Journal of Pediatric Psychology, 44(8), 2019, 999–1008
doi: 10.1093/jpepsy/jsz040
Advance Access Publication Date: 31 May 2019
Original Research Article

Parental Self-Control as a Moderator of the Association Between Family Conflict and Type 1 Diabetes Management

MaryJane S. Campbell,[1] MS, Cynthia A. Berg,[1] PhD, and Deborah J. Wiebe,[2] PhD

[1]Department of Psychology, University of Utah and [2]Psychological Sciences University of California-Merced

All correspondence concerning this article should be addressed to Cynthia A. Berg, PhD, Department of Psychology, 380 S. 1530 E., Salt Lake City, UT 84112. E-mail: Cynthia. Berg@psych.utah.edu

Received December 17, 2018; revisions received April 25, 2019; accepted April 30, 2019

Abstract

Objective To examine whether parental self-control (i.e., parents' ability to regulate their emotions, cognitions, and behaviors) moderates the detrimental association between type 1 diabetes (T1D)-specific family conflict and adherence and HbA1c, such that conflict is most detrimental when parental self-control is low. **Methods** One hundred and forty-nine adolescents diagnosed with T1D (*M*age = 14.09; 53% female) reported on their T1D-specific conflict with their mothers and fathers and their adherence to the T1D regimen at two time points (6 months apart). Mothers and fathers reported on their self-control. Glycated hemoglobin (HbA1c) was obtained from the medical record at both time points. **Results** Higher adolescent-reported conflict with father was associated concurrently with higher HbA1c and lower adherence only for fathers with low self-control (*ps* < .05). Higher adolescent-reported conflict with mother was also associated concurrently with lower adherence only for mothers with lower self-control ($p < .05$); no significant moderation was found for mothers' self-control in predicting HbA1c. Longitudinal analyses indicated family conflict with mother predicted changes in adherence and HbA1c, but there were no significant moderating effects of either mother or father self-control. **Conclusions** Lower parental self-control may prevent parents from handling diabetes-related family conflict in a productive manner. We discuss the implications of parental self-control as an intervention target for health care professionals working with adolescents with T1D and their families.

Key words: adolescents; diabetes; family conflict; parenting; self-control.

Individuals with type 1 diabetes (T1D) must adhere to complex daily tasks such as checking blood glucose levels multiple times throughout the day, administering insulin, and paying careful attention to diet and exercise (American Diabetes Association, 2018). Adolescents face numerous challenges as they navigate increased autonomy in diabetes care in addition to the typical social and academic challenges of adolescence (Borus & Laffel, 2010). When parents remain involved in diabetes management, adolescents experience higher adherence and lower glycated hemoglobin (HbA1c) (Berg et al., 2011; Ellis et al., 2007; Goethals et al., 2017; Wiebe et al., 2014). However, continued parental involvement during this time may present opportunities for parent–child conflict, which is at its highest during middle adolescence (Conger & Ge, 1999).

Family conflict has been consistently implicated as a risk factor for suboptimal diabetes outcomes such as lower adherence and higher HbA1c (Hilliard, Guilfoyle, Dolan, & Hood, 2011; Hood, Butler, Anderson, & Laffel, 2007; Lewin et al., 2006; Luyckx et al., 2013). The risky families model suggests that aspects of family conflict are associated with

adolescent vulnerabilities such as disrupted stress-physiology, poor health behaviors, and disrupted emotional processing (Repetti, Taylor, & Seeman, 2002). When applied to adolescents with T1D, this model is consistent with findings that family conflict is associated with lower adherence and higher HbA1c. The links of conflict with adherence and HbA1c have also been found longitudinally (Hilliard et al., 2011; Luyckx et al., 2013), emphasizing the important contributions of family conflict across time. Given these robust associations, it is important to begin to identify factors that may modify this link, as such factors may become targets for reducing adverse outcomes related to conflict.

Developmental research suggests that although parent-adolescent conflict is normative and can be adaptive, parents' ability to manage their emotional states during arguments may reduce the risk of the conflict becoming dysfunctional (Moed et al., 2015). Supporting this idea, Weinger, O'Donnell, and Ritholz (2001) found that parents' highly emotional reactions to diabetes problems were one of the most common sources of diabetes family conflict. In their focus group study, adolescents' indicated that conflicts with their parents arose when parents were "flipping out" or "going crazy" in response to high or low blood sugars. However, when conflict did occur and parents responded with reassurance and empathy, adolescents felt supported. Thus, parents' ability to control their reactions to the conflict arising from managing this complex illness may moderate the impact of conflict on the adolescent's diabetes management.

Parents' ability to control themselves in situations of conflict likely arises from their underlying capacities in self-control (ability to regulate emotions, cognitions, and behaviors). Self-control facilitates better coping skills and decreased burden within interpersonal systems, and lower parental self-control is associated with negative child outcomes such as child antisocial behaviors and juvenile delinquency (Finkel & Campbell, 2001; Finkenauer, Engels, & Baumeister, 2005; Meldrum, Connolly, Flexon, & Guerette, 2016). Adolescents may benefit from having parents with better self-control such that the adverse aspects of parent-adolescent conflict in relation to diabetes management are minimized. In prior work with the present sample, we reported that mothers are typically more involved in diabetes management than fathers (Berg et al., 2008, 2013). Thus, mothers' level of self-control may be particularly imporant for understanding conflict and its association with diabetes management. In addition, we have found that adolescents with T1D benefit most when both parents report better self-control, such that adolescents reported greater ease of adherence when both, but not one, parents reported higher self-control (Lansing, Crochiere, Cueto, Wiebe, & Berg, 2017). These findings indicate that both parents' regulatory capacities are important to examine. Hence, it is possible that mothers' and fathers' self-control might have different buffering effects on diabetes management.

The goal of this study was to examine whether parental self-control moderates the detrimental effects of conflict on adherence and HbA1c. We examined this longitudinally in separate models among 149 middle adolescents with T1D, their mothers and fathers. We predicted that parental self-control would moderate the association of family conflict with HbA1c and adherence concurrently (Aim 1) and across a 6-month time frame (Aim 2). We expected that for families with lower parental self-control, the relationship among family conflict and diabetes outcomes would be stronger compared to families with higher parental self-control. Given that mood disorders such as depression may play a role in parents' difficulties with emotion regulation (Rutherford, Wallace, Laurent, & Mayes, 2015), that parents experience distress associated with diabetes management (Berg et al., 2013; Streisand, Mackey, & Herge, 2010), and that maternal depression undermines one's ability to effectively parent adolescents with diabetes (Wiebe et al., 2011), we included parental depressive symptoms as covariates in all models.

Method

Participants

Participants included 149 middle adolescents diagnosed with T1D (M age = 14.09 years, SD = 1.49, range = 11.62–16.99) and their mothers and fathers (M mothers age = 42.51 years, SD = 5.85; M fathers age = 44.77 years, SD = 5.85). Adolescents were 53% female, 96% Caucasian, 66% used an insulin pump, and had an average HbA1c of 8.68 (range = 5.8–14.0), which is greater than the 7.5% that ADA recommends for youth under age 20 (American Diabetes Association, 2018). Participants were recruited as part of a larger longitudinal study (N = 252 at Time 1) examining family involvement in diabetes management during adolescence. At enrollment, adolescents were eligible to participate if they were between 10 and 14 years of age, diagnosed with diabetes for more than 1 year, living with their mother, and fluent in English or Spanish (see Wiebe et al., 2014 for additional study details). The father who was most involved with the teen's diabetes management (e.g., biological father, step-father, and/or an adoptive father) was recruited regardless of whether he lived with the child. Of the eligible participants recruited, 66% agreed to participate in the original study. Reasons for refusal included not interested (30%), too busy (21%) travel distance

(18%), uncomfortable with being studied (14%), and the time commitment (5%). Ninety percent of our families included the biological father and mother, 6% included the biological mother with the stepfather, and 1% included each the biological mother with the adopted father, both adopted parents, and the stepmother together with the biological father. The majority of participating parents were Caucasian (87%), with most families (41%) reporting household incomes greater than $75,000 annually.

In the present study, we used data from Time 4 and Time 5 of the larger longitudinal study (Wiebe et al., 2014) in order to capture the developmental period when parent-adolescent conflict generally peaks (Conger & Ge, 1999; Kim, Conger, Lorenz, & Elder, 2001) and the time when both conflict and self-control were assessed in the sample. At Time 4,183 of the original 252 participants (73%) completed study procedures. At Time 5,186 participants completed all study procedures. Primary reasons for loss to follow-up included changes in family circumstances, too busy, and study demands. Only participants with both mothers and fathers participating at Time 4 ($n = 149$) were included in analyses. Those participating at Times 4 and 5 did not differ from the original sample at Time 1 on measures of adherence ($t(250) = .40$, $p = .69$), father's self-control ($t(185) = .23$, $p = .82$), or mother's self-control ($t(250) = .45$, $p = .65$), but they did have lower (better) HbA1c than the original sample ($t(249) = 3.07$, $p < .01$). Participants at Times 4 and 5 also did not differ from the original sample at Time 1 on adolescent demographic variables such as age ($t(250) = .45$, $p = .66$), ethnicity ($t(247) = -.04$, $p = .97$), sex ($t(248) = .38$, $p = .71$), and nature of the parent relationship to the child (mothers: $t(247) = 1.63$, $p = .10$; fathers = $t(247) = .79$, $p = .43$), but mothers and fathers in the current sample were older (mothers: $t(250) = -2.10$, $p = .04$; fathers: $t(180) = -2.73$, $p = .01$) and fewer adolescents in the current sample were using an insulin pump ($t(248) = 2.00$, $p = .05$). Further, there were no differences between clinic sites among key study variables.

Measures

Diabetes-Specific Family Conflict

The Diabetes Family Conflict Scale-Revised (Hood et al., 2007) measured the frequency of parent–child conflict around 15 diabetes tasks (e.g., giving insulin shots or boluses, results of blood sugar monitoring, taking care of low or high blood sugar, and exercising). Adolescents rated separately how often they argued with their mother or father on a scale from 1 (*Almost never*) to 3 (*Almost always*). Reliability in this sample was high for adolescent reports of conflicts with mother ($\alpha = .95$) and father ($\alpha = .96$). Adolescents' reports of conflict were used, as it is likely that the adolescent's perspective on conflict is more influential on outcomes compared to parents' (Hilliard et al., 2011).

Self-Control

Mothers and fathers completed the 11-item Brief Self-Control measure to assess control over behaviors, emotions, and cognitions. This scale was developed by Finkenauer et al. (2005) as a shortened version of Tangney, Baumeister, and Boone's (2004) 36-item measure of trait self-control. Response categories ranged from 1 (*not at all like me*) to 5 (*very much like me*). Higher scores indicate better self-control. Sample items include "I am good at resisting temptation," "I get carried away by my feelings," and "Sometimes I can't stop myself from doing something, even if I know it is wrong." Reliability in the present study was $\alpha = .80$ for mothers and $\alpha = .73$ for fathers.

Parental Depressive Symptoms

Parental depression was measured using the Center for Epidemiological Studies of Depression Scale (Radloff, 1977), a 20-item measure of depressive symptoms throughout the past week rated on a scale from 0 (*None/Rarely*) to 4 (*Most/All*). Higher scores indicate more depressive symptoms. This scale is sensitive to difficulties specific to parenting a child with diabetes (Kovacs et al., 1990). Reliability in this sample was excellent for mothers ($\alpha = .92$), and fathers ($\alpha = .88$).

Adherence

Adherence to the diabetes regimen was measured using the 16-item Self-Care Inventory (adapted from La Greca, Follansbee, & Skyler, 1990). Adolescents rated their adherence to aspects of the diabetes regimen over the preceding month on a scale from 1 (*never*) to 5 (*always*). Adaptations to this scale included the addition of two items related to counting carbohydrates and calculating insulin doses, and updated wording of existing items, which were made in consultation with diabetes educators to reflect updated treatment standards. The scale demonstrated good reliability in this sample ($\alpha = .85$). Adolescent-reported adherence was used as teens may have better access to daily adherence knowledge (e.g., through knowledge about blood glucose testing) as they spend increasing time outside the family (Berg et al., 2016).

Glycemic Control

HbA1c from medical records indexed glycemic control. HbA1c is a measure of average blood glucose levels over the preceding 3 months and is the current standard to assess whether diabetes treatment goals are being achieved. Higher levels indicate poorer blood glucose levels. All clinic sites assessed HbA1c values using the Bayer DCA 2000 method.

Table I. *Pearson Correlations and Descriptive Statistics of Key Study Variables at Time 4 (N = 149)*

	M *(SD)*	Range	1	2	3	4	5	6	7	8	9	10	11
1. Adolescent age	14.09 *(1.49)*	11.62–16.99	1										
2. Adolescent sex	53%	–	−.06	1									
3. Pump status (% using pump)	66%	–	−.13	.00	1								
4. Mother self-control	3.53 *(0.60)*	2.00–4.91	−.11	−.06	−.04	1							
5. Father self-control	3.72 *(0.51)*	2.36–5.00	.02	−.12	.16	.06	1						
6. Adolescent conflict with mother	1.41 *(0.49)*	1.00–3.00	.11	.00	**−.18**	−.15	.10	1					
7. Adolescent conflict with father	1.21 *(0.38)*	1.00–3.00	.07	−.06	**−.20**	−.12	**.17**	**.66**	1				
8. Mother depressive symptoms	11.91 *(10.79)*	0.00–50.00	.08	.00	.01	**−.50**	−.05	.08	.07	1			
9. Father depressive symptoms	10.00 *(8.82)*	0.00–47.00	−.15	.06	−.08	**−.21**	**−.42**	.04	−.00	**.29**	1		
10. Adherence	3.86 *(0.58)*	1.8–5.0	**−.22**	−.01	**.22**	**.19**	.12	**−.29**	−.13	−.09	−.14	1	
11. HbA1c	8.68 *(1.75)*	5.8–14.0	.05	−.05	**−.38**	−.01	−.16	**.32**	**.22**	.09	**.18**	**.39**	1

Note. **Bold** indicates significance $p < .05$.

Procedures

Participants were recruited from a university-based diabetes clinic and a community-based private practice during routine clinic visits. Both clinic sites followed similar clinic procedures. Study procedures were approved by the Institutional Review Board, with adolescents, mothers, and fathers providing consent/assent to participate in the study at Time 1 and completing study procedures every 6 months across six time points. Adolescents and their mothers and fathers completed questionnaires separately at home and adolescents completed additional assessments in the laboratory. Adolescents and parents received $50 each in compensation for completing assessments at each time point.

Analytic Plan

Preliminary analyses examined bivariate correlations among study variables. To examine the moderating effect of parental self-control on the relationship between family conflict and diabetes management at Time 4 (Aim 1), we conducted two multiple regression models separately for mothers and fathers to predict diabetes outcomes (i.e., HbA1c and adherence). In each model, the following variables were covaried because they were correlated with both the predictors and outcomes (see Table I): age, pump status, and parental depressive symptoms. As adolescent age was associated with adherence, but not HbA1c, this covariate was removed from all models predicting HbA1c. Adolescent-reported family conflict with the parent (mother or father), parental self-control, and the interaction between parental self-control and conflict were entered to predict the Time 4 outcome. To examine whether parental self-control moderated the effects of diabetes-specific family conflict on outcomes across time (Aim 2), we conducted comparable hierarchical linear regression models controlling for the relevant Time 4 outcome (adherence or HbA1c).

Conflict and self-control were centered at their mean and the interaction calculated from these centered variables. Significant interaction effects were decomposed via simple slopes and interactions were plotted at one *SD* above and below the mean of self-control and conflict using Dawson's unstandardized two-way interaction utility for Microsoft Excel (Dawson, n.d.). Post-hoc power analysis using the G*power program for the largest proposed model including interaction terms indicated that for 149 participants, small effects ($f^2 = .05$) could be detected with 80% power. All analyses were conducted using SPSS Version 24.

Results

Preliminary Analyses

Means, standard deviations, and correlations among key study variables are provided in Table I. Adolescent-reported conflict with mother and father was relatively low and parent-reported self-control was in the average range. Conflict with mother or father did not significantly change from Time 4 to Time 5, and adolescent age was not associated with conflict with either parent. Further, our measure of family conflict was positively skewed; however, after log-transforming the data and rerunning analyses, the significant moderating analyses remained significant. To enhance interpretation of moderating effects, the results are presented using the original variable (i.e., not transformed). Mothers and fathers reported mild depressive symptoms.

As expected, higher adolescent-reported conflict with mother and father was in general related to higher HbA1c and lower adherence at Times 4 and 5. Only fathers' self-control was positively associated with higher conflict. Higher mother self-control was

Table II. *Hierarchical Multiple Regression Testing Moderating Effect of Parent Self-Control on Time 4 HbA1c and Adherence*

	Time 4 HbA1c			Time 4 Adherence		
	ΔR^2	*B*	95% CI	ΔR^2	*B*	95% CI
MOTHERS						
Step 1	**0.13**			**0.08**		
-Age		–	–		**−0.07**	[−0.14, −0.00]
-Pump status		**−1.25**	[−1.84, −0.67]		0.21	[−0.01, 0.43]
-Mother depressive symptoms		0.01	[−0.02, 0.03]		0.00	[−0.01, 0.01]
Step 2	**0.07**			**0.14**		
-Age		–	–		−0.06	[−0.13, 0.00]
-Pump status		**−1.10**	[−1.67, −0.52]		0.15	[−0.06, 0.36]
-Mother depressive symptoms		0.01	[−0.02, 0.03]		0.00	[−0.01, 0.01]
-Conflict with mother		**0.82**	[0.22, 1.42]		**−0.27**	[−0.49, −0.06]
-Mother's self-control		0.11	[−0.40, 0.63]		0.19	[−0.00, 0.38]
-Conflict * Self-control		−0.80	[−1.86, 0.26]		**0.45**	[0.07, 0.83]
FATHERS						
Step 1	**0.18**			**0.08**		
-Age		–	–		−0.06	[−0.13, 0.01]
-Pump status		**−1.42**	[−2.07, −0.78]		0.19	[−0.04, 0.42]
-Father depressive symptoms		**0.04**	[0.00, 0.07]		−0.01	[−0.02, 0.00]
Step 2	**0.06**			**0.07**		
-Age		–	–		−0.06	[−0.13, 0.01]
-Pump status		**−1.18**	[−1.86, −0.49]		0.08	[−0.16, 0.32]
-Father depressive symptoms		**0.04**	[0.00, 0.08]		−0.01	[−0.02, 0.00]
-Conflict with father		**1.43**	[0.40, 2.46]		**−0.41**	[−0.74, −0.07]
-Father's self-control		0.06	[−0.65, 0.77]		0.06	[−0.19, 0.32]
-Conflict * Self-control		**−1.45**	[−2.79, −0.10]		**0.67**	[0.19, 1.15]

Note. CI = confidence interval. **Bold** indicates significance $p < .05$.

significantly associated with higher adherence at Times 4 and 5, but not HbA1c. There were no significant associations between father self-control and HbA1c or adherence at either time point.

Concurrent Associations of Conflict, HbA1c, and Adherence Moderated by Self-Control

Adolescent-reported conflict with mother was associated with higher HbA1c and lower adherence above and beyond covariates of adolescent age, pump status, and mother-reported depressive symptoms (see Table II). Mother's self-control moderated the association between conflict and adherence, but did not moderate the association with HbA1c. As displayed in Figure 1, simple slopes analyses indicated that the slope between family conflict and adherence was only significant when mother self-control was low (high mother self-control: $B = -0.00$, $p = .98$, low mother self-control $B = -0.54$, $p < .001$).

Adolescent-reported conflict with father was also associated with higher HbA1c and lower adherence above and beyond adolescent age (see Table II). Pump status and father's depressive symptoms were associated with HbA1c, with pump use associated with lower HbA1c and higher father depressive symptoms associated with higher HbA1c; however, pump status and father's depressive symptoms were not associated with adherence. Father's self-control moderated the associations of conflict with adherence as well as the associations with HbA1c. Figure 2 demonstrates that the association between family conflict and adherence was only significant when father self-control was low (high father self-control: $B = -0.07$, $p = .62$, low father self-control $B = -0.75$, $p = .01$). Similarly, Figure 3 demonstrates that the slope between family conflict and HbA1c was only statistically significant when father self-control was low (high father self-control: $B = 0.69$, $p = .09$, low father self-control $B = 2.16$, $p = .01$).[1]

Longitudinal Associations of Self-Control and Conflict with HbA1c and Adherence

Adolescent-reported conflict with mother at Time 4 was associated with higher HbA1c and lower

1 Prior research indicates the benefits of higher self-control in both parents as well as the important role of adolescents' own self-control in managing diabetes. We conducted additional analyses to examine these issues. We first conducted analyses examining mothers' and fathers' self-control and conflict in a combined model. Results indicate that conflict with father was no longer significantly associated with T4 HbA1c or adherence when controlling for conflict with mother. Neither mothers' nor fathers' self-control predicted outcomes, but the interaction of fathers' self-control x conflict remained a significant predictor of T4 HbA1c and adherence (mothers' did not).

Further, analyses examining adolescent self-control as a moderator of these associations did not reveal a significant moderation of adolescent self-control.

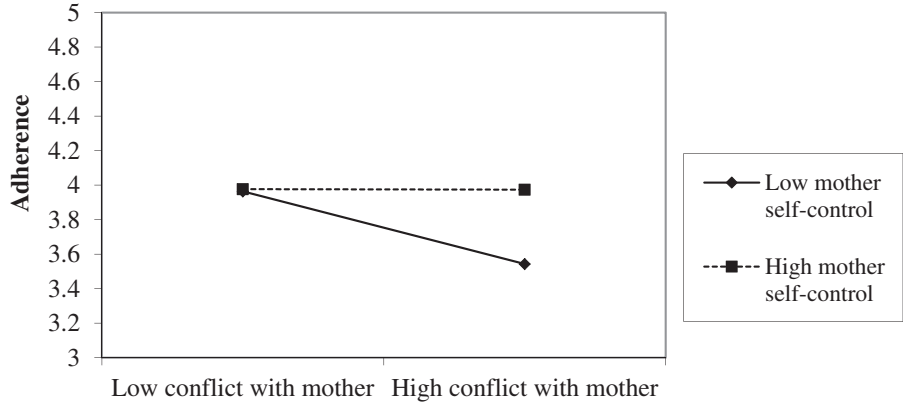

Figure 1. Mother's self-control moderates the association of conflict and Adherence.

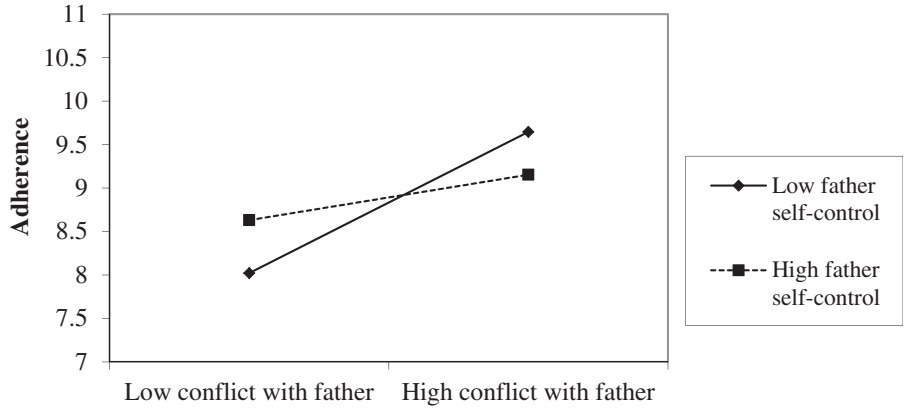

Figure 2. Father's self-control moderates the association of conflict and Adherence.

adherence at Time 5, above and beyond covariates of adolescent age, pump status, mother's depressive symptoms, and Time 4 HbA1c and adherence respectively for the outcomes of HbA1c and adherence (see Table III). Mother's self-control at Time 4 did not moderate the associations among family conflict and Time 5 outcomes. Adolescent-reported conflict with father at Time 4 was not associated with Time 5 outcomes, and father's self-control did not moderate the associations among family conflict and Time 5 outcomes.

Discussion

Consistent with the literature, diabetes-related family conflict was related to lower adherence and higher HbA1c cross-sectionally (Anderson et al., 2002; Hilliard et al., 2011; Hood et al., 2007; Lewin et al., 2006; Luyckx et al., 2013). Further, conflict with mother was related to lower adherence and higher HbA1c 6 months later. While less is known about the underlying mechanisms of general family conflict and its long-term consequences, the risky families model proposed by Repetti and colleagues (2002) suggests that families characterized by conflict present major risks for child physical and mental health outcomes. While interventions exist to help reduce family conflict for individuals with T1D (e.g., Wysocki et al., 2006), understanding the adverse aspects of conflict and ways to reduce its impact would enhance existing interventions.

A novel contribution of the present study is the finding that higher parent-reported self-control buffered the detrimental association between conflict and diabetes management. Among mothers and fathers who reported lower self-control, the negative relationships between conflict and adherence were stronger than among mothers and fathers who reported higher self-control. Further, when fathers reported higher self-control, this buffered the relation between family conflict and HbA1c. This is an important finding given the emphasis on mothers in the T1D literature relative to fathers, as fathers' self-control may be a critical component in managing this complex disease. While fathers are less involved in the day-to-day management of T1D compared to mothers, research suggests that when they are engaged, diabetes management improves (Wysocki & Gavin, 2004). Parents with low self-control may handle conflict in a

Table III. *Hierarchical Multiple Regression Testing Moderation Effect of Parent Self-Control on Time 5 HbA1c and Adherence*

	Time 5 HbA1c			Time 5 Adherence		
	ΔR^2	*B*	95% CI	ΔR^2	*B*	95% CI
MOTHERS						
Step 1	**0.40**			**0.42**		
-Age		–	–		−0.03	[−0.09, 0.03]
-Pump status		−0.40	[−0.94, 0.13]		0.14	[−0.05, 0.33]
-Mother's depressive symptoms		0.02	[−0.01, 0.04]		**−0.01**	[−0.02, −0.00]
-Time 4 outcome		**0.55**	[0.40, 0.71]		**0.61**	[0.45, 0.78]
Step 2	0.03			**0.05**		
-Age		–	–		−0.02	[−0.08, 0.04]
-Pump status		−0.37	[−0.91, 0.16]		0.10	[−0.10, 0.29]
-Mother's depressive symptoms		0.02	[−0.01, 0.04]		−0.01	[−0.02, 0.00]
-Time 4 outcome		**0.52**	[0.36, 0.68]		**0.53**	[0.36, 0.71]
-Conflict with mother		**0.54**	[−0.01, 1.07]		**−0.25**	[−0.44, −0.11]
-Mother's self-control		0.09	[−0.36, 0.53]		0.03	[−0.14, 0.20]
-Conflict * Self-control		0.47	[−0.44, 1.37]		0.20	[−0.13, 0.54]
FATHERS						
Step 1	**0.41**			**0.46**		
-Age		–	–		−0.03	[−0.09, 0.03]
-Pump status		**−0.67**	[−1.23, −0.04]		0.15	[−0.06, 0.40]
-Father's depressive symptoms		0.01	[−0.02, 0.04]		0.00	[−0.01, 0.02]
-Time 4 outcome		**0.54**	[0.37, 0.70]		**0.75**	[0.57, 0.93]
Step 2	0.02			0.02		
-Age		–	–		−0.03	[−0.09, 0.03]
-Pump status		**−0.84**	[−1.46, −0.21]		0.17	[−0.06, 0.40]
-Father's depressive symptoms		0.03	[−0.01, 0.06]		0.00	[−0.01, 0.01]
-Time 4 outcome		**0.54**	[0.37, 0.71]		**0.75**	[0.57, 0.94]
-Conflict with father		−0.07	[−0.97, 0.84]		−0.11	[−0.45, 0.23]
-Father's self-control		0.49	[−0.09, 1.07]		−0.16	[−0.38, 0.06]
-Conflict * Self-control		0.43	[−0.71, 1.57]		0.04	[−0.43, 0.50]

Note. CI = confidence interval. **Bold** indicates significance $p < .05$.

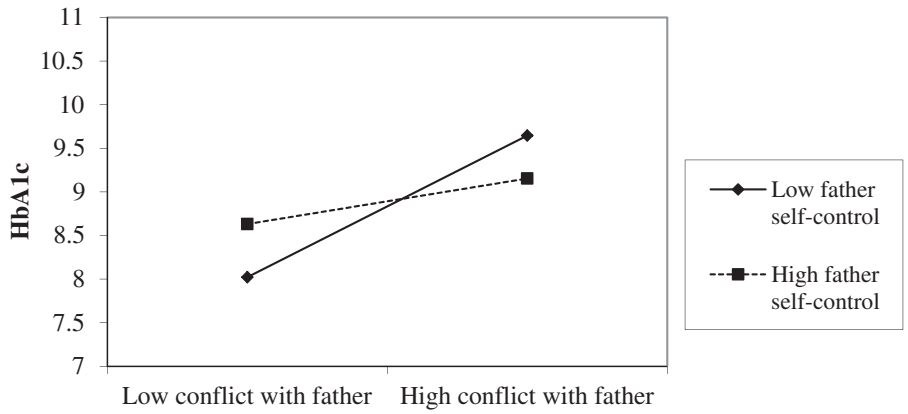

Figure 3. Father's self-control moderates the association of conflict and HbA1c.

more reactive, uncontrolled manner, which may exacerbate the associations between family conflict and diabetes outcomes.

As self-control is comprised of emotional, behavioral, and cognitive pieces, future research should examine all facets of this construct. In particular, the cognitive and behavioral pieces could be important components of self-control that allows parents to help plan (cognitive) and implement (behavioral) strategies to solve diabetes-related problems. In one of the few studies that elicited adolescent descriptions of family conflict, parents' emotional responses to diabetes problems were indicated as triggers, suggesting that deficits in emotion regulation may be a key facet of parental self-control to investigate (Weinger et al., 2001). The fact that fathers', but not mothers' depressive symptoms were predictive of HbA1c may indicate a need for further exploration of the emotional piece of self-control (e.g., emotion regulation). However, it is important to note that while related, parental

depressive symptoms do not fully represent deficits in emotion regulation. In light of this, we interpret our mixed findings as merely evidence for further exploration of this process during family conflict. For this reason, observational examinations of parent responses to diabetes-related conflict could provide unique insight into how families deal with conflict in real-time.

Longitudinally, parental self-control did not buffer the relationship between family conflict and diabetes management. Instead, only conflict with mother predicted changes in HbA1c and adherence across time. Further, the change in *R*-squared for many of our longitudinal models were not significant, highlighting a need for replication in future studies to understand the predictive value of this model across time. It is possible that better parental self-control alleviates only the short-term or concurrent risk for poor diabetes management. It is also possible that self-control is not a trait-like construct but may be more state-like in the context of diabetes-related problems or conflict, such that parents experience a loss of self-control in challenging situations. Therefore, future research should explore patterns of responding to family conflict across the transition from adolescence to emerging adulthood to investigate other parent factors that may be more influential longitudinally. As family conflict is generally highest during middle adolescence, determining which parent variables have lasting buffering effects on the conflict-HbA1c link is crucial for early intervention efforts.

Findings should be interpreted in the context of several study limitations. First, the current study was a secondary analysis of a larger study that was designed to answer different research questions. Second, parental self-control was measured via self-report and may not represent larger self-control capacities. Behavioral measures of this construct would improve our understanding of how parental self-control buffers the negative effects of family conflict. Further, our study utilized subjective self-report measures to examine many of these constructs; however, we utilized different reporters across measures to mitigate this concern as much as possible. In addition, family conflict was relatively low in our sample (although comparable to similarly aged samples) and we examined these effects among mostly intact, Caucasian families. As this limits the generalizability of our findings to families with different ethnic backgrounds, family compositions and families experiencing high levels of conflict, future research should include varying family structures with a wider range of conflict. Of note, this sample is not completely representative of the original sample, as this subset of participants had lower HbA1c than the original sample. However, this limitation likely means that this study provides a more conservative test of the hypotheses relative to a sample with higher HbA1c. Finally, because we did not assess the bidirectionality of the family conflict-diabetes management relationship, it is possible that lower adherence or HbA1c leads to family conflict as well as conflict resulting in poor diabetes management as presented in this work. However, the evidence of a longitudinal relationship between family conflict and diabetes outcomes both in the present study and in the literature suggests that it is the latter. Nonetheless, future research should examine the bidirectional nature of these associations.

Parental self-control may be an important target for intervention among these families. Our findings suggest that interventions targeting self-control may be more effective in reducing the association among family conflict and diabetes outcomes if they incorporate intervention efforts towards improving parental self-control in addition to adolescents'. Health care professionals could implement screening protocols to effectively identify families with low parental self-control, and psychologists could utilize parent-training strategies to improve parents' ability to regulate their emotions, behaviors, and cognitions. For example, the Triple P-Positive Parenting Program focuses on building parents' self-regulation skills, which could be tailored to parents with varying levels of self-control (Sanders, 1999). This could be particularly useful among families already experiencing conflict or among families who are approaching the adolescent years. While identifying and targeting these families early could have short-term implications for families, the longitudinal findings warrant further exploration into other family factors that may buffer the relations among conflict and diabetes outcomes to provide insight into long-term intervention strategies for these families.

Acknowledgment

We thank the physicians and staff at the Primary Children's Hospital Diabetes Program, the adolescents and parents who participated, and members of the ADAPT research team for their execution of data collection.

Funding

Research was supported by grant R01 DK063044 from the National Institute of Diabetes and Digestive and Kidney Diseases.

References

American Diabetes Association. (2018). Standards of medical care in diabetes-2018. *Diabetes Care*, *41*, S1–S2.

Anderson, B. J., Vangsness, L., Connell, A., Butler, D., Goebel-Fabbri, A., & Laffel, L.M. (2002). Family conflict, adherence, and glycaemic control in youth with short duration type 1 diabetes. *Diabetes Medicine*, *19*, 635–642.

Berg, C. A., Butler, J. M., Osborn, P., King, G., Palmer, D. L., Butner, J., … Wiebe, D. J. (2008). Role of parental monitoring in understanding the benefits of parental acceptance on adolescent adherence and metabolic control of type 1 diabetes. *Diabetes Care*, *31*, 678–683. doi: 10.2337/dc07-1678

Berg, C. A., Butner, J. E., Butler, J. M., King, P. S., Hughes, A. E., & Wiebe, D. J. (2013). Parental persuasive strategies in the face of daily problems in adolescent type 1 diabetes management. *Health Psychology*, *32*, 719–728. doi: 10.1037/a0029427

Berg, C. A., Butner, J. E., Turner, S. L., Lansing, A. H., King, P., & Wiebe, D. J. (2016). Adolescents', mothers', and fathers' reports of adherence across adolescence and their relation to hba1c and daily blood glucose. *Journal of Behavioral Medicine*, *39*, 1009–1019. doi: 10.1007/s10865-016-9771-5

Berg, C. A., King, P. S., Butler, J. M., Pham, P., Palmer, D., & Wiebe, D. J. (2011). Parental involvement and adolescents' diabetes management: The mediating role of self-efficacy and externalizing and internalizing behaviors. *Journal of Pediatric Psychology*, *36*, 329–339. doi: 10.1093/jpepsy/jsq088

Borus, J. S., & Laffel, L. (2010). Adherence challenges in the management of type 1 diabetes in adolescents: Prevention and intervention. *Current Opinion in Pediatrics*, *22*, 405–411. doi: 10.1097/MOP.0b013e32833a46a7

Conger, R. D., & Ge, X. (1999). Conflict and cohesion in parent-adolescent relations: Changes in emotional expression from early to midadolescence. In *Conflict and Cohesion in Families: Causes and Consequences* (pp. 185–206). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Dawson, J. (n.d.) *Interpreting interaction effects: Two-way interactions*. Retrieved from http://www.jeremydawson.co.uk/slopes.htm

Ellis, D. A., Podolski, C. L., Frey, M., Naar-King, S., Wang, B., & Moltz, K. (2007). The role of parental monitoring in adolescent health outcomes: Impact on regimen adherence in youth with type 1 diabetes. *Journal of Pediatric Psychology*, *32*, 907–917. doi: 10.1093/jpepsy/jsm009

Finkel, E. J., & Campbell, W. K. (2001). Self-control and accommodation in close relationships: An interdependence analysis. *Journal of Personality and Social Psychology*, *81*, 263–277.

Finkenauer, C., Engels, R. C. M. E., & Baumeister, R. F. (2005). Parenting behaviour and adolescent behavioural emotional problems: The role of self-control. *International Journal of Behavioral Development*, *29*, 58–69.

Goethals, E. R., Oris, L., Soenens, B., Berg, C. A., Prikken, S., Van Broeck, N., … Luyckx, K. (2017). Parenting and treatment adherence in type 1 diabetes throughout adolescence and emerging adulthood. *Journal of Pediatric Psychology*, *42*, 922–932. doi: 10.1093/jpepsy/jsx053

Hilliard, M. E., Guilfoyle, S. M., Dolan, L. M., & Hood, K. K. (2011). Prediction of adolescents' glycemic control 1 year after diabetes-specific family conflict: The mediating role of blood glucose monitoring adherence. *Archives of Pediatrics and Adolescent Medicine*, *165*, 624–629. doi: 10.1001/archpediatrics.2011.86

Hood, K. K., Butler, D. A., Anderson, B. J., & Laffel, L. M. B. (2007). Updated and revised diabetes family conflict scale. *Diabetes Care*, *30*, 1764–1769.

Kim, K. J., Conger, R. D., Lorenz, F. O., & Elder, G. H. (2001). Parent-adolescent reciprocity in negative affect and its relation to early adult social development. *Developmental Psychology*, *37*, 775–790.

Kovacs, M., Iyengar, S., Goldston, D., Obrosky, D. S., Stewart, J., & Marsh, J. (1990). Psychological functioning among mothers of children with insulin-dependent diabetes mellitus: A longitudinal study. *Journal of Consulting and Clinical Psychology*, *58*, 189–195.

La Greca, A. M., Follansbee, D., & Skyler, J.S. (1990). Developmental and behavioral aspects of diabetes management in youngsters. *Children's Health Care*, *19*, 132–139. doi: 10.1207/s15326888chc1903_1

Lansing, A. H., Crochiere, R., Cueto, C., Wiebe, D. J., & Berg, C. A. (2017). Mother, father, and adolescent self-control and adherence in adolescents with type 1 diabetes. *Journal of Family Psychology*, *31*, 495–503. doi: 10.1037/fam0000292

Lewin, A. B., Heidgerken, A. D., Geffken, G. R., Williams, L. B., Storch, E. A., Gelfand, K. M., & Silverstein, J. H. (2006). The relation between family factors and metabolic control: The role of diabetes adherence. *Journal of Pediatric Psychology*, *31*, 174–183. doi: 10.1093/jpepsy/jsj004

Luyckx, K., Seiffge-Krenke, I., Missotten, L., Rassart, J., Casteels, K., & Goethals, E. (2013). Parent-adolescent conflict, treatment adherence and glycemic control in type 1 diabetes: The importance of adolescent externalising symptoms. *Psychology and Health*, *28*, 1082–1097. doi: 10.1080/08870446.2013.782405

Meldrum, R. C., Connolly, G. M., Flexon, J., & Guerette, R. T. (2016). Parental low self-control, family environments, and juvenile delinquency. *International Journal of Offender Therapy and Comparative Criminology*, *60*, 1623–1644. doi: 10.1177/0306624X15584907

Moed, A., Gershoff, E. T., Eisenberg, N., Hofer, C., Losoya, S., Spinrad, T. L., & Liew, J. (2015). Parent-adolescent conflict as sequences of reciprocal negative emotion: Links with conflict resolution and adolescents' behavior problems. *Journal of Youth and Adolescence*, *44*, 1607–1622. doi: 10.1007/s1096401402095

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385–401. doi: https://doi.org/10.1177/014662167700100306 [Database]

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin*, *128*, 330–366.

Rutherford, H. J., Wallace, N. S., Laurent, H. K., & Mayes, L. C. (2015). Emotion regulation in parenthood. *Developmental Review*, *36*, 1–14. doi: 10.1016/j.dr.2014.12.008

Sanders, M. R. (1999). Triple P-Positive Parenting Program: Toward an empirically validated multilevel parenting and family support strategy for the prevention of behavior and

emotional problems in children. *Clinical Child and Family Psychology Review*, *2*, 71–90. https://doi.org/10.1023/A:1021843613840

Streisand, R., Mackey, E. R., & Herge, W. (2010). Associations of parent coping, stress, and well-being in mothers of children with diabetes: Examination of data from a national sample. *Maternal and Child Health Journal*, *14*, 612–617. doi: 10.1007/s10995-009-0497-7

Tangney, J., Baumeister, R., & Boone, A. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*, 271–322.

Weinger, K., O'Donnell, K. A., & Ritholz, M. D. (2001). Adolescent views of diabetes-related parent conflict and support: A focus group analysis. *Journal of Adolescent Health*, *29*, 330–336.

Wiebe, D. J., Berg, C. A., Gelfand, D., Butler, J., Korbel, C., Fortenberry, K. T., & McCabe, J. (2011). Longitudinal associations of maternal depressive symptoms, maternal involvement, and diabetes management across adolescence. *Journal of Pediatric Psychology*, *36*, 837–846.

Wiebe, D. J., Chow, C. M., Palmer, D. L., Butner, J., Butler, J. M., Osborn, P., & Berg, C. A. (2014). Developmental processes associated with longitudinal declines in parental responsibility and adherence to type 1 diabetes management across adoelscence. *Journal of Pediatric Psychology*, *39*, 532–541. doi: 10.1093/jpepsy/jsu006

Wysocki, T., & Gavin, L. (2004). Psychometric properties of a new measure of fathers' involvement in the management of pediatric chronic diseases. *Journal of Pediatric Psychology*, *29*, 231–240.

Wysocki, T., Harris, M. A., Buckloh, L. M., Mertlich, D., Lochrie, A. S., Taylor, A., … White, N. H. (2006). Effects of behavioral family systems therapy for diabetes on adolescents' family relationships, treatment adherence, and metabolic control. *Journal of Pediatric Psychology*, *31*, 928–938.