Pathways From Emotional Adjustment to Glycemic Control in Youths With Diabetes in Hong Kong

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Objective: To examine factors that influence emotional adjustment, adherence to diabetic care, and glycemic control in Hong Kong youths with insulin-dependent diabetes mellitus (IDDM).

Methods: Seventy youths, their mothers, and matched controls provided information on health beliefs, authoritarian parenting style, parent-child conflict, emotional adjustment, and adherence to medical regimen. Glycosylated hemoglobin levels were obtained to measure glycemic control.

Results: Predictors explained 34% of the variance in emotional adjustment and 39% of the variance in glycemic control. The data supported a pathway from emotional adjustment to self-efficacy to adherence behaviors to glycemic control. In contrast to Western culture and consistent with prediction, parenting style did not associate with negative outcomes, and even relatively low levels of parent-child conflict correlated negatively with emotional adjustment in this culture.

Conclusions: Management of conflict and self-efficacy enhancing interactions are suggested interventions to enhance adherence to diabetic care in Hong Kong youths with IDDM.

Key words: childhood diabetes; glycemic control; Hong Kong; emotional adjustment.

This article presents an investigation of factors that influence emotional adjustment, adherence to diabetic care, and glycemic control in a group of 70 Hong Kong Chinese youths with insulin-dependent diabetes mellitus (IDDM) and their mothers. The variables investigated were health beliefs, family style, and parent-child conflict. These factors have been found to influence emotional and health outcomes in Western samples. The study had two primary aims, both related to current gaps in the literature. The first aim was to examine risk variables for emotional distress in the Hong Kong Chinese pediatric diabetes population. Much of what is known about adjustment to chronic illness in youths is based on information from Western samples. The second aim was to investigate the pathway from emotional adjustment to glycemic control. Whereas it has been documented that non-adherent youths show emotional and behavioral problems (e.g., Kovacs, Goldston, Obrosky, & Iyengar, 1992), there is less information about how
such effects occur. Such information would be particularly useful in designing interventions to maximize the emotional and health status of young people with diabetes.

Numerous factors have been associated with adjustment of the patient with diabetes in particular (see, e.g., Johnson, 1995) and pediatric patients with chronic illness in general (see, e.g., Eiser, 1990; Wallander & Varni, 1998). The variables assessed, health beliefs, parenting styles, parent-child conflict, were chosen with two guiding principles in mind. Variables that might be moderated by cultural differences between the West and Hong Kong in their influence on emotional adjustment were of particular interest. A second guideline was that predictors be amenable to clinical intervention.

Variables

Health Beliefs

The health belief model (Becker, 1974) has contributed to the understanding of compliance with health care and medical recommendations (La Greca & Schuman, 1995). Self-efficacy, or the individual’s belief that he or she has the ability to follow health care recommendations, has been found to relate positively with adherence in Western studies of youths with diabetes (Littlefield et al., 1992). The association of locus of control beliefs and emotional adjustment in a culture where the supernatural and “luck” are given important roles as sources of influence is of theoretical interest. We predicted that chance beliefs would relate negatively to adjustment in both the diabetic and non-health-impaired samples. Furthermore, we predicted that internal locus of control would associate with self-efficacy, as the belief that health is influenceable would logically associate with the belief that one is actually effective in influencing one’s own health. We also predicted that beliefs that powerful others (physicians and health care personnel) have the key to improving health will improve adherence behaviors.

Parenting and Family Styles

In the Western developmental literature, authoritative parental style has been linked with various positive outcomes (Steinberg, Dornbusch, & Brown, 1992). An essential component of this style is a negotiating and compromising attitude on the part of the parents, with children given a voice in decision making. In contrast, the authoritarian style involves a rigid, power assertive attitude and has been associated with negative outcomes in the West. In studies of Chinese-American and other Asian groups in the West, the authoritarian family style has been noted as common (Steinberg et al., 1992). Furthermore, it has been noted that in contrast to Western teenagers, Asian teenagers do not show negative outcomes in at least some areas of function in the presence of authoritarian parenting (Leung, Lau, & Lam, 1998; Steinberg et al., 1992). In line with these studies with similar populations, we predicted that authoritarian family structure would not have a negative effect on the emotional adjustment of Hong Kong Chinese youths.

Parent-Child Conflict

In Western theories of adolescence, parent-child conflict has been seen as normative and related to the task of gaining autonomy from parents (Steinberg, 1990). Parent-child conflict is present with lower frequency and intensity in Chinese families with adolescents than in Western families (Yau & Smetana, 1996). Numerous investigations have found an inverse relationship between family conflict and youngsters’ treatment adherence (Friedman & Litt, 1987; Hauser et al., 1990). We therefore hypothesized that in a culture where obedience is emphasized and autonomy from parents not recognized as an important developmental task, conflict between young people and their parents will relate to negative emotional adjustment not just in patients with diabetes but also in non-health-impaired controls.

Perceptions of conflict and family style have generally been obtained from the offspring (Steinberg et al., 1992; Yau & Smetana, 1996). We obtained information from mothers and offspring, allowing examination of disparities and differential influences on outcomes.

Glycemic Control and Adherence to Medical Regimen

Stabilizing control over blood glucose levels in diabetes requires adherence to a complex regimen of glucose monitoring, insulin injections, diet, and ex-
ercise. A decline in insulin sensitivity accompanies puberty (Bloch, Clemens, & Sperling, 1987). An additional reason for poor glycemic control in adolescents compared to children is nonadherence. Maximizing adherence to diabetes regimens is an important goal for most treatment programs.

Models of the Relationships Among Predictors, Adherence, and Glycemic Control

The literature has emphasized theory-driven research (Wallander & Varni, 1998) and the importance of assessing critical intervening variables in developing models (Johnson, 1995). Of particular interest in this study was the pathway from emotional adjustment to disease control, two variables that have been linked in the pediatric chronic illness literature. Predictors were restricted to measures derived from the patients themselves, because simple causal pathways were more appropriate in this first study in this culture. An additional practical concern was that sample size restrictions did not allow for a complex multivariate model to be tested with adequate power.

The variables studied were organized into a logical causal model as follows. Certain of the measures were predicted as influencing emotional adjustment: parent-child conflict, chance locus of control, and duration of disease (Hanson, Cigrang, et al., 1989). We also included gender, because there is some evidence of differences between girls and boys in their emotional response to development of diabetes (Ryan & Morrow, 1986). In Hong Kong (Stewart et al., 1999), as in the West, postpubertal girls show more symptoms of emotional distress than do boys. Although gender differences have not been emphasized in the compliance literature in the West, there is more gender differentiation in Hong Kong than in most Western cultures (Cheung, 1996). We predicted that emotional adjustment in turn would influence glycemic control in several steps. First, well-adjusted youths would be more likely to have a greater sense of self-efficacy. Higher self-efficacy would lead to better adherence. We predicted that self-efficacy would be the mediator of emotional adjustment’s effects on adherence. Finally, with better adherence, glycemic control would be higher. In addition to this pathway from emotional adjustment to glycemic control, we hypothesized that self-efficacy would also be influenced by internal locus of control. Adherence would also be affected by belief in powerful others’ ability to influence good health. Finally, we predicted that pubertal status (Bloch et al., 1987) would exercise a direct effect on glycemic control.

Method

Participants

This study includes 70 patients with IDDM and their mothers, and a parallel age- and gender-matched set of non-health-impaired control mother-offspring pairs. Patients with diabetes were recruited during a clinic visit from four pediatric endocrinology clinics in Hong Kong where they are being followed. Inclusion criteria were: age 9 to 21 years and availability of mother (or the primary caretaker if mother was not living in the home). Exclusion criteria were concurrent primary diagnoses such as Cooley’s anemia or significant sensory impairment. Of patients who met eligibility requirements, only two were not included in the sample as their parent refused participation. Control families were recruited from the rolls of a government dental clinic and selected to match the participants with diabetes in age and gender on a case-by-case basis. Exclusion criteria for control participants were presence of chronic illness or sensory handicap. Approximately twice as many families had to be contacted as agreed to participate. The study was not conducted during a scheduled clinic visit, and the major reason given for refusal was inconvenience. There were no gender or age differences between those who agreed and those who refused participation. No other information was available, so the possibility of a bias in the group that served as controls in this study is acknowledged. All participants were assured of the confidentiality of the data, and forms were coded for anonymity. Approval was obtained from the university ethics committee. Signed informed consent was obtained from patients and parents.

The samples consisted of 33 boys and 37 girls in each group. The average age was 15 years and 1 month for both patients with diabetes and 15 years and 2 months for control patients. The average grade placement for diabetic patients was 8.5, and for control patients 8.6. Eighty-three percent of fathers and 91% of mothers of diabetic patients had no more than a secondary school education, and
24% of fathers and 29% of mothers had not studied beyond primary school. The sample was largely lower to middle class, as would be expected from their attendance at government-funded public clinics. Patients with diabetes and controls were approximately equivalent (p value for difference > .05) for age, grade placement, mothers’ and fathers’ education, birthplace, family structure, number of people in household, birth order, and whether they lived in private or public housing.

Physicians provided information regarding co-existing disease and pubertal stage (Tanner’s stages graded from I to V). Table I presents descriptive information on the diabetes patients.

**Measures**

All measures were administered in Chinese. Two bilingual individuals translated those forms that did not exist in Chinese translation, using a forward-backward translation procedure. All youths completed the forms independently with the research assistant available to clarify questions. Mothers were offered the option for independent completion versus support with reading the questions.

**Glycemic Control.** Glycosylated hemoglobin ($\text{HbA}_1c$) levels are routinely obtained in each clinic. All levels obtained in the 12 months prior to the participation were included. Multiple $\text{HbA}_1c$ measures were highly correlated (Cronbach’s alpha coefficient = .92); therefore the average score was used as the measure. Values were converted for pooling as follows. The mean $\text{HbA}_1c$ value was subtracted from the high value of the normal range (high values ranged from 5.9% to 6.5%), and the result divided by the high value and multiplied by 100. The scores reported thus reflect percentage above the normal range adjusted for each laboratory.

**Adherence.** In line with the emphasis in the literature on assessing adherence behaviors and glycemic control separately, and using multidimensional instruments to assess adherence (Glasgow & Anderson, 1995; Johnson, 1995), a scale (Littlefield et al., 1992) covering the different aspects of the diabetes regimen was used. These aspects were regular blood glucose testing, keeping blood glucose at the recommended level, taking insulin shots on schedule, following diet plan, exercising, treating a reaction, and remembering to do everything every day. Patients rated their adherence to these different aspects of the diabetes regimen by giving themselves grades on each care behavior from 0 to 100 (substituted for letter grades). This scale was found to have good internal consistency in our sample ($\alpha = .85$). The average was computed across the seven areas and used as the measure of adherence. This measure was obtained only from patients.

**Emotional Adjustment.** Emotional adjustment was assessed by the General Health Questionnaire (GHQ). A questionnaire designed to assess emotional adjustment in youths with chronic illness would have been ideal; however, there is not one available that has been validated for use with the Hong Kong population. A 12-item short form of the GHQ has been adapted for use in Hong Kong (Lee, Lam, Ong, Wang, & Kleevens, 1985). High scores indicate poor adaptation. Internal consistency was found to be adequate for patients and control subjects ($\alpha = .75$ and .78, respectively).

**Health Beliefs.** The Multidimensional Health Locus of Control (MHLOC) (Wallston, Wallston, & DeVellis, 1978) is an 18-item instrument that provides scores for internal, chance, and powerful others as determinants of health status and has been translated into Chinese (Chan, 1997). For patients with diabetes, the questions were reworded to reflect control over diabetes. Parallel measures were obtained from mothers and offspring. However, mothers were asked to describe their beliefs about control over their offspring’s health. Chance locus of control beliefs showed good internal consistency for mothers and youths in both diabetes and control groups ($\alpha$ ranged from .71 to .88). The alphas for powerful others and internal scales, respectively, were as follows: diabetic patients: .64, .44; mothers of diabetic

<table>
<thead>
<tr>
<th>Table I. Descriptive Data on Patients with Diabetes</th>
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<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Age of onset</td>
</tr>
<tr>
<td>Duration of disease</td>
</tr>
<tr>
<td>Number of daily injections</td>
</tr>
<tr>
<td>Number of daily glucose checks</td>
</tr>
<tr>
<td>Number of hypoglycemic episodes in last month</td>
</tr>
<tr>
<td>Number of diabetes-related hospitalizations in last year</td>
</tr>
<tr>
<td>$\text{HbA}_1c$ (% above high value of normal range)</td>
</tr>
<tr>
<td>Diabetes adherence</td>
</tr>
<tr>
<td>Diabetes self-efficacy</td>
</tr>
<tr>
<td>Pubertal status (n in each Tanner stage)</td>
</tr>
</tbody>
</table>

*Note:* All numbers are rounded to two decimal places.
on these scales, and of the authoritarian and democratic constructs, this finding is not unexpected. For example, the item “Parents make all the important decisions in the family” is intended to be part of the authoritarian scale as conceptualized by Bloom. It is quite expected that it would correlate negatively with the democratic family scale that includes the item “In our family, parents do not check with children before making important decisions” (reverse scored in the Bloom’s democratic scale). For this reason, a single scale was extracted. Seven items emerged as loading on a single factor. The alpha coefficients for this scale were .63 and .65 for patients with diabetes and their mothers, respectively. For the control group and mothers, the alphas were .62 and .57.

### Results

#### Differences Between Participants With Diabetes and Controls

Table II presents the means and standard deviations for the main variables of the study, for participants with diabetes and controls. Participants with diabetes differed significantly from their age- and gender-matched controls on locus of control beliefs ($t$ ranging from 2.91–6.85 [66], $p < .005$), with the patients reporting higher powerful other and internal, and lower chance locus of control than the controls. Mothers of youths with diabetes showed a similar pattern relative to control mothers ($t$ ranging from 3.4–5.16 [66], $p < .001$). Within families, offspring reported lower powerful others ($t = 2.37$ and 3.98 [66], $p < .02$) and higher internal locus of control ($t = 2.49$ and 2.52 [66], $p < .01$) than controls.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Families of Diabetic Patients</th>
<th>Control Families</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children</td>
<td>Mothers</td>
</tr>
<tr>
<td>Frequency of conflict</td>
<td>2.34, 0.52</td>
<td>2.35, 0.59</td>
</tr>
<tr>
<td>Intensity of conflict $^{a,b}$</td>
<td>1.58, 0.70</td>
<td>1.50, 0.81</td>
</tr>
<tr>
<td>Authoritarian family function</td>
<td>2.18, 0.46</td>
<td>2.19, 0.43</td>
</tr>
<tr>
<td>Locus of control—powerful others</td>
<td>4.10, 0.73</td>
<td>4.50, 0.57</td>
</tr>
<tr>
<td>Locus of control—chance $^{c}$</td>
<td>2.31, 0.66</td>
<td>2.29, 0.72</td>
</tr>
<tr>
<td>Locus of control—internal $^{c}$</td>
<td>4.54, 0.58</td>
<td>4.23, 0.85</td>
</tr>
<tr>
<td>General Health Questionnaires (GHQ)</td>
<td>2.00, 0.44</td>
<td>NA</td>
</tr>
</tbody>
</table>

$^{a}$Mothers significantly different from each other.
$^{b}$Offspring and mothers in control families significantly different from each other.
$^{c}$Offspring significantly ($p < .05$) different from each other.
$^{d}$Offspring and mothers in families with a diabetic child significantly different from each other.

Self-Efficacy. Patients with diabetes indicated their beliefs about their own ability to follow each of the seven adherence prescriptions using a scale from 1 to 100 (Littlefield et al., 1992). The alpha coefficient for the seven-item scale was .90.

Parent-Offspring Conflict. Conflict was measured by a scale covering nine domains of disagreement and asking both offspring and their mothers to rate the frequency (on a scale from “1, very rarely” to “5, very frequently”) and severity (from “1, very mild” to “5, very severe”) of the conflict between child and parents. Eight of the domains have been found to be salient in a previous study with a Hong Kong sample (Yau & Smetana, 1996). Disagreement about child’s health was included as the ninth domain. The scales showed Cronbach reliability alphas from .73 to .79 for frequency and from .76 to .84 for severity of conflict in this sample. Frequency and intensity of conflict were highly correlated ($r$ ranging from .82 to .90) for youths with diabetes, control participants, and both sets of mothers. They were averaged to obtain one conflict score for multivariate analyses.

Authoritarian Family Function. Ten items from the Self-Report Measures of Family Function (Bloom, 1985) were completed by patients, controls, and their mothers. These items were grouped by Bloom into two scales, democratic and authoritarian function. As these scales have not been previously used in Hong Kong, the items were subjected to a principal components factor analysis with oblimin rotation, with two scales extracted. The two scales showed significant overlap of items, with signs reversed for loading on the two separate factors. Given the complementarity of many of the items on these scales, and of the authoritarian and democratic constructs, this finding is not unexpected. For example, the item “Parents make all the important decisions in the family” is intended to be part of the authoritarian scale as conceptualized by Bloom. It is quite expected that it would correlate negatively with the democratic family scale that includes the item “In our family, parents do not check with children before making important decisions” (reverse scored in the Bloom’s democratic scale). For this reason, a single scale was extracted. Seven items emerged as loading on a single factor. The alpha coefficients for this scale were .63 and .65 for patients with diabetes and their mothers, respectively. For the control group and mothers, the alphas were .62 and .57.
mothers. Mothers of patients with diabetes reported more intense conflict than did control mothers (\(t = 2.46\) [66], \(p = .02\)).

### Bivariate Correlations Among Health and Emotional Outcomes and Predictors

Table III presents the bivariate correlations of predictors to emotional adjustment, adherence, and glycemic control. Almost none of the mothers’ measures showed significant association to their offsprings’ emotional adjustment, adherence, or glycemic control. One exception was that in the control group, mothers’ chance locus of control associated with offsprings’ emotional adjustment (\(r = -.33\), \(p = .006\)). In addition, internal locus of control measures obtained from mothers of diabetic patients in relation to their offsprings’ illness associated negatively with HbA1c (\(r = .25\), \(p = .04\)). An association was also predicted between internal locus of control and self-efficacy. The correlation was nonsignificant (\(r = .00\), \(p = .99\)).

### Constructing a Model to Predict Glycemic Control

Causal modeling utilizing path analyses and multiple regression (Munro & Page, 1993) was used to test the model described in the introduction, linking predictors to emotional adjustment, and emotional adjustment to adherence through the mediating agency of self-efficacy, and finally adherence to metabolic control. The model was tested in four steps. All variables in the earlier steps were included to test later steps (Munro & Page, 1993). Table IV presents the results of the analyses at each step. At step 1, emotional adjustment was regressed on predictors. At step 2, internal locus of control was included. At step 3, internal locus of control was included at step 3 to predict adherence. Pubertal status was added at step 4.

Gender was a significant predictor of emotional adjustment; boys showed better adjustment than did girls. Gender also showed direct effects on adherence at step 3, with boys reporting better adherence than girls.

The revised model consistent with these analyses is presented as Figure 1, showing the significant pathways from the regression equations rerun following trimming of the model. Thirty-nine percent of the variance in glycemic control was predicted by this model, \(F(8, 61) = 4.80\), \(p = .0001\).

Whereas numerous indirect paths were charted, one goal of our study was to elucidate the mechanisms of the effect of emotional adjustment on adherence. We hypothesized that the association between emotional adjustment and adherence was mediated by self-efficacy. The criteria for mediation (Baron & Kenny, 1986) were met as follows: (1) the predictor of emotional adjustment correlated with the proposed mediator of self-efficacy (Table III); (2) self-efficacy correlated with the outcome of adherence (Table III); and (3) when self-efficacy was included in the equation, the previously significant relationship between emotional adjustment and adherence became nonsignificant (Table IV, step 3).

### Discussion

This study investigated disease-related and psychosocial influences on emotional adjustment and
and intensity ($r = .14$ and $.04$, $p > .05$) of conflict was poor. We are not aware of Western data on rates of congruence of parents’ and children’s perceptions of conflict, although there is literature to suggest that lack of congruence with regard to family processes is typical of dysfunctional families (Olson et al., 1983). In Chinese families there is a strong sanction against the expression of negative affect (Wu, 1996), which may contribute to the lack of agreement in perceptions.

Parent-child conflict is particularly common during the teenage years, where a majority of the participants in this study fall. Developmental theory (e.g., Steinberg, 1990) gives conflict a normative place, relating it to the offspring’s achievement of autonomy from parents. While intense and persistent conflict is expected to have a negative and long-term effect on both offspring and parent emotional adjustment, such concerns have not been previously expressed relative to low levels of conflict. It is notable that in the families of patients with diabetes, the level of conflict from the youth’s perspective was equivalent to that of a nonclinic age- and gender-matched set of control families. The association between conflict and adjustment is also present in control families. In Chinese culture, where obedience to parents is emphasized, harmonious family function is valued, and independence from parents is not an explicit goal, conflict may be particularly disruptive.

To further explore the association between conflict and emotional adjustment, we inquired whether patients and mothers showed congruence in their ratings of conflict. We found that in families of both diabetic patients and controls, the congruence between mothers and children with regard to frequency ($r = 11$ and $-.02$, respectively, for families with and without a child with diabetes, $p > .05$) and intensity ($r = .14$ and $.04$, $p > .05$) of conflict was poor. We are not aware of Western data on rates of congruence of parents’ and children’s perceptions of conflict, although there is literature to suggest that lack of congruence with regard to family processes is typical of dysfunctional families (Olson et al., 1983). In Chinese families there is a strong sanction against the expression of negative affect (Wu, 1996), which may contribute to the lack of agreement in perceptions.

The association between chance locus of control and emotional adjustment in both patients and controls has some implication for the universality of the psychological importance of having control. Even in a culture where supernatural beliefs are common, absence of control associates with distress. These findings are consistent with those of a study of Hong Kong adults with nasopharyngeal cancer (Sun & Stewart, in press), which found that chance locus of control associated positively with glycemic control in youths with diabetes in Hong Kong. Our findings contribute to the literature by elucidating a pathway from emotional adjustment to glycemic control through the agency of self-efficacy and adherence (Figure 1). In addition, the findings suggest intervention strategies to improve glycemic control in young people with diabetes.

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Table IV. Multiple Regression Analyses for Path Model of Effects from Predictors to Glycemic Control

<table>
<thead>
<tr>
<th>Step and Dependent Variable:</th>
<th>Variables Showing Significant Prediction</th>
<th>Regression Coefficient, $T$, $p$</th>
<th>$R^2$, $F(df)$, $p$ for step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: GHQ$^a$</td>
<td>Gender</td>
<td>$-.23$, $2.22$, $.03$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration of illness</td>
<td>$-.29$, $2.69$, $.009$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chance locus of control</td>
<td>$-.33$, $3.13$, $.003$</td>
<td>$.33$, $7.78 (4,65)$,.0001</td>
</tr>
<tr>
<td>Step 2: self-efficacy</td>
<td>Chance locus of control</td>
<td>$-.26$, $-2.59$, $.01$</td>
<td></td>
</tr>
<tr>
<td>Step 3: adherence</td>
<td>GHQ$^a$</td>
<td>$.38$, $2.65$, $.01$</td>
<td>$.12$, $1.52 (6,63)$, NS</td>
</tr>
<tr>
<td></td>
<td>Chance locus of control</td>
<td>$-.26$, $-2.59$, $.01$</td>
<td></td>
</tr>
<tr>
<td>Step 4: HbA$_1c$, $^b$</td>
<td>Chance locus of control</td>
<td>$.61$, $6.30$, $.0001$</td>
<td>$.51$, $7.80 (8,61)$,.0001</td>
</tr>
<tr>
<td></td>
<td>Pubertal stage</td>
<td>$.25$, $2.15$, $.04$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration of illness</td>
<td>$.25$, $2.11$, $.04$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adherence</td>
<td>$-.48$, $-3.34$, $.002$</td>
<td>$.39$, $3.73 (10,59)$,.0006</td>
</tr>
</tbody>
</table>

$^a$High scores indicate poor adjustment.
$^b$High scores indicate poor control.

Figure 1. Revised model showing direct and indirect effects on glycemic control. Glycemic control is inverse to HbA$_1c$ levels. Emotional adjustment is inverse to GHQ level.
depression. In the same study, however, also reported was the finding that internal locus of control has strong positive association with emotional adjustment. Low reliability of the internal locus of control scale in this sample may well have contributed to low sensitivity in detecting associations. Furthermore, multicollinearity might have obscured the relationships among some of the locus of control variables and outcomes in the multivariate predictions. However, contradictory evidence regarding the relationship between internal beliefs and disease management in the pediatric population has been reported in Western studies as well (La Greca & Schuman, 1995).

Boys were better than girls were at adhering to their diabetes regimen. There is a parallel difference in glycemic control and girls have significantly higher HbA1c levels, suggesting that these findings are not a reflection simply of greater truthfulness among girls than boys. This finding, though not prospectively hypothesized, was not surprising to the clinicians in our group. Girls have been observed to have more difficulty with separating themselves from peer activities, which can interfere with the demands of the diabetic regimen. Further studies examining the specific barriers girls face in managing their regimens would be worthwhile.

Duration of disease exerted direct effects on glycemic control. The mediators of this effect are unknown. Duration of illness has been found in other investigations (Hanson, Henggeler, Harris, Burghen, & Moore, 1989) to relate to glycemic control and to have a complex relationship with other variables, particularly family cohesion and adaptation, in predicting glycemic control. Coping styles have also been found to associate with duration (Hanson, Cigrang, et al., 1989), such that older adolescents with longer duration of illness show less effective coping styles. These associated variables were not measured here and may present as confounding factors in the relationship observed.

As shown in Figure 1, our data emphasize the need for assessment and promotion of emotional adjustment even when the medical professional's primary interest is in disease management. Girls with diabetes in Hong Kong appear to be at higher risk for emotional and adherence difficulties. Family counseling for conflict management would be a worthwhile proactive effort at time of diagnosis. Frank discussion regarding conflict between mothers and children may enhance their shared reality regarding levels of conflict. Increasing mothers' awareness of their own role in their child's distress may also have positive effects.

The association between self-efficacy and adherence has implications for health professionals. Relatively simple techniques can be incorporated into routine care to enhance patients' sense of efficacy. Examples of such techniques include initial setting of realistic goals, reassurance with regard to (or "normalization") of early difficulties in smooth management, and a problem-solving approach in reviewing patient "diaries."

Our sample included a wide developmental range. Some of the variables we examined may well change in level over the life span. Family function may become more democratic as youths mature. Parent-child conflict levels have been shown to fluctuate with age in nonclinical Western families, with an increase in early adolescence, and a decrease after about age 18 (Papalia & Olds, 1992). In exploratory analyses, we examined whether the central variables of this study correlated with age and found that older youths with diabetes reported less authoritarian parenting (r = -.34). None of the other variables showed age-related linear changes in families of youths with diabetes. The association among these variables may also change. Authoritarian styles may be more age-atypical for older teenagers and therefore be more likely to contribute to conflict and distress. Conflict with parents may decrease in importance as late adolescents form important attachments outside the family. In our study, authoritarian family function did not associate significantly with adaptation in younger (below age 18) or older (18 year and above) participants. On the contrary, youths over age 18 showed an even stronger association between conflict with parents and emotional adjustment (r = .62, p = .004) than did participants below age 18 years (r = .33, p = .01). Adolescents with chronic illness face many complications around issues of individuation (Anderson & Coyne, 1993). All participants with diabetes, for example, were still living at home. These post-hoc analyses raise questions about age-related complexities in parent-child interactions in families of youths with diabetes in Hong Kong. These questions cannot be adequately explored with our sample size and age distribution but should be addressed in future studies.

This study has several limitations. The sample size is relatively small, precluding exploration of interaction effects. The findings cannot be generalized to patients from the private health care sector. Ad-
coherence was measured by self-report with no independent observer ratings. The data were obtained in a cross-sectional methodology; longitudinal data would allow for tests of the causal model proposed. Mothers were included; however, family influences and perceptions are not restricted to those from mothers. The absence of findings in relation to maternal influences may reflect the importance of fathers and siblings in parental and family influences in this strongly family-oriented culture. The majority of the instruments used were designed in the West. As might be expected, some of the measures had relatively weak coherence in this culture, increasing the possibility of Type I error. Internal locus of control and family function may be better detected by a different set of questions than those on our imported instruments. Future qualitative investigations are recommended to derive measures that may be more culturally accurate.

Despite these shortcomings, our study presents an initial examination of emotional adjustment, adherence with diabetes regimen, and glycemic control in a sample of Hong Kong youths. In summary, this study adds to the present literature by expanding investigations into non-Western cultures and addressing the culture-general nature of some of the relationships that have been found in Western studies. Further, the data support a model linking emotional adjustment to glycemic control through the mediating agency of self-efficacy to adherence, which then has a direct effect on glycemic control. The data and the model presented in this study suggest that interventions designed to decrease parent-child conflict and increase patients' self-efficacy may improve adherence to diabetic regimens and glycemic control.

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