

Decision-Making Competence and Adherence to Treatment in Adolescents with Diabetes

Victoria A. Miller,¹ PhD, and Dennis Drotar,² PhD

¹Department of Psychology, Case Western Reserve University and ²Case Western Reserve University School of Medicine and Rainbow Babies and Children's Hospital

Objective To examine decision-making competence (the ability to form effective plans for managing different situations) in a sample of adolescents with type I diabetes and their parents. We hypothesized that adolescent decision-making competence would mediate the relationship between parent–adolescent communication and adherence to treatment. **Methods** The sample consisted of 63 adolescents and their parents. Parent–adolescent communication during a problem-solving task was assessed, as well as adolescent maladaptive decision-making (adolescent report), adherence to treatment (parent and provider report; number of glucose tests), and metabolic control (HbA1C). **Results** Parent–adolescent communication was associated with adherence to treatment but not with adolescent decision-making. Poorer decision-making was associated with lower adherence per parent report but not provider report or the number of glucose tests. Decision-making competence did not mediate the relationships between parent–adolescent communication and adherence. **Conclusions** These results are consistent with prior research demonstrating associations between parent–adolescent communication and adherence and identify adolescent decision-making competence as another potentially important correlate of adherence. These findings highlight several areas for future research.

Key words adherence; decision-making; parent–adolescent communication; type I diabetes.

An important goal of adolescence is the development of decision-making skills, especially because adolescents' increasing autonomy requires that they make more decisions on their own (Miller & Byrnes, 2001). Decision-making competence is defined as the ability or capacity to form flexible and effective plans for managing different situations in the midst of pursuing one's goals (Miller & Byrnes, 2001; Schlundt, Flannery, David, Kinzer, & Pichert, 1999). Unlike problem-solving, which requires identifying an adequate solution to a problem, decision-making requires making a choice among competing courses of action and often occurs under conditions of uncertainty (Beyth-Marom, Fischhoff, Quadrel, & Furby, 1991). The components of effective decision-making include setting a goal, identifying and evaluating

options, implementing the selected course of action, and evaluating the consequences of the decision (Byrnes, 2005; Klaczynski, Byrnes, & Jacobs, 2001). For children and adolescents, decision-making autonomy and competence develop gradually and involve taking on increased responsibility for making decisions previously made by parents (Dornbusch et al., 1985; Steinberg & Silverberg, 1986). Prior research suggests that decision-making competence is greater during older adolescence and for domains in which adolescents have the most experience (Mann, Harmoni, & Power, 1989). However, adolescents may assume decision-making autonomy before they have the requisite skills to make decisions effectively. On the contrary, adolescents may have the ability to make competent decisions, but parents may not allow

All correspondence concerning this article should be addressed to Victoria A. Miller, Center for Research Integrity, The Children's Hospital of Philadelphia, CHOP North Room 1514, 34th Street and Civic Center Boulevard, Philadelphia, Pennsylvania 19104. E-mail: millerv@email.chop.edu.

Journal of Pediatric Psychology 32(2) pp. 178–188, 2007

doi:10.1093/jpepsy/jsj122

Advance Access publication May 22, 2006

Journal of Pediatric Psychology vol. 32 no. 2 © The Author 2006. Published by Oxford University Press on behalf of the Society of Pediatric Psychology. All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

increased autonomy, regardless of the adolescents' decision-making skills.

Adolescent decision-making competence has far-reaching consequences for many life contexts, including those related to the management of a chronic illness such as type I diabetes. Children and adolescents with type I diabetes must monitor their symptoms, test their blood under the appropriate circumstances (e.g., when certain symptoms are present), and make adjustments in diet, physical activity, and insulin doses to maintain optimal glucose levels (Seiffge-Krenke, 2002; Wysocki & Greco, 1997). Thus, the management of type I diabetes necessitates an ongoing series of decisions that must be carried out on a daily basis by adolescents and their parents (Palmer et al., 2004). For example, if the adolescent with diabetes develops a headache, he or she must decide how likely it is that the headache reflects a blood sugar reaction and make a decision about the best course of action (e.g., wait, test blood to determine blood sugar level, eat something, or consult a parent). As parents become less involved in diabetes management across adolescence, adolescents assume greater responsibility for making such decisions (Palmer et al.). However, these increases in adolescent autonomy for diabetes management are often accompanied by poorer diabetes outcomes (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997; Palmer et al., 2004; Wysocki et al., 1996).

The way in which adolescents make decisions about diabetes management may be associated with their adherence to the treatment regimen for diabetes, which typically worsens during adolescence (Kovacs, Obrosky, Goldston, & Drash, 1997; Miller-Johnson et al., 1994; Reid, Dubow, Carey, & Dura, 1994). Such problems with adherence may have clinically significant consequences on adolescents' abilities to sustain adequate metabolic control, which has been shown to be important in preventing the long-term complications of diabetes (DCCT Research Group, 1993). To our knowledge, adolescent decision-making competence has not been examined in previous research with adolescents with diabetes, despite its potential to yield scientifically important and clinically useful information for health care professionals who provide services to this population, as well as adolescents with other chronic health conditions. The present study examined decision-making competence in a sample of adolescents with type I diabetes. Our first hypothesis was that adolescent decision-making competence would be associated with adherence to the diabetes treatment regimen.

In addition to the neglect of the role of decision-making competence in the management of chronic illness,

the factors that influence adolescent decision-making competence have not been well documented. Given the powerful role of the family as a socializing agent in the development of children and adolescents (Conger & Petersen, 1984), family influences on decision-making are potentially important. The primary theoretical model that guided this study is social learning theory, which predicts that in the context of family discussions, adolescents learn what family members consider when making decisions, the consequences of different decisions, and the communication skills that are necessary to negotiate and influence decisions (Liprie, 1993; White, 1996; Wills, Blechman, & McNamara, 1996). In addition, adolescent participation in family decision-making may foster participatory learning, the development of critical thinking skills, and active practice in decision-making (Liprie, 1993). Prior empirical work has demonstrated that effective parent-adolescent communication is associated with better decision-making competence in physically healthy adolescents (Brown & Mann, 1990). Prior studies have also demonstrated relationships between mothers' and female adolescents' decision-making competence (Brown & Mann, 1991) as well as between parent conflict resolution skills and adolescent decision-making competence (Brown & Mann, 1990). These studies provide preliminary support for the causal influence of family communication on adolescent decision-making, via modeling and reinforced practice. Thus, drawing on social learning theory and prior research, our second hypothesis was that parent-adolescent communication would be associated with better decision-making competence in adolescents with diabetes.

In addition to their potential influence on adolescent decision-making skills, family factors are important for disease management in children and adolescents with a chronic illness (Kazak, Rourke, & Crump, 2003). For example, effective parent-adolescent communication has been shown to be associated with better adherence to treatment in adolescents with diabetes (Bobrow, AvRuskin, & Siller, 1985; Wysocki, 1993). In addition, prior research has demonstrated that communication may facilitate parental provision of diabetes-related support to adolescents (Hanna, Juarez, Lenss, & Guthrie, 2003). Thus, our third hypothesis was that parent-adolescent communication would be associated with adherence to treatment in this study.

In sum, our proposed model integrates findings from developmental research (Brown & Mann, 1990; Liprie, 1993; White, 1996; Wills et al., 1996) and research with pediatric populations (Bobrow et al.,

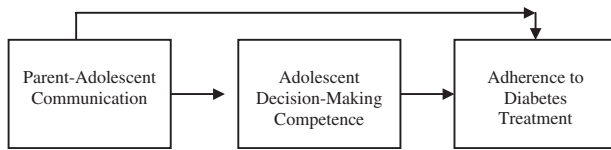


Figure 1. Proposed relationships between parent-adolescent communication, adolescent decision-making competence, and adherence to treatment.

1985; Wysocki, 1993) and describes the relationships between parent-adolescent communication, adolescent decision-making competence, and adherence to diabetes treatment (Fig. 1). The model hypothesizes a positive relationship between adolescent decision-making competence and adherence. That is, children who have effective decision-making skills will be better able to manage daily treatment tasks and barriers to adherence (e.g., when social activities interfere with the diabetes treatment regimen). This hypothesis is based on the assumption that decision-making competence relates to relevant behaviors (Schlundt et al., 1999), such as carrying out aspects of diabetes treatment. Second, the model hypothesizes that more effective parent-adolescent communication will be associated with better adolescent decision-making competence. This hypothesis is based on social learning theory as well as on prior research with physically healthy adolescents (Brown & Mann, 1990). Third, the model hypothesizes that more effective parent-adolescent communication will be related to better adolescent adherence to treatment (Bobrow et al., 1985; Wysocki, 1993). Finally, the model proposes an explanation of *how* parent-adolescent communication relates to adherence in adolescents with diabetes. Our fourth hypothesis was that decision-making competence would be the key factor by which family communication exerts an influence on adherence to treatment (e.g., mediation). We also examined metabolic control as a potential correlate of both parent-adolescent communication and adolescent decision-making competence. The factors that influence metabolic control of type I diabetes are important to identify because of the potential long-term physiological complications of poor metabolic control (DCCT Research Group, 1993).

Methods

Participants

Participants were recruited from an endocrinology clinic in a tertiary children's hospital. Inclusion criteria included that the adolescent was between the ages of 11

and 17 years and had a diagnosis of type I diabetes for at least 1 year, and the parent had to identify themselves as either "most involved" or "equally involved" in the adolescent's diabetes care compared with the other parent (if applicable). Families were excluded if the adolescent had another major chronic health condition requiring daily treatment or if the adolescent had a developmental delay.

Of the original 347 families who were sent letters, 198 families could be reached by telephone. Of those contacted, 23 were not eligible to participate, and 105 (53%) refused to participate because of the lack of time or interest. Sixty-three parent-adolescent dyads (36% of eligible contacted participants) completed the study procedures. Participants were equivalent to those who were contacted but declined to participate in terms of gender but were slightly younger than nonparticipants, $t(176) = -2.94, p < .004$.

The final sample of adolescents consisted of 34 males (54%) and 29 females (46%) between the ages of 11 and 17 years ($M 13.3, SD \pm 1.77$). The majority of adolescent participants were Caucasians ($n = 55, 87%$); seven (11%) participants were African Americans; and one (2%) was "other." Adolescents had a diagnosis of type I diabetes for an average of 5.76 years ($SD \pm 3.64$, range 1–13). A minority of adolescents in the present sample used an insulin pump ($n = 7, 11%$). The average HbA1C value for the present sample indicated slightly less than adequate glucose control over the previous 3–4 months ($M 8.63, SD \pm 1.35$, range 6.4–12.4). This is comparable to the clinic population from which the sample was drawn and is also similar or slightly better than other samples of adolescents with diabetes in prior research (Anderson et al., 1997; Hanson, De Guire, Schinkel, & Kolterman, 1995). Parent participants consisted of 55 mothers and 8 fathers. Parents were primarily married ($n = 51, 81%$), held a college or graduate degree ($n = 26, 40%$), and tended to be middle-to-upper-middle class.

Measures

In addition to a demographic questionnaire, we assessed parent-adolescent communication, adolescent decision-making competence, and adherence to treatment.

Demographics

A background information form was completed by parents and was used to collect information about the adolescent (age, gender, grade, race, and duration of illness), the parent, and the family (age, marital status, family composition, occupation, education, and income).

Parent–Adolescent Communication

A standard problem-solving task was used to obtain a communication sample, which was audiotaped and coded to assess parent–adolescent communication. Our own observations, as well as prior reports, suggest that most families forget that they are being observed and that behavior during interaction tasks is rated as similar to what occurs at home (Carlson, Gesten, McIver, DeClue, & Malone, 1994). Before the task, parents and adolescents independently completed the 17-item version (Steinberg, 1987) of the Issues Checklist (Robin & Foster, 1989) and the 15-item Diabetes-Specific Conflict Questionnaire (Saletsky, 1991). These two questionnaires were used to determine which topics would be discussed during the problem-solving task. Topics with moderate-to-high frequency and intensity ratings were chosen by the study personnel for discussion—one for a general adolescent issue (e.g., chores) and the other for a diabetes-specific issue (e.g., glucose testing). This procedure has been used successfully in samples of adolescents with diabetes and their parents (Carlson et al., 1994). For each of the two issues, parents and adolescents were told to present their respective points of view and to come toward a mutually satisfactory solution. They were given no further instructions about the interaction, such as who should initiate the discussion. The order of the discussion tasks for the general issue and diabetes-specific issue was alternated across participants to decrease sequencing effects. The investigator or research assistant left the room, and discussions were timed and audiotaped. Families were given 10 min to discuss each issue. Findings related to communication during the diabetes problem-solving task are reported in this study.

The Interaction Behavior Code (IBC) was used to code negative and positive communication during the problem-solving task (Robin & Foster, 1989). Observational measures of family functioning are superior to self-report measures because they are more accurate and less likely to reflect respondent bias (Robin & Foster). Seven items on the IBC reflect positive communication behaviors and include stating the other's opinion, making suggestions, and praising. Twenty-five items on the IBC reflect negative behaviors and include threatening, criticizing, and disregarding the other person's points. Twenty-two items are rated either *yes* or *no* depending on whether or not each communication behavior occurred during the interaction sample for each participant. Ten items are scored on a 3-point scale (*no*, *a little*, or *a lot*). Points were summed for the negative and positive items, yielding a total negative score and total positive score for each participant.

Using the coding of the principal investigator as the criterion, the coders were trained to >80% agreement across each item for the communication samples of five participants before they independently coded the samples. A subset of 14 participants was used to compute the final reliability for each coder based on the parent and adolescent total scores for negative and positive communication. Interrater reliability was assessed using the intraclass correlation coefficient (ICC) for continuous data. The ICCs (range .74–.98) indicated acceptable interrater reliability. The validity of the IBC was established in prior research (Prinz & Kent, 1978).

Decision-Making Competence

The Melbourne Decision-Making Questionnaire (MDMQ) is a modified version of the original Flinders Decision-Making Questionnaire and is based on the Janis and Mann conflict theory of decision-making (Mann, Burnett, Radford, & Ford, 1997). This model of decision-making specifies the steps involved in competent decision-making, which include an examination of goals, options, facts relating to each alternative, and the effects of each alternative. When faced with a decision, the decision maker can respond in various ways, which will influence the degree to which the decision maker engages in the steps of competent decision-making. The MDMQ measures the way in which the decision maker responds to decision-making (e.g., making an impulsive decision and procrastinating), which will influence the degree to which the decision maker's goals are achieved.

The MDMQ consists of 22 items that measure both competent and maladaptive decision-making and was completed by adolescents. The vigilance subscale reflects competent decision-making (e.g., "I like to consider all the alternatives."), whereas the three other subscales (hypervigilance, buck-passing, and procrastination) reflect maladaptive decision-making (e.g., "I waste a lot of time on trivial matters before getting to the final decision."). The respondent rates each item on a 4-point scale ranging from *not at all true* to *almost always true*. Prior research suggests that the MDMQ is a valid measure of decision-making competence. For example, in a sample of university students, a factor analysis supported the four subscales of the MDMQ (Mann et al., 1997). In addition, scores correlated significantly with decision behaviors in a sample of physically healthy university students (Burnett, Mann, & Beswick, 1989) and was sensitive to treatment changes following a course on decision-making skills for high school students (Mann, Harmoni, Power, Beswick, & Ormond, 1988). On the basis of the original Flinders Adolescent Decision-Making

Questionnaire, higher levels of maladaptive decision-making and lower levels of vigilant decision-making were associated with worse performance on a hypothetical decision-making scenario (Ormond, Luszcz, Mann, & Beswick, 1991).

Although prior research documented coefficient α s ranging from .74 to .87 (Mann et al., 1997), the α s in the present sample were .64 for vigilance, .56 for procrastination, .72 for hypervigilance, and .75 for buck-passing. The inclusion of younger adolescents, who tend to give less reliable responses (Thompson, Berenson, & Butcher, 1987), may explain the lower α in our sample. However, we used a conservative α cutoff score of .70 (Murphy & Davidshofer, 1998) and employed only the hypervigilance and buck-passing subscales in the present analyses. Hypervigilant decision-making is characterized by feeling pessimistic about finding a good solution, feeling under time pressure, and swinging abruptly in decision-making preference because of the concern that something will go wrong. Buck-passing is characterized by avoiding making decisions and leaving decisions to others.

Adherence

Parents and adolescents completed the Self-Care Inventory (SCI) (Greco et al., 1990), which measures adherence to 14 diabetes tasks over the past month. Each task is rated on a 5-point scale ranging from *never do it* to *always do this as recommended without fail*. Previous research has demonstrated adequate internal consistency for adolescent report (.76–.86) and mother report (.81–.83) (Miller & Drotar, 2003; Wysocki et al., 2000). In this study, the coefficient α was .66 for adolescent report and .70 for parent report. As with the MDMQ, we utilized a recommended α criterion of .70 (Murphy & Davidshofer, 1998) and excluded adolescent report on the SCI from the present analyses. The SCI is associated with the 24-hr recall interview method (Greco et al., 1990), suggesting that it is a valid measure of adherence.

Each child's diabetes health care provider, either a clinical nurse specialist or an endocrinologist, completed the 9-item Health Care Provider Rating questionnaire, which assesses the degree to which the child and his/her family have been adherent to nine aspects of diabetes care. This questionnaire was based on a description of an 8-item adherence measure used by La Greca, Follansbee, and Skyler (1990). One item was added ("testing ketones") to reflect the importance of this task in the diabetes treatment regimen. The coefficient α was acceptable (.85) in the present sample. Validity was established in prior research (La Greca et al., 1990).

Each adolescent's medical chart was reviewed to obtain the average number of glucose tests performed

each day over the previous 2 weeks, which is recorded in the adolescent's glucose meter. When more tests were performed each day, adolescents were considered more adherent to the diabetes treatment regimen. Each adolescent's current glycosolated hemoglobin (HbA1C), which provides information about average blood glucose values over the previous 3–4 months, was also obtained.

Procedure

The study was approved by the institutional review board. Physicians were informed of the study and gave their consent for parents to be contacted. Letters were sent informing potential participants about the study, and a follow-up telephone call was made to determine eligibility and willingness to participate. If they agreed, families were met by study personnel at the child's regular clinic visit. After obtaining consent from the parent, assent was obtained from the adolescent. The parent and the adolescent independently completed the questionnaires and then engaged in the audiotaped problem-solving task. Families were compensated \$25 after the completion of the study.

Results

Data Analytic Plan

Pearson's product-moment and Spearman's rho correlations were used to test hypotheses 1–3. To test for mediation, we followed the guidelines described by Baron and Kenny (1986) and Holmbeck (1997) (described below).

Descriptive Findings

Descriptive data (*M*, *SD*, *Mdn*, and range) for all variables are presented in Table I. Table II presents bivariate correlations among the variables.

Table I. Descriptive Data

| Variable | <i>M</i> ± <i>SD</i> | <i>Mdn</i> (range) |
|-----------------------------------|----------------------|--------------------|
| Communication variables | | |
| Parent positive communication | 3.46 ± 1.82 | 4.00 (0–7.00) |
| Parent negative communication | 0.90 ± 2.04 | 0.00 (0–10.00) |
| Adolescent positive communication | 1.11 ± 1.38 | 1.00 (0–5.00) |
| Adolescent negative communication | 1.98 ± 2.29 | 1.00 (0–11.00) |
| Decision-making variables | | |
| Adolescent hypervigilance | 6.13 ± 3.31 | 6.00 (0–15.00) |
| Adolescent buck-passing | 4.00 ± 2.68 | 3.00 (0–15.00) |
| Adherence variables | | |
| Parent report of adherence | 3.72 ± 0.56 | 3.69 (2.23–4.86) |
| Provider report of adherence | 3.25 ± 0.53 | 3.44 (1.89–4.00) |
| Number of glucose tests per day | 2.77 ± 0.85 | 2.79 (0.50–4.93) |
| HbA1C | 8.63 ± 1.35 | 8.55 (6.40–12.40) |

Table II. Bivariate Correlations

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------------------|-------|-------|--------|------|--------|------|---------|---------|--------|
| 1. Parent negative communication | – | | | | | | | | |
| 2. Parent positive communication | –.03 | – | | | | | | | |
| 3. Adolescent negative communication | .39** | –.03 | – | | | | | | |
| 4. Adolescent positive communication | .20 | .43** | –.13 | – | | | | | |
| 5. Adolescent hypervigilance | –.02 | .05 | .03 | .03 | – | | | | |
| 6. Adolescent buck-passing | .00 | .09 | .14 | –.04 | .50*** | – | | | |
| 7. Parent report of adherence | –.23 | .23 | –.28* | .10 | –.33** | –.19 | – | | |
| 8. Provider report of adherence | –.29* | .34** | –.26* | .10 | –.02 | .05 | .56*** | – | |
| 9. Glucose tests per day | –.24 | .40** | .04 | .19 | –.22 | –.03 | .39** | .38** | – |
| 10. HbA1C | .08 | –.18 | .29*** | .07 | .15 | .19 | –.54*** | –.62*** | –.36** |

Note: Coefficients using the following variables are based on Spearman's rho correlations: parent negative communication, adolescent negative communication, adolescent positive communication, and adolescent buck-passing. The remaining coefficients are based on Pearson's product-moment correlations.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Relationships Between Decision-Making and Adherence

The first hypothesis was that higher levels of adolescent hypervigilance and buck-passing would be associated with lower adherence. As predicted, higher levels of adolescent hypervigilance were associated with lower parent report of adherence ($r = -.33$, $p < .01$). Adolescent hypervigilance was not associated with provider report of adherence or glucose tests per day, and adolescent buck-passing was not associated with any of the adherence variables.

Relationships Between Communication and Decision-Making

The second hypothesis was that lower levels of positive communication and higher levels of negative communication would be associated with higher levels of adolescent hypervigilance and buck-passing. None of the parent-adolescent communication variables were associated with adolescent hypervigilance or buck-passing.

Relationships Between Communication and Adherence

The third hypothesis was that lower levels of positive communication and higher levels of negative communication would be associated with lower levels of adherence. As predicted, lower levels of parent positive communication were associated with lower provider report of adherence ($r = .34$, $p < .01$) and fewer glucose tests ($r = .40$, $p = .002$). Higher levels of parent negative communication were associated with lower provider report of adherence ($r = -.29$, $p = .022$). Higher levels of adolescent negative communication were associated with lower parent report of adherence ($r = -.28$, $p < .03$) and lower provider report of adherence ($r = -.26$, $p < .04$). Adolescent positive communication was not associated with adherence.

Relationships Between Communication, Decision-Making, and Metabolic Control

Higher levels of adolescent negative communication were associated with higher HbA1C values ($r = .29$, $p < .03$), indicating worse metabolic control. Adolescent positive, parent negative, and parent positive communication were not associated with adolescent HbA1C values, nor was adolescent decision-making competence.

Decision-Making as a Mediating Variable

To determine whether decision-making competence mediated the relationship between parent-adolescent communication and adherence, we must ensure that four conditions are met, as described by Baron and Kenny (1986) and Holmbeck (1997): (a) the independent variable (IV; parent-adolescent communication) must be associated with the mediator (adolescent decision-making); (b) the IV must be associated with the dependent variable (DV; adherence); (c) the mediator must be associated with the DV; and (d) the effect of the IV on the DV must be less after controlling for the mediator. The results of the analyses that tested hypotheses 1–3 were the tests of these three conditions. On the basis of these results, there were no potential mediational pathways, primarily because parent-adolescent communication was not associated with adolescent decision-making competence.

Discussion

This study extends prior research by examining a potential mechanism underlying the relationship between parent-adolescent communication and adherence to treatment that has been found in prior research (Bobrow et al., 1985; Wysocki, 1993). In addition, this study was the first to our knowledge to examine the relationship

between decision-making competence and adherence to treatment in a sample of children or adolescents with a chronic illness.

Consistent with prior research, higher levels of parent positive communication were associated with better adherence to diabetes treatment. In addition, lower levels of both parent and adolescent negative communication were related to improved adherence. This set of findings is consistent with social learning theory (White, 1996). When family communication is negative, adolescents are more likely to observe a family decision-making process characterized by pessimism, failure to take responsibility, and the inability to consider alternate perspectives. In this context, allocations of responsibility for diabetes decision-making may be unclear, making successful management of diabetes difficult to achieve. Moreover, negative communication may engender strong affect and disrupt the quality of family problem-solving. For example, Carlson et al. (1994) demonstrated that negative statements made during a family problem-solving task were associated with increased problem-solving difficulty in families of children with diabetes.

Another potential explanation for the relationship between parent-adolescent communication and adherence is that adolescents may be less likely to seek help from their parents when communication is negative (Pianta & Harbers, 1996). A failure to seek help when necessary may limit the opportunities for adolescents to engage in joint decision-making with parents, which has been associated with positive psychological adjustment in various domains in samples of physically healthy adolescents (Dornbusch et al., 1985; Dornbusch, Ritter, Mont-Reynaud, & Chen, 1990). Joint decision-making is likely to precede full adolescent autonomy for diabetes-related issues (Dornbusch et al., 1985) and has been identified as a significant component of diabetes management in prior research (Anderson et al., 1997; Wiebe et al., 2005). In addition, joint decision-making may be crucial for the development of diabetes self-management skills in adolescents.

The hypothesis that parent-adolescent communication would be associated with adolescent decision-making competence was not supported, which is inconsistent with prior research (Brown & Mann, 1990). One possible explanation for this inconsistency is related to the limited variability of several variables in the present study. For example, the majority of parents and adolescents demonstrated low levels of negativity, and the majority of adolescents demonstrated low levels of buck-passing. This restriction of range can limit the power to detect associations, particularly

when effect sizes are small. In addition, this study utilized an observational method for the assessment of parent-adolescent communication. In contrast, Brown and Mann utilized adolescent self-report questionnaires for the measurement of both parent-adolescent communication and adolescent decision-making competence. It is possible that the significant associations found in that study were the result of shared method variance involved in the use of a single method of data collection. In that sense, the results of the present study may represent a more accurate picture of the constructs under examination.

The hypothesis that adolescent decision-making would be associated with adherence to treatment was partially supported. The results demonstrated that adolescent hypervigilant decision-making predicted worse adherence to treatment according to parent report. A style of decision-making that is characterized by pessimism and indecisiveness may render the adolescent ineffective in making decisions about diabetes care, especially if the adolescent feels that the outcome will be negative regardless of what he or she decides. The end result may be that diabetes tasks do not get completed in a timely manner or at all.

Adolescent hypervigilance was not associated with provider report of adherence or number of glucose tests per day, and adolescent buck-passing was not associated with any of the adherence variables. One potential explanation for the lack of consistency in the relationships between adolescent decision-making and adherence is that self-reports of decision-making competence may not reflect what adolescents actually do in real-world settings, when faced with psychosocial factors such as peer influence and stress (Steinberg & Scott, 2003). That is, it is possible for an adolescent to possess competent decision-making skills but fail to apply these skills in family and medical care contexts in such a way that adequate adherence is achieved. A related explanation is that decision-making style is specific to the context of the decision that has to be made. The present study utilized a questionnaire consisting of generic questions about how the respondent typically responds to decisions, but this measure may not reflect the processes involved in diabetes-related decisions. For example, diabetes-related decisions must be made on a daily basis, carry additional emotional significance compared with other types of decisions, and may have both short-term and long-term health consequences. It is possible that adolescents approach these decisions differently than they do other types of issues (e.g., academics and peer difficulties).

This study has several limitations. One limitation of the study is its lack of generalizability to older adolescents,

ethnic minority families, and adolescents from lower-income families. Additional research is necessary to determine whether parent–adolescent communication, decision-making competence, and adherence operate in a similar way in these groups of adolescents. Moreover, there were limitations in the assessment of decision-making competence, which should be addressed in future research. The MDMQ assesses the respondent’s generic approach to decision-making and demonstrated somewhat low reliability for several subscales, which were not included in the present analyses. However, the internal consistency of the two subscales used in this study was adequate, and preliminary evidence of the validity of the measure in this population is suggested by the associations between adolescent hypervigilance and adherence to treatment according to parent report. Therefore, these findings are an important first step in the evolution of our knowledge base related to the role of decision-making in the management of chronic illness. An additional measurement limitation in this study is our use of the SCI, which was developed 15 years ago and may not reflect contemporary trends in diabetes management (e.g., for adolescents on intensive insulin regimens or insulin pumps).

Although the findings from our study do not support every aspect of our proposed model, there are still important clinical implications of our findings. For example, consistent with prior research (Bobrow et al., 1985; Wysocki, 1993), parent–adolescent communication was associated with adolescent adherence to the diabetes treatment regimen in the present study. Parent–adolescent communication has been addressed in previous intervention studies with adolescents with diabetes. For example, Wysocki et al. (2000) utilized Behavioral-Family Systems Therapy (BFST) in a sample of adolescents with diabetes and their families. Adolescents in the BFST group demonstrated improved parent–adolescent relationships and decreased diabetes-related conflict. However, there were no improvements in adherence to treatment. The authors suggested that improvement in adherence may require that BFST sessions specifically target each family’s unique barriers to treatment adherence. Interventions that aim at improving joint decision-making around diabetes-related issues may also have a positive impact on diabetes-related outcomes. For example, an intervention aimed at maintaining parent–child teamwork around diabetes-related tasks prevented the worsening of metabolic control that was seen in the control group after 1 year (Laffel et al., 2003). However, the development of interventions that specifically target adolescent decision-making skills may be premature,

given the lack of consistency in the findings related to decision-making competence and diabetes-related outcomes in the present study.

The findings of this study also suggest several areas for future investigation. One area for future research involves the development of better methods for assessing adolescent decision-making competence, including observational methods and the use of parent ratings of adolescent decision-making. For example, prior research related to the competence of children to provide informed consent has utilized both hypothetical (Weithorn & Campbell, 1982) and actual (Ambuel & Rappaport, 1992) decision-making scenarios to assess the extent to which children follow the steps of competent decision-making. Direct observation of children’s decision-making skills may be more reflective of how children approach decisions in their day-to-day lives compared with self-reports of decision-making style. In addition, future research should develop measures to assess decision-making competence with respect to diabetes-specific issues, which may differ from other types of decisions faced by adolescents. Future studies should also consider the use of more recently developed measures of adherence such as the Diabetes Self-Management Profile, which incorporates recent advances in diabetes treatment (Harris et al., 2000).

Finally, future research should employ larger samples so that potential moderating variables can be more fully explored. For example, prior research has demonstrated that the duration of illness moderates the association between family relationships and adherence to diabetes treatment, such that the relationship is stronger as the duration of illness lengthens (Hanson et al., 1995). Similarly, developmental variables such as age or the level of autonomy might affect the degree to which adolescent decision-making competence is associated with adherence, such that decision-making competence is associated with adherence only for older adolescents or for adolescents with higher levels of autonomy for diabetes management tasks. It is also possible that decision-making competence is associated with adherence to treatment only when diabetes-related knowledge is high. Decision-making skills in the absence of such knowledge may not lead to successful management of the diabetes treatment regimen. Both variables should be included in future research related to decision-making competence in adolescents with diabetes.

Given the importance of increasing autonomy during adolescence and the impact of decision-making competence in various life domains, the role of decision-making competence in the self-management of diabetes is potentially

important. Overall, the results from this study provide preliminary support for the relationship between adolescent decision-making competence and adherence to treatment and confirm prior research on the relationship between family functioning and adherence to treatment. These findings represent an important first step in elucidating the role of decision-making in the management of chronic illness during childhood and adolescence.

Acknowledgments

This work was supported by NIMH 18830-17. We thank William Dahms, Paul McGuigan, Carol Meszaros, and Wendy Campbell for their support throughout this project and Lindsey Godwin, Angelica Marino, and Stacey Simon for their help with recruitment and data entry. We also thank Richard Ittenbach for statistical guidance and the anonymous reviewers for their helpful feedback on earlier versions of this manuscript.

This article is based on the dissertation thesis of the first author.

Received August 25, 2005; revisions received December 9, 2005 and March 31, 2006; accepted April 12, 2006

References

- Ambuel, B., & Rappaport, J. (1992). Developmental trends in adolescents' psychological and legal competence to consent to abortion. *Law and Human Behavior, 16*(2), 129–154.
- Anderson, B., Ho, J., Brackett, J., Finkelstein, D., & Laffel, L. (1997). Parental involvement in diabetes management tasks: Relationships to blood glucose monitoring adherence and metabolic control in young adolescents with insulin-dependent diabetes mellitus. *Journal of Pediatrics, 130*(2), 257–265.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.
- Beyth-Marom, R., Fischhoff, B., Quadrel, M. J., & Furby, L. (1991). Teaching decision making to adolescents: A critical review. In J. Baron & R. V. Brown (Eds.), *Teaching decision making to adolescents* (pp. 19–59). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bobrow, E., AvRuskin, T., & Siller, J. (1985). Mother-daughter interaction and adherence to diabetes regimens. *Diabetes Care, 8*(2), 146–151.
- Brown, J., & Mann, L. (1990). The relationship between family structure and process variables and adolescent decision making. *Journal of Adolescence, 13*, 25–37.
- Brown, J., & Mann, L. (1991). Decision-making competence and self-esteem: A comparison of parents and adolescents. *Journal of Adolescence, 14*, 363–371.
- Burnett, P. C., Mann, L., & Beswick, G. (1989). Validation of the Flinders Decision Making Questionnaire on course decision making by students. *Australian Psychologist, 24*(2), 285–292.
- Byrnes, J. P. (2005). The development of self-regulated decision making. In J. E. Jacobs & P. A. Klaczynski (Eds.), *The development of judgment and decision making in children and adolescents* (pp. 5–38). Mahwah, NJ: Lawrence Erlbaum Associates.
- Carlson, K., Gesten, E., McIver, L., DeClue, T., & Malone, J. (1994). Problem solving and adjustment in families of children with diabetes. *Children's Health Care, 23*(3), 193–210.
- Conger, J., & Petersen, A. (1984). *Adolescence and youth* (3rd ed.). New York: Harper & Row.
- DCCT Research Group. (1993). The effect of intensive diabetes treatment on the development and progression of long-term complications of insulin-dependent diabetes mellitus: The Diabetes Control and Complications Trial. *New England Journal of Medicine, 329*, 977–986.
- Dornbusch, S. M., Carlsmith, J. M., Bushwell, S., Ritter, P. L., Leiderman, P. H., Hastorf, A. H., et al. (1985). Single parents, extended households, and the control of adolescents. *Child Development, 56*, 326–341.
- Dornbusch, S. M., Ritter, P. L., Mont-Reynaud, R., & Chen, Z. Y. (1990). Family decision making and academic performance in a diverse high school population. *Journal of Adolescent Research, 5*, 143–160.
- Greco, P., La Greca, A., Ireland, S., Wick, P., Freeman, C., Agramonte, R., et al. (1990). Assessing adherence in IDDM: A comparison of two methods [Abstract]. *Diabetes, 39*(Suppl. 1), 108A.
- Hanna, K. M., Juarez, B., Lenss, S. S., & Guthrie, D. (2003). Parent-adolescent communication and support for diabetes management as reported by adolescents with type I diabetes. *Issues in Comprehensive Pediatric Nursing, 26*, 145–158.
- Hanson, C., De Guire, M., Schinkel, A., & Kolterman, O. (1995). Empirical validation for a family-centered model of care. *Diabetes Care, 18*(10), 1347–1356.
- Harris, M. A., Wysocki, T., Sadler, M., Wilkinson, K., Harvey, L. M., Buckloh, L. M., et al. (2000). Validation of a structured interview for the assessment of diabetes self-management. *Diabetes Care, 23*, 1301–1304.

- Holmbeck, G. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599–610.
- Kazak, A. E., Rourke, M. T., & Crump, T. A. (2003). Families and other systems in pediatric psychology. In M. C. Roberts (Eds.), *Handbook of pediatric psychology* (pp. 159–175). New York: Guilford.
- Klaczynski, P. A., Byrnes, J. P., & Jacobs, J. E. (2001). Introduction to the special issue: The development of decision making. *Applied Developmental Psychology, 22*, 225–236.
- Kovacs, M., Obrosky, D. S., Goldston, D., & Drash, A. (1997). Major depressive disorder in youths with IDDM: A controlled prospective study of course and outcome. *Diabetes Care, 20*, 45–51.
- La Greca, A., Follansbee, D., & Skyler, J. (1990). Developmental and behavioral aspects of diabetes management in youngsters. *Children's Health Care, 19*(3), 132–139.
- Laffel, L. M., Vangsness, L., Connell, A., Goebel-Fabbri, A., Butler, D., & Anderson, B. J. (2003). Impact of ambulatory, family-focused teamwork intervention on glycemic control in youth with type I diabetes. *Journal of Pediatrics, 142*, 409–416.
- Liprie, M. L. (1993). Adolescents' contributions to family decision making. *Marriage and Family Review, 18*, 241–253.
- Mann, L., Burnett, P., Radford, M., & Ford, S. (1997). The Melbourne Decision Making Questionnaire: An instrument for measuring patterns for coping with decisional conflict. *Journal of Behavioral Decision Making, 10*, 1–19.
- Mann, L., Harmoni, R., & Power, C. (1989). Adolescent decision-making: The development of competence. *Journal of Adolescence, 12*, 265–278.
- Mann, L., Harmoni, R., Power, C., Beswick, G., & Ormond, C. (1988). Effectiveness of the GOFER course in decision making for high school students. *Journal of Behavioral Decision Making, 1*, 159–168.
- Miller, D. C., & Byrnes, J. P. (2001). To achieve or not to achieve: A self-regulation perspective on adolescents' academic decision making. *Journal of Educational Psychology, 93*(4), 677–685.
- Miller, V. A., & Drotar, D. (2003). Discrepancies between mother and adolescent perceptions of diabetes-related decision-making autonomy and their relationship to diabetes-related conflict and adherence to treatment. *Journal of Pediatric Psychology, 28*(4), 265–274.
- Miller-Johnson, S., Emery, R., Marvin, R., Clarke, W., Lovinger, R., & Martin, M. (1994). Parent-child relationships and the management of insulin-dependent diabetes mellitus. *Journal of Consulting and Clinical Psychology, 62*, 603–610.
- Murphy, K. R., & Davidshofer, C. O. (1998). *Psychological testing: Principles and applications* (5th ed.). Englewood Cliffs, NJ: Prentice Hall.
- Ormond, C., Luszcz, M. A., Mann, L., & Beswick, G. (1991). A metacognitive analysis of decision making in adolescence. *Journal of Adolescence, 14*, 275–291.
- Palmer, D. L., Berg, C. A., Wiebe, D. J., Beveridge, R. M., Korbel, C., & Upchurch, R. (2004). The role of autonomy and pubertal status in understanding age differences in maternal involvement in diabetes responsibility across adolescence. *Journal of Pediatric Psychology, 29*(1), 35–46.
- Pianta, R. C., & Harbers, K. L. (1996). Observing mother and child behavior in a problem-solving situation at school entry: Relations with academic achievement. *Journal of School Psychology, 34*, 307–322.
- Prinz, R. J., & Kent, R. N. (1978). Recording parent-adolescent interactions without the use of frequency or interval-by-interval coding. *Behavior Therapy, 9*, 602–604.
- Reid, G., Dubow, E., Carey, T., & Dura, J. (1994). Contribution of coping to medical adjustment and treatment responsibility among children and adolescents with diabetes. *Developmental and Behavioral Pediatrics, 15*(5), 327–335.
- Robin, A., & Foster, S. (1989). *Negotiating parent-adolescent conflict*. New York: The Guilford Press.
- Saletsky, R. (1991). Autonomy and mother-child relations in a sample of adolescents with insulin-dependent diabetes (Doctoral Dissertation, Case Western Reserve University, 1990). *Dissertation Abstracts International, 52*(2B), 1081–1082.
- Schlundt, D., Flannery, M. E., David, D., Kinzer, C., & Pichert, J. (1999). Evaluation of a multi-component, behaviorally oriented, problem-based “summer school” program for adolescents with diabetes. *Behavior Modification, 23*(1), 79–105.
- Seiffge-Krenke, I. (2002). “Come on, say something, Dad!” Communication and coping in fathers of diabetic adolescents. *Journal of Pediatric Psychology, 27*(5), 439–450.
- Steinberg, L. (1987). Impact of puberty on family relations: Effects of pubertal status and pubertal timing. *Developmental Psychology, 23*(3), 451–460.

- Steinberg, L., & Scott, E. S. (2003). Less guilty by reason of adolescence: Developmental immaturity, diminished responsibility, and the juvenile death penalty. *American Psychologist*, *58*(12), 1009–1018.
- Steinberg, L., & Silverberg, S. (1986). The vicissitudes of autonomy in early adolescence. *Child Development*, *57*, 841–851.
- Thompson, B., Butcher, A., & Berenson, G. (1987). Children's beliefs about sources of health: A reliability and validity study. *Measurement and Evaluation in Counseling and Development*, *20*(2), 80–88.
- Weithorn, L., & Campbell, S. (1982). The competency of children and adolescents to make informed treatment decisions. *Child Development*, *53*, 1589–1598.
- White, F. (1996). Parent–adolescent communication and adolescent decision-making. *Journal of Family Studies*, *2*(1), 41–56.
- Wiebe, D. J., Berg, C. A., Korbel, C., Palmer, D. L., Beveridge, R. M., Upchurch, R., et al. (2005). Children's appraisals of maternal involvement in coping with diabetes: Enhancing our understanding of adherence, metabolic control, and quality of life across adolescence. *Journal of Pediatric Psychology*, *30*(2), 167–178.
- Wills, T., Blechman, E., & McNamara, G. (1996). Family support, coping, and competence. In E. M. Hetherington & E. Blechman (Eds.), *Stress, coping, and resiliency in children and families* (pp. 107–133). Mahwah, NJ: Lawrence Erlbaum Associates.
- Wysocki, T. (1993). Associations among teen–parent relationships, metabolic control, and adjustment to diabetes in adolescents. *Journal of Pediatric Psychology*, *18*(4), 441–452.
- Wysocki, T., & Greco, P. (1997). Self-management of childhood diabetes in family context. In D. Gochman (Ed.), *Handbook of health behavior research II: Provider determinants* (pp. 169–187). New York: Plenum Press.
- Wysocki, T., Harris, M., Greco, P., Bubb, J., Danda, C., Harvey, L., et al. (2000). Randomized, controlled trial of behavior therapy for families of adolescents with insulin-dependent diabetes mellitus. *Journal of Pediatric Psychology*, *25*(1), 23–33.
- Wysocki, T., Taylor, A., Hough, B., Linscheid, T., Yeates, K., & Naglieri, J. (1996). Deviation from developmentally appropriate self-care autonomy. *Diabetes Care*, *19*(2), 119–125.