetes stress. The diabetes stress questionnaire (10) is a 65-item self-report instrument designed to assess daily stressors related to diabetes. The measure yields a composite scaled score with higher scores indicating higher levels of stress. Internal consistency has been reported to be excellent ($\alpha = 0.97$), and the measure has been shown to have good concurrent validity (10).

Metabolic control. Metabolic control was measured by the percentage of HbA_{1c} (A1C) at the clinic visit of recruitment. The mean A1C level for the participating youths was 8.59 ± 1.42, which is comparable to the mean for the clinic as a whole (±8.7).

RESULTS

— To explore the viability of the proposed model, a series of steps was needed: *1*) determine the factor structure and psychometric properties of the friend attribution questionnaire, *2*) test the hypothesized relationships among the study variables, and *3*) determine the significance of the indirect effects.

Factor structure and psychometric properties of the friend attribution questionnaire

In order to determine the factor structure of the friend attribution questionnaire, Russell's (11) recommendations were followed by subjecting the seven item-sums ("A" total through "I" total) to exploratory factor analysis using the correlation matrix, principal axis factoring (to extract two factors), and promax rotation. These items were the sums of individual questions repeated across the seven vignettes (question A vignette 1 + question A vignette 2, etc.). The internal consistencies (Table 1) for these item-sums ranged from fair to excellent. Item-sums were excluded from factors if they loaded on multiple scales or had pattern matrix loading <0.45. These procedures resulted in two factors, NAFRs and AADs, which accounted for 39.49 and 13.69% of item variance, respectively. Factor scores were then computed by summing their respective item-sums (reversed values if the item-sums had a negative loading). Table 1 shows the item and factor descriptive statistics, pattern factor item loadings, and the reliability (internal consistency α) coefficients based on the unweighted sum of individual factor items.

With regard to the validity of the measure, the mean (±SD) participant experience rating across vignettes (mean of H items) was 2.58 (±0.83). This suggests that these vignettes reflect situations similar to those experienced in their lives and that on average the participants had at least "some" experiences similar to those in the vignettes. Substantiation of criterion validity was obtained by examining the correlations among study variables. More specifically, NAFRs had significant positive relationships with diabetes-related distress ($r = 0.28$, $P < 0.01$) and

Table 1—*Item and factor descriptive statistics, pattern factor item loadings, and the internal consistency α coefficients*

Variable		α	Factor 1 loading	Factor 2 loading
A1C	8.64 ± 1.43			
Diabetes stress questionnaire	2.01 ± 0.58	0.97		
NAFRs (1, "I'm sure I would not think this;" 3, "Unsure;" 5, "I'm sure I'd think this")	38.82 ± 12.77	0.93		
Item A (reversed total) ("I'd think my friends would understand and be supportive")	12.24 ± 5.72	0.90	0.531*	0.182
Item B (total) ("I'd think my friends would get mad or frustrated")	10.29 ± 4.18	0.79	0.690*	−0.001
Item C (total) ("I'd think my friends wouldn't care")	19.48 ± 9.28	0.91	0.019	0.100
Item D (total) ("I'd think my friends wouldn't like me anymore")	7.93 ± 2.54	0.89	0.761*	0.030
Item E (total) ("I'd think my friends wouldn't invite me anymore")	8.44 ± 3.33	0.85	0.941*	−0.056
AADs (1, "Very;" 3, "Some;" 5, "Not at all")	39.59 ± 13.47	0.91		
Item F (total) ("How worried would you be about what your friends would think if you did your diabetes care in this situation?")	12.95 ± 5.806	0.83	0.255	0.495*
Item G (total) ("How easy would it be for you to do your self-care in this situation?")	14.15 ± 5.63	0.88	−0.085	0.902*
Item I (total) ("How likely is it that you would do your diabetes care in this situation?")	12.40 ± 5.24	0.88	−0.055	0.668*

Data are means ± SD, unless otherwise indicated. *Retained on factor.

AAD ($r = 0.52$, $P < 0.0001$) and no direct relationship with metabolic control ($r = 0.01$, $P = 0.90$). Similarly, AAD was positively correlated with diabetes-related distress ($r = 0.40$, $P < 0.0001$) and not related directly to metabolic control ($r = 0.096$, $P = 0.39$). These results provide evidence of criterion validity, since these relationships are in the magnitude and direction that are theoretically expected (12). Furthermore, the corrected item-total correlations (NAFR [means ± SD] 0.56 ± 0.12, AAD 0.57 ± 0.07) and interitem correlations (NAFR 0.34 ± 0.17, AAD 0.36 ± 0.14) provided strong evidence for both content and construct validity (12) of the NAFR and AAD scales (12).

Hypothesis testing

In light of the preliminary evidence for the validity and reliability of the friend attribution questionnaire, the hypothesized model was evaluated using path analysis. Although similar to multiple regression, there are several benefits to testing models via path analysis. These benefits include the ability to: *1*) simultaneously estimate the significance of both direct and indirect relationships, *2*) obtain estimates corrected for variables with nonnormal distributions, and *3*) determine the adequacy of the model using goodness-of-fit statistics. This study's sample size ($n = 102$) and cases-to-measure ratio (~13:1) exceeds standard recommendations for path analysis of 5–10 cases per measure (13,14).

The hypothesized model was tested using robust maximum-likelihood estimation method in LISREL 8.54 (15) and goodness-of-fit indexes; all suggested an excellent fit between the model and the data. As predicted, NAFRs and AADs had significant indirect effects on metabolic control through the variable diabetes-related stress. As hypothesized, a significant indirect relationship between NAFRs and diabetes-related stress was found through the intermediary variable of AADs. However, contrary to the hypothesis, NAFRs did not have a direct effect on diabetes-related stress ($t = 0.97$, $P > 0.05$). For parsimony, the structural model was tested again fixing the path between NAFRs and diabetes-related stress to zero, resulting in even better fit statistics. This model accounted for 27% of the variance in AAD, 16% for diabetes-related distress, and 11% of the variance of metabolic control. This final model with standardized estimates is presented in Fig. 1, with the indirect relationships indicated with a dashed line. Additional details regarding the model and the goodness-of-fit statistics can be obtained from A.A.H.

CONCLUSIONS — The purpose of this study was to examine the relationships among NAFRs within a social context, AADs, diabetes stress, and metabolic control. The results suggest that adolescents with type 1 diabetes who make negative attributions about expected friend reactions to their self-care efforts are more likely to anticipate adherence difficulties. In addition, these AADs are associated with increased diabetes-related stress, which in turn is related to poorer metabolic control.

Adolescent concerns about friend reactions in this study cannot be accounted for by nondisclosure of disease status. Most of the participants had told many of their friends. This finding has important clinical implications. Even though past research has found that friends provide valuable support for adolescents with type 1 diabetes (4), some adolescents are still apprehensive about friend reactions to their adherence behaviors, which increase the risk of nonadherence. This study did not address whether the participants had a history of negative experiences with their friends over diabetes self-care efforts or in general. Future research should address whether adolescents prone to negative attributions about their friends have received social sanctions from friends for past adherence behavior. Given previous research that has shown evidence of friend support for adolescents with diabetes (4), it seems unlikely that there was a pattern of negative friend reactions in this sample.

With regard to the psychometric

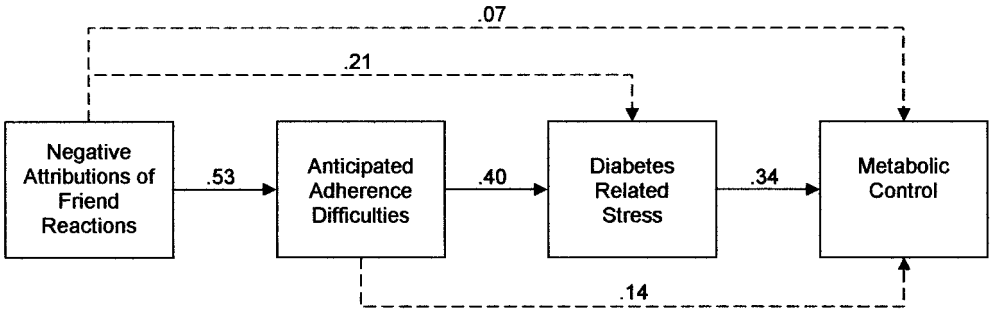

Figure 1—*Final path model with standardized estimates. Indirect effects are indicated with a dashed line (all paths are significant at* $P < 0.05$*).*

properties of the Friend Attribution Questionnaire, results obtained from the exploratory factor analysis are promising, as the factor structure, reliability coefficients, and preliminary estimates of validity provide strong evidence for the utility of this measure. Lastly, as with all measurement models, the stability is in question until validated using additional various samples.

This study has several limitations. First, given the cross-sectional design of the study, causal relationships cannot be specified. Also, the adolescent responses to the presented vignettes may not have provided a reflection of their actual behavior in social situations. Adolescent or parent report of attributions and behavior in real social situations may provide some confirmatory evidence to the role of NAFRs. In addition, the results were based entirely on self-report. Finally, the sample was comprised primarily of European-American youth (89%), which limits the generalizability of the findings.

The social information–processing model of adjustment offers a helpful framework for understanding the impact of NAFRs on adherence efforts and diabetes-related stress. The results of this study indicate that adolescents who expect negative reactions from friends to self-care behaviors likely find self-care more difficult and experience more feelings of stress. While the impact of NAFRs on actual adherence behavior was not directly assessed in this study, the role of such cognitive activity in the development of maladaptive behavioral and emotional patterns has been established (7). It is not difficult to imagine NAFRs directly hampering self-care efforts in social situations.

The model presented here suggests that adolescents' negative attributions likely create problems with adherence that are caused primarily by their own thoughts and beliefs. The finding that negative friend reactions are unlikely (4) creates a clinical paradox. Adolescents who neglect self-care behaviors because of expectations of negative reactions from friends increase their risk of complications and prevent their friends from providing positive support. It becomes an important clinical task, then, to assess each adolescent's attributions about self-care while with friends. Attempts to challenge and correct misperceptions in this area combined with arming adolescents with specific strategies to test out their attributions in relatively "safe" ways may yield significant gains in the consistency of self-management. In some cases, the attributions may be so firmly held that a referral to a psychologist skilled in cognitive behavioral psychotherapy is indicated.

Cognitive behavioral psychotherapy posits that individuals respond primarily to cognitive representations of a situation, rather than to the situation itself (7). Therapists work with clients to identify and monitor negative cognitive processes and develop learning experiences to remediate these cognitive processes to promote desired behavioral and emotional change. Cognitive-behavioral interventions have shown a varying degree of success in decreasing emotional distress (16) and improving adherence behavior of adolescents with type 1 diabetes (17). Further attempts at developing and refining cognitive behavioral interventions to address negative attributions would benefit from more systematically considering the contexts of adherence difficulties.

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