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The Mediating Role of Extreme Peer Orientation in the Relationships between Adolescent-Parent Relationship and Diabetes Management

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Abstract

The study examined whether the quality of the adolescent-parent relationship was associated with better diabetes management in adolescents with type 1 diabetes by decreasing adolescents' extreme peer orientation. Adolescents ($n=252$; 46% male and 54% female) aged 10-14 years with type 1 diabetes completed assessments of extreme peer orientation (i.e., tendency to ignore parental advice and diabetes care in order to fit in with friends), adolescent-parental relationship, and adherence; HbA1c scores indexed metabolic control. Adolescents with higher quality relationships with parents reported less peer orientation and better diabetes care. The mediational model revealed that adolescents' high quality relationships with their parents (mother and father) were associated with better treatment adherence and metabolic control through less peer orientation. It is likely that high quality adolescent-parent relationships may be beneficial to adolescent diabetes management through a healthy balance between peer and parental influence.

Keywords

Type 1 Diabetes; Extreme Peer Orientation; Parenting; Adolescent

Adolescents with type 1 diabetes struggle with the concerns and management of a serious chronic illness, while negotiating relationships with their peers and their parents. The transition into adolescence has been characterized by increased associations with peers, a decrease in parental influence and interactions (Berndt, 1979), and declines in metabolic control and treatment adherence (Jacobson, Hauser, Lavori, Wolfsdorf, Herskowitz, Milley, et al., 1990; Wysocki, 1993). High quality adolescent-parent relationships can facilitate positive peer relationships (e.g., Brendt, 1979; Brown, Mounts, Lamborn, & Steinberg, 1993), including better adherence and metabolic control (Miller-Johnson et al., 2004). These high quality relationships with mothers and fathers may affect health outcomes by decreasing adolescents' extreme peer orientation, primarily adolescents' willingness to sacrifice their healthy development in order to maintain their peer relationships (Fuligni & Eccles, 1993). The present study examined whether adolescents' perceptions of a high quality parental (mother and father)

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relationship (i.e., high parental acceptance, communication, and encouraging independence) were associated with better adherence and metabolic control through the mediational pathway of lower levels of extreme peer orientation.

Peer relationships are important throughout adolescence and can have both positive and negative effects (e.g., Brendgen, Vitaro, & Bukowski, 2000; Hartup, 1999; Vitaro, Tremblay, Kerr, Pagani, & Bukowski, 1997). Peers can exert a negative influence on day-to-day behaviors (Berndt, 1979) and on diabetes management, particularly if accommodating peers becomes more important to adolescents than managing their diabetes (Wyoscki & Greco, 2006). It is normal for adolescents to desire acceptance by peers, for those with diabetes, acceptance by peers without diabetes may be of additional importance (Youniss & Haynie, 1992). In an effort to facilitate peer relationships, adolescents may ignore parent's advice regarding appropriate self-care to manage their diabetes since they may regard themselves as invulnerable to the negative consequences of their behavior (Hanson, 1990).

Peer orientation can have varying effects on adolescent development depending on the level of peer orientation. Extreme peer orientation (EPO) differs from healthy and supportive relationships with friends (Fuligni & Eccles, 1993). Adolescents who exhibit the extreme form of peer orientation may excessively desire peer acceptance, and place greater importance on advice from peers than from parents (Devereux, 1970; Fuligni & Eccles, 1993; Fuligni, Eccles, Barber, & Clements, 2001; Steinberg, 1987; Jacobson et al., 1990). Such adolescents may violate parental rules about their diabetes care to maintain cohesion with their peers. For example, adolescents with diabetes who want to feel similar to their peers may have poorer dietary adherence when in the company of their peers (Delamater, Smith, Kurtz, White, 1988; Thomas, Peterson, & Goldstein, 1997). The direct relationship between EPO and diabetes management has not been explored. However, Hains and colleagues found adolescents with diabetes anticipated having difficulty adhering to their diabetes regimen and had worse HbA1c if they believed their friends would think negatively of their diabetes care (i.e., eating healthy food and administering insulin) (Hains, Berlin, Davies, Parton, & Alemzadeh, 2006; Hains et al., 2007). Adolescents with diabetes are likely similar to those without diabetes in their susceptibility to peer conformity, and their desire to be accepted and fit in, but the consequences can threaten their health if peer conformity disrupts diabetes management.

The degree of peer orientation (i.e., extreme peer orientation) displayed by adolescents is reflective of the adolescent-parent relationship (Fuligni & Eccles, 1993). The parental relationship although primarily desirable for overall positive development, might be a risk factor for greater involvement with peers and poor diabetes management. When parents are less accepting, non-communicative, and fail to encourage independence, early adolescents have greater involvement with peers and may become alienated from their parents (Devereux, 1970, Fuligni & Eccles, 1993; Fuligni et al, 2001). In contrast, high levels of acceptance and parental demonstrations of love and warmth are associated with greater adherence to parental rules and standards (Baumrind, 1991; Kim, Conger, Lorenz, & Elder, 2001; Lamborn, Mounts, Steinberg, & Dornbusch, 1991). Thus, when the adolescent-parent relationship lacks acceptance, open communication, and does not encourage independence, adolescents may become vulnerable to the risk of developing extreme peer orientation.

Previous research shows that parenting characteristics of acceptance, communication, and encouraging independence are associated with better adherence and metabolic control (Berg et al., 2008; La Greca, Follansbee, & Skyler, 1990; Miller-Johnson et al., 2002; Skinner, John, & Hampson, 2000; White, 1990; Wysocki et al., 1996; Wysocki, et al., 2000). The existing literature further suggests that adolescents who have poorer quality adolescent-parent relationships may be more oriented toward their peers (McCord, 1990). There is a paucity of information available regarding the role of peer orientation in adolescent diabetes management,

although it is plausible that peer orientation mediates associations between the quality of the adolescent-parent relationship and diabetes management. By understanding the processes through which the adolescent-parent relationship (mother and father) is associated with diabetes management, we may identify alternative interventions to promote the health of this vulnerable population.

The Present Study

The present study examined whether the association between a higher quality adolescent-parent relationship (i.e., higher acceptance, communication, and encouraging independence) and diabetes management is mediated by adolescent extreme peer orientation. The research explored whether extreme peer orientation (EPO) (1) was associated with treatment adherence and metabolic control, (2) occurred in the context of lower quality adolescent-parent relationships, and (3) mediated the association between adolescent-parent relationship quality and diabetes management (i.e., metabolic control and treatment adherence). We hypothesized that adolescents who are higher on EPO would have poorer metabolic control and treatment adherence. A second hypothesis was that high quality parenting by mothers and fathers, as demonstrated by acceptance, communication, and encouraging independence, would be associated with none or less peer orientation. Finally, we predicted that peer orientation would mediate the benefits of mother and father relationship quality on metabolic control and treatment adherence.

Method

Participants and Recruitment

Participants included 252 children (M age = 12.49 years, SD = 1.53, age range = 10-15.40 years, 53.6% females) diagnosed with type 1 diabetes, their mothers (M age = 39.97, SD = 6.32) and fathers (M age = 42.26, SD = 6.20). Adolescents completed questionnaires rating relationships with mothers (n = 252) and fathers (n = 243) separately, while mothers provided demographic and health data. Recruitment of participants occurred at a university/private partnership clinic (76%) and a community-based private practice (24%) that followed similar treatment regimen and clinic procedures (i.e., similar insulin regimens, similar procedures for placing participants on an insulin pump, and shared some interdisciplinary staff). The eligibility criteria included adolescents who were between 10 and 14 years of age, diagnosed with diabetes longer than one year (M = 4.13 years, SD = 3), able to read and write either English or Spanish (n = 3 Spanish speaking adolescents and parents), and living with mother. Parents gave written informed consent and adolescents gave written assent. The appropriate Institutional Review Boards approved the study.

Of the qualifying individuals approached, 66% of adolescents and mothers agreed to participate and filled out forms. Comparisons of eligible adolescents who participated versus those who did not indicated that participants were older (12.5 versus 11.6 years, t (367) = 6.2, p < .01), but did not differ on gender, pump status, HbA1c or time since diagnosis (ps > .20). Adolescents were largely Caucasian (94%) and middle class, with most (73%) having average annual household incomes of \$50,000 or more. Education levels of associate's (2-year college) degrees or beyond were reported for 51% of mothers and 58% of fathers. An average Hollingshead Index value of 42.04 indicated that the sample was on average of medium business, minor professional, and technical status. Approximately half (50.8%) of the adolescents were on an insulin pump, with the remainder being prescribed multiple daily injections (MDI). Mothers of adolescents on MDI reported physicians recommended an average of 4.14 insulin injections (SD = 1.81, range = 0-10) and 5.53 blood glucose checks per day (SD = 1.70, range = 1-11).

Procedure

Recruitment of participants occurred at the diabetes clinics; questionnaire packets were distributed and completed individually, and returned at a subsequent laboratory appointment. The cover sheet described the importance of the adolescent completing the questionnaire alone, and instructed participants to address all questions directly to investigators.

Measures

Metabolic control—Glycosylated hemoglobin (HbA1c) recorded in medical records at the recruitment visit indexed metabolic control. HbA1c is the medical standard for evaluating the quality of diabetes control, and reflects average blood glucose levels over the past 3-4 months (Bryden, Peveler, Stein, Neil, Mayou, & Dunger, 2001); higher values indicate poorer diabetes control. HbA1c was obtained using the Bayer DCA2000 by clinic staff. Participant authorization provided access to medical records to obtain HbA1c and other illness information (e.g., treatment regime, etc.).

Adherence—Adolescents completed a 16-item Self Care Inventory (adapted from La Greca, Auslander, Greco, Spetter, Fisher, & Santiago, 1995) to assess adherence to the diabetes regimen over the preceding month applicable to their regimen (1=*never* to 5=*always did this as recommended without fail*). Items were rephrased so that they were relevant to both regimens (i.e., using the insulin pump or not) such as bolusing (relevant to the insulin pump) or taking insulin (relevant to those not on the insulin pump). For the questions that were not applicable, adolescents were given a not applicable option. The scale was updated by adding two items to reflect current standards of diabetes care with the assistance of a certified diabetes educator (i.e., How well have you followed recommendations for counting carbohydrates; How well have you followed recommendations for calculating insulin doses based on carbohydrates in meals and snacks). Total scores demonstrated good internal consistency ($\beta = .85$ in our sample).

Peer Orientation—The Extreme Peer Orientation (EPO) scale evaluated how much children were willing to sacrifice positive development to receive peer acceptance (Fuligni & Eccles, 1993). The original four-item scale was adapted by adding three diabetes items (i.e., How much does the time you spend with your friends keep you away from doing the things you ought to do to manage your diabetes?; Would you ignore your diabetes management needs in order to make someone like you?; and Is it okay to go against your parents' advice about diabetes care in order to keep your friends?). Questions were scored on a Likert scale where 1 = *No, None, Never*, 2 = *Some, Sometimes*, and 3 = *Yes, Quite a bit, Very often*. A principal components analysis revealed a one-factor solution accounting for 35.01% of the variance (Eigenvalue = 2.45; $\beta = .66$). Items were averaged, scores above 1 reflected adolescents' willingness to forego positive development, including good diabetes management, to be accepted by their peers.

Adolescent-Parent Relationship Quality—The quality of the adolescent-parent relationship was measured through three scales capturing acceptance, independence-encouragement and communication. Two subscales from the Mother-Father-Peer scale (Epstein, 1983) were used. The *Acceptance Scale* assessed the degree to which children perceived love, acceptance, and appreciation. For example, "My mother/father enjoys being with me." The *Independence-Encouragement Scale* assessed the degree to which the parent encouraged the child's independence and self-reliance. For example, "My mother/father encourages me to make my own decisions." Response choices ranged from 1 = *strongly disagree* to 5 = *strongly agree*. The scales displayed adequate reliability (Acceptance from mothers $\alpha = .73$ and fathers $\alpha = .83$; Independence-encouragement from mothers $\alpha = .64$ and fathers $\alpha = .68$).

The third scale was the *Inventory of Parent and Peer Attachment* from Armsden and Greenberg (1987). Five items assessed adolescents' communications with their parents on a scale of 1 = *not true* to 5 = *always true*. For example, "My mother/father understands me." Reliability was adequate for mothers $\alpha = .64$ and fathers $\alpha = .69$.

The three parental relationship scores were strongly correlated ($r = .53$ to $.68$). Previously, Palmer et al. (2009) examined the adolescent-parenting variables (acceptance, encouragement, and communication), and demonstrated these three scales can combine to form a single composite factor. To reduce the number of analyses, factor scores generated by Palmer et al. (2009) were used to index the quality of the adolescent-parent relationship; higher scores indicated higher acceptance, communication, and independence encouragement. Analyses of the individual variables demonstrated the same pattern of results as reported with the composite factor score, and are available upon request from the first author.

Control Variables – Adolescents' Characteristics—Mothers completed a demographic questionnaire that tapped into information about the child with diabetes (i.e., pump status (0=yes, 1=no), length of diabetes, gender, and age).

Statistical Analyses

To examine whether extreme peer orientation mediated the association between adolescent-parent relationship quality and diabetes management, multiple linear regression analyses were used to discern whether relationship quality predicted peer orientation and each outcome (adherence or HbA1c), and whether the association between relationship quality and outcomes was reduced when peer orientation was included as a predictor (Baron & Kenny, 1986). We verified the mediating effects of peer orientation with a formal confirmatory test of the indirect effect with the recommended bootstrapping procedure using the SPSS macros provided by Preacher and Hayes (2008b). A 95% confidence interval was used to assess mediation. If the confidence interval did not contain zero, then the indirect effect was significant and a mediational effect was verified (Preacher & Hayes, 2004; 2008a; 2008b; Shrout & Bolger, 2002). The Bootstrapping test is superior to the Sobel test in terms of power and Type I error rates, and allows for the inclusion of covariates (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008a; 2008b).

We separately analyzed adolescents' relationship quality with mother and with father in order to measure the individual contribution of each parent on the health of the adolescent. In all analyses, we statistically controlled illness duration, pump status, and age of adolescent, as these items are typically associated with diabetes outcomes (e.g., Berg et al., 2008; Wiebe et al., 2005). Tests of whether age interacted with peer orientation were not significant, and age was not statistically associated with EPO. There were no gender differences in diabetes outcomes or peer orientation, and gender did not interact with EPO; thus, gender was not included in the analyses.

Results

Sample Characteristics

The correlations, means, and standard deviations among study variables are displayed in Table 1. The majority (80%) of adolescent reported events of EPO (range = 1.14 - 2.24). As predicted, adolescents who reported higher quality relationships with parents (mothers and fathers) displayed better adherence and metabolic control. In addition, peer orientation was associated with lower quality adolescent-parent relationships, and poorer diabetes adherence and HbA1c.

Peer Orientation as a Mediator between Adolescent-Parent Relationship Quality and Diabetes Management

Mediation analyses were conducted to determine whether peer orientation mediated the relationship between adolescent-parental relationship quality for mothers and fathers and diabetes management (HbA1c and adherence). Two independent regression analyses were conducted to determine whether the adolescent-parental relationship variables predicted HbA1c (i.e., one analysis for mother and one for father), and another two examined whether the adolescent-parental relationship variables predicted treatment adherence. Higher quality adolescent-father relationships were associated with lower levels of HbA1c and higher levels of treatment adherence (see Table 2). Higher quality adolescent-mother relationships were associated with higher treatment adherence, but were not associated with HbA1c. Since the total direct effect of the independent variable on the dependent variable is not a requirement for mediation (Preacher & Hayes, 2004), the quality of the adolescent-mother relationship was included in the following analyses. In the second series of regressions, we separately regressed two independent adolescent-parent relationship variables onto the mediating variable (EPO). Each was significantly associated with peer orientation (see Table 2).

Finally, in four separate regressions, we included both extreme peer orientation and adolescent-parent relationship quality to determine whether the mediator explained the association with diabetes management. The analysis of the adolescent-mother relationship quality on HbA1c, revealed that mediation was supported (see Table 3). Relationship quality with the mother was not associated with HbA1c when the mediator EPO was in the regression equation. We further checked this result with the bootstrapping technique (Preacher & Hayes 2008b), where zero fell outside the 95% confidence interval around the indirect effect (range = $-.33$ to $-.06$). This mediational model represented an effect size of $R^2 = .18$ ($F=9.60$), $p = .0001$, providing convergent evidence that the benefit of the adolescent-mother relationship quality on HbA1c occurred through adolescents reporting lower levels of peer orientation. Similar analyses for adolescent-mother relationship quality predicting adherence supported an indirect path through extreme peer orientation, accounting for 21% of the variance (see Table 3).

Similar analyses with fathers' relationship quality revealed paternal relationship quality was not associated with HbA1c when the mediator EPO was in the regression equation. The bootstrapping technique (Preacher & Hayes 2008b) demonstrated an indirect path between relationship quality with father and HbA1c through extreme peer orientation, accounting for 16% of the variance. Similar analyses for paternal relationship quality predicting adherence supported an indirect path through extreme peer orientation, accounting for 18% of the variance.

Discussion

The present study is the first to demonstrate that adolescents who are oriented toward their peers (i.e., seek advice and support from their peers over their parents) may put themselves at risk for poorer diabetes management, and peer orientation may partially mediate associations between adolescent-parent relationships and diabetes management. Good quality adolescent-mother and adolescent-father relationships were associated with better health outcomes and less peer orientation. Additionally, peer orientation mediated the associations of both adolescent-mother and adolescent-father relationship quality with diabetes outcomes. Although prior research has demonstrated the importance of adolescent-parent relationships for good diabetes management (Berg et al., 2008; Miller-Johnson, et al., 1994; Wiebe, et al., 2005), we know little about the processes whereby the quality of the adolescent-parent relationship and peer orientation are associated with diabetes outcomes. The developmental literature suggests that a warm, high quality, cohesive relationship with parents allows adolescents to value their parents' opinions, respect their rules, and thus be less likely to rely

on their peers for advice (Kim et al. 2001; Fugilini & Eccles, 1993; Goldstein, Davis-Kean, & Eccles, 2005; Steinberg, 1990). Adolescents normatively seek parental advice throughout adolescence, but often experience closer relationships with mothers than with fathers (Buhrmester & Furman, 1987; Larson & Richards, 1994). We found that adolescents who perceived both their mother and their father to be accepting, communicative, and encouraging of independence were less likely to sacrifice their health for peer acceptance and seek their peers' advice over their parents, and had better health outcomes.

When adolescents with type 1 diabetes are extremely peer oriented, it is likely that they place importance on peer relationships rather than their own health. Adolescents who are peer oriented may modify their behavior to fit in with their peers to avoid being viewed as different (Bronfenbrenner, 1967; Devereux, 1970; Fuligni & Eccles, 1993; Fuligni et al. 2001; Steinberg, 1987). For adolescents who are coping with a chronic illness such as diabetes, not being seen as different may be more difficult given the continuous demands of their treatment regimen (e.g., regularly checking their blood glucose, eating healthy foods, administering insulin injections). These adolescents may limit or modify diabetes management behaviors to fit in with the group norms, and poorer adherence can have serious consequences for their blood glucose control.

A high quality adolescent-parent (mother, father) relationship can positively influence peer choices, the manner in which adolescents manage their diabetes, and ultimately metabolic control and adherence to diabetes regimens. During adolescence, the adolescent-parent relationship is subject to changes, where adolescents spend less time with their parents and more time with their peers, although complete rejection of the parent is rare (Buchanan, et al. 1990; Larson, Richards, Moneta, Holmbeck, Duckett, 1996; Steinberg, 1990). It is developmentally appropriate for adolescents and parents to have a high quality cohesive relationship through acceptance, regular communication, and encouragement of independence, which may encourage adolescents to have a healthy balance of parent influence and peer affiliation (Kim et al. 2001; Fugilini & Eccles, 1993; Goldstein, Davis-Kean, & Eccles, 2005). Although it is normal for adolescents to seek advice and support from peers, this may become more common when adolescents do not have a high quality cohesive relationship with their parents. Findings from the current study support the hypothesis that adolescents' orientation towards their peers occurred in the context of lower quality adolescent-parent relationships. The low quality adolescent-parent relationship can be detrimental for diabetes care, as it may place adolescents at risk of positive healthy development by ignoring their parents' advice to be accepted by their peers.

The present findings add to the literature documenting the importance of parental involvement for managing diabetes during adolescence, and identify adolescents' peer orientation as a potential mediating mechanism. Parental involvement in pediatric diabetes care is crucial for good management (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1999; Wysocki et al., 1996). During adolescence, however, the nature of that involvement ideally shifts to support the adolescents' developing autonomy and independence in diabetes management. Relationships that are characterized by warmth and acceptance (Berg et al., 2008), and that support autonomy through collaboration and teamwork (Helgeson et al., 2008; Laffel et al., 2003; Wysocki et al., 2009) and low parental control (Wiebe et al., 2005) appear particularly beneficial for adolescents' diabetes management. The present data suggest that such benefits may occur because adolescents who maintain good quality relationships with parents are less likely to take risks (i.e., miss injections) with their health for peer acceptance. Interventions that promote parents' interactive communication, acceptance, and encourage independence, may increase opportunities for parental support while minimizing peers distracting adolescents from their diabetes management.

Several limitations of this investigation deserve mention. As the purpose of this study was to determine how the adolescent perceived their social world, we focused our examination solely from the perspective of the adolescent and their perceptions of their relationships with peers and parents. Previous studies have indicated adolescents' perceptions of parenting are more strongly associated with diabetes outcomes than are parental perceptions (Berg et al. 2008). The cross-sectional nature of our study prevents us from making causal statements regarding the direction of effects between child-parent relationships, peer orientation, and diabetes management. The moderate reliability of the EPO, communication, and independence-encouragement scales should be taken into consideration when reviewing the results.

Age was not significantly associated with peer orientation and was not a moderator of the associations between peer orientation and diabetes outcomes. This is likely due to the small age range. The majority of participants were placed at mid-adolescence when there is a peak in peer pressure (Sumter, Bokhorst, Steinberg & Westenberg, 2009), possibly making them more likely to be oriented toward their peers. The adolescent-parent relationship quality measures probed non-diabetes specific interactions between the adolescent and the parent. Parenting measures that asked diabetes specific questions regarding acceptance, communication, and encouraging independence in diabetes care may have resulted in stronger associations in diabetes outcomes. Future research would benefit from a comparison between diabetes-specific and general parenting measures to examine differential associations with diabetes outcomes.

The EPO scale has not been previously used in the context of diabetes, and more work needs to be done to fully understand the meaning of the results. It is conceivable, for example, that adolescents who are not experiencing any events of peer orientation are adolescents who have better adherence because they are more reliant on their parents. This could be beneficial for diabetes management in the short-run, but may not facilitate necessary independent diabetes management skills. Adolescents, who experience events of peer orientation, may become distracted by peer influence and take unnecessary risks (i.e., not administering insulin injections or eating sugary foods), thus are likely to have difficulty managing their diabetes. Due to the normative nature of peer relationships, it is likely that a balanced relationship between peer interactions and self-care is important for adolescents coping with diabetes. By identifying risk factors in the social world of the adolescent, researchers and clinicians can more effectively target interventions to prevent serious risk and unhealthy illness management patterns in this vulnerable population.

These findings suggest that high quality involvement between adolescents and their parents consisting of parental acceptance, open communication, and encouraging independence provides an environment likely to foster adolescents who value both their parents and their peers. The mediational analyses suggested a more balanced orientation to peers may be one path toward better adherence and metabolic control. We did not test the differences between mother and father relationship quality with the adolescent, but similar patterns were found for both parents. High quality relationships with mother and with father appear important for helping adolescents balance parent and peer influences for more positive adolescent health and development.

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Table 1
Means, Standard Deviation (SD), and Correlations among Primary Study Variables

	2	3	4	5	6	7	8	M	SD
1. HbA1c	-0.31**	0.23**	-0.13*	-0.23**	0.16*	0.12	0.28**	8.37	(1.58)
2. Adherence		-0.28**	0.36**	0.37**	-0.20**	-0.10	-0.10	3.94	(0.58)
3. EPO			-0.25**	-0.29**	0.08	-0.05	0.09	1.30	(0.26)
4. Mother Quality+				0.59**	0.10	-0.001	-0.21**	0.00000	(0.45)
5. Father Quality++					-0.004	0.02	-0.17*	0.0000	(0.51)
6. Age						0.07	0.01	12.49	(1.53)
7. Ill. duration							-0.14*	56.86	(35.56)
8. Pump								1.49	(0.50)

Note:

EPO = Extreme Peer Orientation; Mother Quality = Mother relationship quality; Father Quality = Father Relationship Quality; + Mother Relationship Quality is presented as a factor score of Acceptance (Mean=4.34, SD=.66), Communication (Mean=3.96, SD=.67), and Encouraging Independence (Mean=4.05, SD=.61); ++Father Relationship Quality is presented as a factor score of Acceptance (Mean=4.18, SD=.83); Communication (Mean=3.77, SD=.76), and Encouraging Independence (Mean=3.98, SD=.76); Ill. Duration = Illness duration.

* $P < .05$,

** $P < .01$;

Table 2

Regression Analyses of Adolescent-Parent Relationship Quality Predicting HbA1c, Adherence, and Extreme Peer Orientation with Covariates

HbA1c			
Predictors	<i>B (SE)</i>	<i>Beta</i>	<i>R</i> ²
Mother Quality	−0.26 (0.22)	−0.07	0.14
Age	0.20 (0.07)	0.19*	
Illness Duration	0.007 (0.003)	0.14*	
Pump	0.92 (0.20)	0.29**	
Father Quality	−0.46 (0.19)	−0.15*	0.14
Age	0.17 (0.06)	0.16**	
Illness Duration	0.005 (0.003)	0.11	
Pump	0.87 (0.20)	0.28**	
Adherence			
Predictors	<i>B (SE)</i>	<i>Beta</i>	<i>R</i> ²
Mother Quality	0.48 (0.08)	0.38**	0.19
Age	−0.09 (0.02)	−0.23**	
Illness Duration	−0.002 (0.001)	−0.10	
Pump	−0.02 (0.07)	−0.02	
Father Quality	0.40 (0.07)	0.35**	0.19
Age	−0.08 (0.02)	−0.20**	
Illness Duration	−0.002 (0.001)	−0.10	
Pump	−0.07 (0.07)	−0.06	
Extreme Peer Orientation			
Predictors	<i>B (SE)</i>	<i>Beta</i>	<i>R</i> ²
Mother Quality	−0.25 (0.04)	−0.25**	0.08
Age	0.02 (0.01)	0.10	
Illness Duration	0.000 (0.000)	−0.03	
Pump	0.02 (0.03)	0.04	
Father Quality	−0.14 (0.03)	−0.28**	0.11
Age	0.02 (0.01)	0.12	
Illness Duration	0.000 (0.000)	−0.02	
Pump	0.04 (0.04)	0.08	

Note:

Mother Quality.= Mother relationship quality; Father Quality = Father Relationship Quality.

*
p<.05;

**
p<.01;

Table 3

Regression and Bootstrap Analyses of the Mediating Role of Extreme Peer Orientation (EPO) between Adolescent-Parent Relationship, HbA1c, and Adherence with Covariates

Predictor	HbA1c				Adherence			
	<i>B</i> (<i>SE</i>)	<i>Beta</i>	<i>R</i> ²	BCa 95% CI LL UL	<i>B</i> (<i>SE</i>)	<i>Beta</i>	<i>R</i> ²	BCa 95% CI LL UL
Mother Quality	−0.08 (0.22)	−0.02	0.18	−0.33 −0.06	0.42 (0.08)	0.33**	0.21	0.02 0.13
EPO	1.174 (0.39)	0.19**			−0.44 (0.14)	−0.20**		
Age	0.18 (0.07)	0.17**			−0.08 (0.02)	−0.20**		
Illness	0.008	0.16**			−0.001	−0.09		
Duration	(0.003)				(0.001)			
Pump	0.90 (0.20)	0.28**			−0.01 (0.07)	−0.01		
Father Quality	−0.31 (0.20)	−0.10	0.16	−0.30 −0.04	0.35 (0.07)	0.31**	0.18	0.02 0.12
EPO	0.97 (0.39)	0.16*			−0.38 (0.14)	−0.17**		
Age	0.15 (0.06)	0.15*			−0.07 (0.02)	−0.07		−0.17**
Illness	0.01	0.13*			−0.001	−0.09		
Duration	(0.003)				(0.001)			
Pump	0.84 (0.20)	0.27**			−0.06 (0.07)	−0.06		−0.05

Note:

Mother Quality = Mother relationship quality; Father Quality = Father Relationship Quality; CI = confidence interval; LL = lower limit; UL = upper limit. Bootstrap test results presented as BCa 95% CI. BCa 95% CI = bias corrected and accelerated bootstrapping confidence intervals that include corrections for both median bias and skew (MacKinnon, et al. 2004). Confidence intervals containing zero are not significant.

* p<.05;

** p<.01;