The Role of Peers for Diabetes Management in Adolescents and Emerging Adults With Type 1 Diabetes: A Longitudinal Study

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OBJECTIVE

The increasing importance of peers in adolescence and emerging adulthood has been widely acknowledged. However, longitudinal research linking the peer context to diabetes management and outcomes is scarce. The present longitudinal study in a large sample of youths with type 1 diabetes related both positive and negative peer variables to diabetes outcomes over a time interval of 1 year.

RESEARCH DESIGN AND METHODS

Our sample consisted of 467 adolescents (14–17 years of age) and emerging adults (18–25 years of age) with type 1 diabetes who participated in a two-wave longitudinal study. Questionnaires tapped into peer support, extreme peer orientation, parental responsiveness, diabetes-related distress, and treatment adherence. HbA_{1c} values were obtained from the treating physicians of patients. Cross-lagged analysis from a structural equation modeling approach was performed to assess the directionality of effects.

RESULTS

Peer support negatively predicted diabetes-related distress over time. Extreme peer orientation positively predicted treatment distress over time. Parental responsiveness negatively predicted food distress over time. Treatment adherence negatively predicted extreme peer orientation, treatment distress, and HbA_{1c} values over time. For emerging adults specifically, there was a reciprocal relationship between HbA_{1c} values and extreme peer orientation because they positively predicted each other.

CONCLUSIONS

This study highlights the importance of peers in predicting the functioning of youths with type 1 diabetes. Additionally, treatment adherence at baseline was found to negatively predict extreme peer orientation, treatment distress, and worse glycemic control over time. In sum, the current study underscores the importance of the peer context for adolescents and emerging adults with type 1 diabetes.

Adolescence constitutes a challenging developmental phase in the life span because adolescents are expected, while undergoing rapid hormonal and physical changes, to become increasingly independent from parents and to develop strong emotional ties with peers (1). On top of these normative expectations, adolescents with type 1 diabetes have to cope with treatment-related daily challenges. These challenges may provide patients with additional stress, possibly resulting in poor treatment adherence and glycemic control (2). A 4-year follow-up study (3) indeed confirmed that as

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adolescents grew older, treatment adherence and glycemic control deteriorated. However, such decreases in self-care are not only of concern during adolescence but characterize patients in their 20s as well (4). In industrialized societies, core developmental tasks of adolescence indeed continue well into the late 20s, a period referred to as emerging adulthood (5). This period is characterized by ongoing explorations and may be experienced as a period of instability and insecurity, besides the many opportunities it provides. As a result of this instability, emerging adults with type 1 diabetes are often not ready to properly manage their diabetes independent from parents (4).

In line with the social-ecological theory developed by Bronfenbrenner (6), the social context has been found to relate to psychological functioning and glycemic control in youths with type 1 diabetes (7). Previous studies have examined the influence that parents may have on their child's disease management and well-being in both adolescents and emerging adults (7). For many youths, however, peers also make up a large part of the social context (6). Moreover, during the transition to adulthood, the pattern of one's social relations becomes redefined as peers gain in importance, whereas parental control further declines (8). Despite an increased orientation toward friends, emerging adults with type 1 diabetes report having fewer friends and experience less friend support than their agemates (7,9). Unfortunately, little research has investigated the unique role of peers and parents for well-being and diabetes-specific functioning (10–12). Further, although qualitative studies have acknowledged the importance of peers in diabetes management (11), quantitative studies are inconclusive, possibly as a result of some of the following study limitations.

First, previous research mainly focused on peer support, whereas other important peer variables were often overlooked. One particularly important variable in this respect is extreme peer orientation, referring to the degree to which fitting in with peers is valued more than performing important age-specific tasks (e.g., performing academically) and managing one's diabetes (13,14). Second, although studies combining both parent and peer variables in the context of type 1 diabetes are scarce, their results underscore the importance of studying parents and peers simultaneously (14,15). By doing so, one can assess their unique relevance to well-being and diabetes-specific functioning. Third, longitudinal research using appropriate statistical methods to examine the directionality of effects is lacking. Such research is important as peer variables in cross-sectional designs are often assumed to be predictors of diabetes-related outcomes (16), without this assumption being formally tested. Finally, past studies have often failed to clearly define the type of support assessed. However, both general versus diabetes-specific and emotional versus instrumental peer support have been shown to differentially relate to treatment adherence and glycemic control (17). In the current study, we measured general emotional support from peers (further referred to as peer support) because this type of peer support is most valued by patients (18). Parental emotional support and warmth (further referred to as parental responsiveness) (19) was measured as the counterpart of general emotional support from peers and has been associated with better treatment adherence (20).

The present longitudinal study sampling adolescents and emerging adults with type 1 diabetes examined how peer support, extreme peer orientation, and parental responsiveness were related to treatment adherence, diabetes-related distress, and glycemic control over a time span of 1 year. Cross-lagged analysis was used to assess the directionality of effects and possible reciprocal mechanisms. In addition, these relations were examined from a developmental perspective, distinguishing between adolescents (14–17 years of age) and emerging adults (18–25 years of age). Because the influence of peers may increase during emerging adulthood, we tentatively expected directional paths involving peer variables to be more pronounced in emerging adults. Overall, peer support and parental responsiveness were expected to negatively predict diabetes-related distress over time (21,22). Extreme peer orientation was hypothesized to negatively predict treatment adherence and to positively predict diabetes-related distress over time.

RESEARCH DESIGN AND METHODS

Participants and Procedure

This study is part of a larger project in which participants were recruited via the Belgian Diabetes Registry (23). Dutch-speaking patients in whom type 1 diabetes had been diagnosed, who were between the ages of 14 and 25 years and were not suffering from impaired cognitive abilities as declared by their parents, qualified for inclusion in the study. A total of 1,450 patients were sent questionnaires. Fifty-three questionnaires did not reach their destination because of a wrong address. A total of 575 patients (response ratio 41.16%) returned completed questionnaires with signed informed consent forms (provided by parents for patients $<$18 years of age). One year later, 574 patients were asked to participate again, and 429 (response ratio 74.73%) completed questionnaires. All participants were rewarded with a cinema ticket each time they participated. For the current study, we only included participants from whom we obtained HbA_{1c} values at time (T) 1 and/or T2. This resulted in data from 467 patients at T1 (53.0% girls) and 353 patients at T2 (54.8% girls). Self-reported characteristics of participants at T1 can be found in Table 1. Across both time points, only 12.97% of scale scores on the study variables were missing. We performed Little's missing-completely-at-random test, which was not significant [$\chi^2(281) = 298.14$, $P = 0.23$], indicating that missing values were likely missing completely at random (24). The current study was institutional review board approved.

Measures

General Emotional Support From Peers

To measure peer support, we used the quality of communication and the degree of trust subscales (eight items) from the Inventory of Parent and Peer Attachment (25). The items were translated to Dutch by Beyers et al. (26). Each item has a 4-point Likert scale ranging from "almost never" to "almost always." A sample item reads as follows: "My friends encourage me to talk about my difficulties." The Cronbach α values were 0.84 at T1 and 0.85 at T2.

Parental Responsiveness

Perceived parental responsiveness from both parents was assessed with the responsiveness scale (seven items) from the Child Report of Parent Behavior Inventory (27). This scale has been used before in a Dutch sample of adolescents and emerging adults (19). Items were answered on a 5-point Likert scale, ranging from "does not apply at all" to "strongly applies." We computed the average of

Table 1—Participants' self-reported characteristics

	T1 (n = 467)
HbA_{1c}	
%[a]	7.7 (1.4)
mmol/mol[a]	61 (15.3)
Sex	
Boys	47.1%
Girls	52.9%
Age, years[a]	18.6 (3.4)
Mean age at diagnosis, years[a]	11.4 (5.6)
Illness duration, years[a]	7.1 (4.8)
Insulin administration[b]	
Injection	79.5%
Pump	20.5%
Civil status (>1 option)	
Living with parents	72.5%
Living with partner/ (re)married	7.0%
Relationship (living separately)	22.1%
Single	12%
Work	
Student	76.2%
Working	18.8%
Unemployed	4.0%
Education	
University or college	19.7%
General secondary education	32.5%
Technical or vocational education	34.3%
Primary education	7.0%
Unqualified	2.8%

[a]Mean value with SD between brackets.
[b]Coded as 0 = insulin injection; 1 = insulin pump.

the mother and father scores. A sample item reads as follows: "My mother/father makes me feel better after discussing my worries with her/him." The Cronbach α values were 0.88 and 0.91 at T1 and 0.90 and 0.91 at T2 for mother and father, respectively.

Extreme Peer Orientation

The Extreme Peer Orientation questionnaire was developed by Fuligni and Eccles (13) and was supplemented with diabetes-relevant items by Drew et al. (14). The items were translated to Dutch using the back-translation procedure. Patients answered seven items on a 4-point Likert scale, ranging from "almost never" to "almost always." A sample item reads as follows: "Would you ignore your diabetes management needs in order to make someone like you?" The Cronbach α values were 0.71 at both T1 and T2.

Diabetes-Related Distress

Diabetes-related food, treatment, and emotional distress were assessed using three subscales of the Problem Areas in Diabetes (PAID) scale (28). These subscales consisted of 18 items in total with four response options each, ranging from "not a problem" to "a serious problem." The PAID scale and its subscales have been validated in a Dutch sample (29) and have been used in emerging adults as well (23). Sample items for each subscale include the following: "Feelings of deprivation regarding food and meals" (food, 3 items), "Feeling discouraged with your diabetes regimen" (treatment, 3 items), and "Feeling constantly burned out by the constant effort to manage diabetes" (emotional, 12 items). The Cronbach α values were 0.73, 0.75, and 0.93 at T1 and 0.74, 0.75, and 0.92 at T2, respectively.

Treatment Adherence

Treatment adherence during the past month was measured via the Self-Care Inventory (30). This scale consists of 14 items with six response options each, ranging from "never do it" to "always do this as recommended without fail," with an additional "not applicable" response option. We omitted the item "wearing a medic alert ID" because this is not standard practice in Belgium, leaving the scale with 13 items. The Self-Care Inventory was translated to Dutch using the back-translation procedure. The Cronbach α values were 0.74 at T1 and 0.75 at T2.

Glycemic Control

HbA_{1c} values in an approximate time frame of 3 months before or after questionnaire completion were obtained from patients' treating physicians. HbA_{1c} values are reported as both Diabetes Control and Complications Trial (DCCT)-derived units (%) and International Federation of Clinical Chemistry and Laboratory Medicine–recommended units (mmol/mol). Healthy values, as indicated by the American Diabetes Association (31), are considered to be <7.0% or 53 mmol/mol in adults and <7.5% or 58 mmol/mol in adolescents.

Statistical Analyses

To examine mean differences at T1, we performed two MANOVAs using the Wilks lambda test. We used Pearson correlations to examine within-time associations. To assess the directionality of effects, cross-lagged analyses from a structural equation modeling approach were performed, using R version 3.3.1 and the R package lavaan 0.5–22. Because Little's missing-completely-at-random test was not significant, we used the full information maximum likelihood procedure, which produces more reliable results than more classical approaches such as listwise deletion (32). Our cross-lagged design controls for all within-time associations and stability paths in estimating prospective paths. Additionally, we controlled for sex, age, illness duration, living situation, and type of insulin administration. Standard model fit indices were used to asses model fit: a root mean square error of approximation (RMSEA) <0.08, a standardized root mean square residual <0.09, a comparative fit index (CFI) >0.90, and χ^2 value as small as possible (33). Because of our large sample size, the χ^2 value was divided by its corresponding df value, resulting in the normed χ^2, which should be <5 (34). The models were estimated using the robust maximum likelihood estimation to model non-normal data. As a sensitivity analysis, the primary cross-lagged analysis was repeated in the 353 participants who participated at both T1 and T2, and the results were virtually identical to those reported below.

Additionally, we performed two multigroup analyses to investigate whether age at baseline (dummy coded with 0 = adolescents/14–17 years of age; 1 = emerging adults/18–25 years of age) or sex (0 = boys; 1 = girls) moderated the cross-lagged path estimates. Comparative fit indices were used to assess whether the freely estimated model outperformed the fixed model. This is the case when $\Delta\chi^2$ is significant ($P < 0.05$), ΔCFI exceeds 0.01, and ΔRMSEA exceeds 0.015.

RESULTS

Participant Characteristics

Baseline participant characteristics can be found in Table 1. The mean HbA_{1c} value was 7.7% (61 mmol/mol) in our sample, which is slightly above the recommended value for adolescents with diabetes (7.5% or 58 mmol/mol) (31). The mean participant age was 18.6 years, with a mean illness duration of 7.1 years. Almost 80% of patients injected their insulin, whereas the rest used an insulin pump. Most patients (72.5%) lived with their parents. Concerning work status, 76.2% of patients were students, 18.8% had a job, and 4% were unemployed. Concerning education, 19.7% of patients had a university

or college degree, 66.8% of patients had a general secondary, technical, or vocational education degree, and 9.8% had a primary education degree or were unqualified. When interpreting these results, one should note that many of these youths are still enrolled in school to obtain a degree.

Mean-Level and Correlational Analyses

The MANOVA with type of insulin administration as an independent variable did not point to significant mean differences in the study variables (Wilks lambda 0.977; $F_{(8,358)} = 1.03$, $P = 0.411$, $\eta^2 = 0.02$). The MANOVA with sex as an independent variable pointed to significant multivariate group differences (Wilks lambda 0.910; $F_{(8,361)} = 44.457$, $P < 0.001$, $\eta^2 = 0.09$). Follow-up univariate analyses are displayed in Table 2. Girls scored higher than boys on peer support, emotional distress, and food distress. Boys scored higher than girls on extreme peer orientation.

With respect to age and illness duration at T1, there were significant positive correlations between emotional distress and age ($r = 0.11$, $P = 0.017$) and between HbA_{1c} values and illness duration ($r = 0.11$, $P = 0.027$). Significant negative correlations were found between parental responsiveness and age ($r = -0.10$, $P = 0.040$), treatment adherence and age ($r = -0.20$, $P < 0.001$), food distress and illness duration ($r = -0.13$, $P = 0.004$), and treatment adherence and illness duration ($r = -0.11$, $P = 0.021$). Additional within-time associations among the variables at T1 and T2 are presented in Table 3. All study variables were significantly correlated with each other at T1. Extreme peer orientation was positively related to HbA_{1c} values and diabetes-related distress but was negatively related to treatment adherence and peer support. Peer support was negatively related to all variables except for treatment adherence and parental responsiveness, with which it was positively related. At T2, these associations remained highly similar, except that the associations between peer support on the one hand and treatment distress, treatment adherence, and HbA_{1c} values on the other hand became nonsignificant. The association between parental responsiveness and HbA_{1c} values was also not significant at T2.

Cross-Lagged Analyses

The main model fitted the data adequately ($\chi^2(8) = 23.42$; $P = 0.003$; χ^2/df = 2.93; RMSEA 0.066; standardized root mean square residual 0.021; CFI 0.994). All significant standardized cross-lagged estimates and stability coefficients are displayed in Fig. 1. For reasons of parsimony, within-time associations and paths from the control variables to the study variables are not displayed. With respect to the cross-lagged paths, peer support at T1 predicted relative decreases in emotional, food, and treatment distress at T2. In addition, parental responsiveness predicted relative decreases in food distress at T2. Furthermore, extreme peer orientation at T1 predicted relative increases in treatment distress at T2. Finally, treatment adherence at T1 predicted relative decreases in extreme peer orientation, treatment distress, and HbA_{1c} values at T2.

The fixed model where paths were constrained to be equal between boys and girls ($\chi^2(66) = 91.70$, $P = 0.020$; CFI 0.990; RMSEA 0.043) was compared with a free model where paths were allowed to differ ($\chi^2(20) = 32.90$, $P = 0.035$; CFI 0.995; RMSEA 0.055). None of the three fit indices indicated a significantly better fit of the free model over the fixed model ($\Delta\chi^2(46) = 58.78$, $P = 0.098$; ΔCFI 0.005; ΔRMSEA 0.012), indicating that sex did not moderate the cross-lagged path estimates. Further, the fixed model where paths were constrained to be equal between adolescents and emerging adults ($\chi^2(66) = 125.77$, $P < 0.001$; CFI 0.978; RMSEA 0.064) was compared with a free model where paths were allowed to differ between age-groups ($\chi^2(20) = 38.36$, $P = 0.008$; CFI 0.993; RMSEA 0.066). All fit indices, except for the ΔRMSEA, indicated a significantly better fit of the free model over the fixed model ($\Delta\chi^2(46) = 87.40$, $P < 0.001$; ΔCFI 0.015; ΔRMSEA 0.002), suggesting that at least some paths of the cross-lagged model were moderated by age. Follow-up analyses indicated that three paths were significantly different between adolescents and emerging adults. Food distress at T1 positively predicted HbA_{1c} values at T2 for adolescents ($\beta = 0.195$, $P = 0.037$) but not for emerging adults. Additionally, extreme peer orientation at T1 positively predicted HbA_{1c} values at T2 for emerging adults ($\beta = 0.135$, $P = 0.020$) but not for adolescents. HbA_{1c} values at T1, in turn, positively predicted extreme peer orientation at T2 for emerging adults ($\beta = 0.165$, $P = 0.025$) but not for adolescents.

Table 2—Univariate ANOVAs for sex at T1

Variable at T1	Boys	Girls	*F* value (df = 1;397)	*P* value	η^2
Peer support	2.97 (0.54)	3.18 (0.56)	16.60***	<0.001	0.035
Parental responsiveness	3.90 (0.71)	3.90 (0.78)	0.01	0.907	<0.001
Extreme peer orientation	1.45 (0.43)	1.37 (0.33)	4.22*	0.041	0.009
Emotional distress	1.02 (0.85)	1.36 (0.91)	17.40***	<0.001	0.036
Treatment distress	0.84 (0.95)	0.99 (0.93)	2.69	0.100	0.006
Food distress	1.12 (0.91)	1.31 (0.95)	4.75*	0.030	0.010
Treatment adherence	3.79 (0.51)	3.74 (0.55)	1.32	0.250	0.003
HbA_{1c}					
%	7.73 (1.5)	7.75 (1.3)	0.02	0.880	<0.001
mmol/mol	61 (16.4)	61 (14.2)			

Values are mean (SD), unless otherwise indicated. *$P < 0.05$; ***$P < 0.001$.

CONCLUSIONS

The present longitudinal study in a large sample of adolescents and emerging adults with type 1 diabetes identified prospective associations linking peer and parent variables to diabetes-related distress, treatment adherence, and glycemic control over time. The current study underscores the need to focus on the peer context to understand the functioning of youths with type 1 diabetes.

Regarding our preliminary analyses, in line with previous literature, girls reported more peer support and diabetes-related emotional and food distress (9,29,35); boys reported more extreme peer orientation. Although sex differences in extreme peer orientation have not been investigated before, this finding seems to fit in with research on impulsivity (36). Indeed, not complying with treatment regimens to fit in with peers may be tempting in the short term but harmful

Table 3—Within-time correlations among study variables at T1 and T2

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Peer support		0.29***	−0.16***	−0.16***	−0.14**	−0.21***	0.16***	−0.10*
2. Parental responsiveness	0.30***		−0.20***	−0.19***	−0.20***	−0.21***	0.33***	−0.13*
3. Extreme peer orientation	−0.16**	−0.24***		0.30***	0.23***	0.27***	−0.27***	0.26***
4. Emotional distress	−0.22***	−0.26***	0.24***		0.71***	0.71***	−0.30***	0.15**
5. Treatment distress	−0.09	−0.20***	0.24***	0.70***		0.51***	−0.29***	0.16**
6. Food distress	−0.33***	−0.32***	0.22***	0.70***	0.49***		−0.25***	0.12*
7. Treatment adherence	0.07	0.26***	−0.30***	−0.21***	−0.22***	−0.15**		−0.27***
8. HbA_{1c} values	0.05	−0.05	0.20***	0.17**	0.29***	0.16**	−0.21***	

Coefficients above and below the diagonal are respectively for T1 and T2. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

in the long term, and boys may be less sensitive to long-term consequences (36). Future research could further explore sex differences in extreme peer orientation and its implications for diabetes management.

Second, somewhat in line with patient reports in qualitative studies (21,22), peer support negatively predicted the three subscales of the PAID over time, pointing to the importance of peers to diabetes-specific functioning. These effects were present when parental responsiveness was included as well, emphasizing the unique importance of peer support. With respect to treatment adherence and glycemic control, neither peer support nor parental responsiveness were predictive. For peer support, this finding is in line with previous literature (3,11). Parental responsiveness, however, has been related to treatment adherence over time in a previous study (20). More research is thus needed to investigate potential prospective effects of parental responsiveness on diabetes-specific functioning. The finding that general emotional peer support may protect against diabetes-related distress in youth with type 1 diabetes over time seems to be in contrast with previous research on social support and diabetes outcomes. Two studies (16,17) indeed identified negative influences of diabetes-specific and instrumental peer support on diabetes-specific functioning. However, when it comes to peers, patients may benefit more from general support than from diabetes-specific support because the latter may be experienced as intrusive in some instances (17). Hence, research not only needs to distinguish between sources of support (i.e., peers vs. parents) but also between types of support (e.g., emotional vs. instrumental) because of the differential influences they may have on diabetes outcomes.

The lack of prospective associations between social support and treatment adherence and glycemic control may be partially a result of our sample, which consisted mostly of white, well-educated patients. Recent literature suggests that social support may be important in avoiding poor health outcomes, especially in minority youth (37) or youth from families with low socioeconomic status (38). Hence, future research could explore the role of variables such as income and care access in linking social support to diabetes functioning. In addition, because emotional support by peers and parents was associated with (diabetes-related) distress but not so much with treatment adherence or glycemic control, future research could focus more on mental health as outcomes of emotional support. Past research (11) studying the influence of peers on diabetes outcomes mainly focused on treatment adherence and glycemic control and indeed failed to find consistent effects, except for peer conflict. Factors other than emotional support may explain more variance in treatment adherence and glycemic control (e.g., mental health and parental diabetes-specific support) (3,12).

Third, the influence of peers on diabetes outcomes was not only positive (9). Extreme peer orientation predicted experienced treatment distress 1 year later. Further, although extreme peer orientation did not predict treatment adherence over time, treatment adherence negatively predicted extreme peer orientation, treatment distress, and HbA_{1c} values over time. Constructs like coping

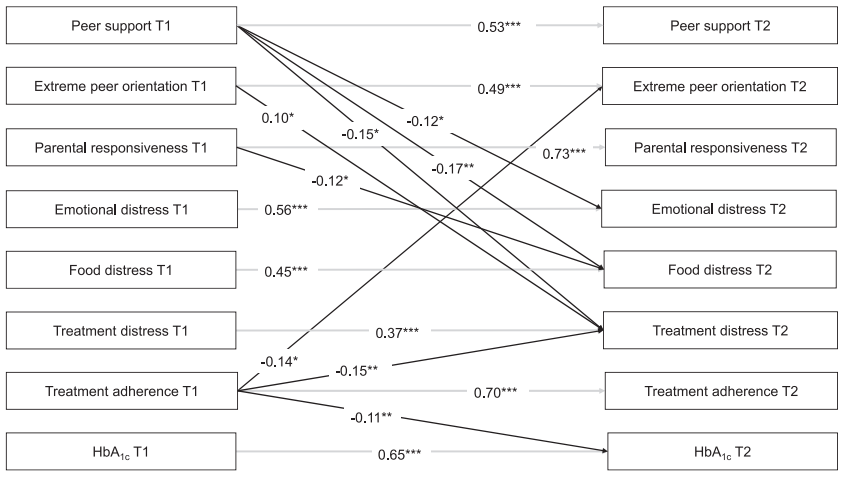

Figure 1—Cross-lagged model linking peer support, extreme peer orientation, parental responsiveness, diabetes-related distress, treatment adherence, and HbA_{1c} values over time. For reasons of clarity, within-time associations and paths from the control variables (sex, age, illness duration, living situation, and type of insulin administration) are not presented in the figure. All coefficients are standardized. Paths that are moderated by age-group can be found in the body of the main text. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

or illness self-concept may underlie the pathway from treatment adherence to extreme peer orientation (2,23,39). For instance, patients that fail to adhere to their treatment may reject their diabetes as part of their sense of self (23) and, consequently, may deem their treatment to be less important than fitting in with peers (39). Future research could indeed examine whether variables such as illness self-concept mediate this relation. Further, some directional paths were moderated by age. In our subsample of emerging adults, there was a reciprocal relationship over time between extreme peer orientation and HbA_{1c} values, with more extreme peer orientation predicting higher HbA_{1c} values, and vice versa. Because of the decline of parental involvement and increasing peer involvement in the lives of emerging adults (8), parental involvement may diminish adverse effects of extreme peer orientation on diabetes management in adolescents but not so much in emerging adults. With respect to the reverse pathway (i.e., from HbA_{1c} values to extreme peer orientation), worse glycemic control has been found to predict avoidant coping strategies over time (2). Patients' extreme peer orientation may be symptomatic for such an avoidant way of coping with their disease because being too oriented toward peers may make individuals refrain from engaging in necessary treatment regimens. Because this was the first study to assess extreme peer orientation in emerging adults with type 1 diabetes, future studies should replicate our findings and provide more insight into the occurrence of specific mechanisms.

Clinical Implications

Provided that the present results can be replicated longitudinally using more intensive longitudinal designs, the multidisciplinary clinical team should, apart from focusing on parents, pay attention to patient-peer interactions as well. Because we found that a higher level of emotional support from peers was predictive of less diabetes-related distress, positive peer interactions should be monitored and encouraged. In addition, the finding that treatment adherence predicted both extreme peer orientation and treatment distress over time suggests the value of acquiring stable treatment adherence. Helping patients in accepting their disease and acquiring adequate treatment adherence may prevent them from experiencing treatment distress and neglecting treatment in favor of fitting in with peers. Furthermore, as an undesirable reciprocal relationship between extreme peer orientation and glycemic control was obtained for emerging adults, it seems important to monitor patients who value fitting in with peers at the expense of managing their diabetes. Hence, treating clinicians should pay attention especially to emerging adults' relations with peers because emerging adults scoring high on extreme peer orientation seem to be increasingly at risk for poor glycemic control over time. One way to anticipate this circumstance may be through raising awareness of type 1 diabetes in patients' schools. In doing so, patients may disclose their illness more easily to their peers and be less inclined toward neglecting their treatment in favor of fitting in with their agemates (10). If patients receive little peer support and/or are highly oriented toward peers at the expense of their diabetes management, these patients may benefit from peer support interventions such as the one described by Fisher et al. (40). In this type of intervention, patients receive both emotional and instrumental support from other patients with diabetes so that patients can learn to benefit from peer support without having the risk of neglecting their treatment in favor of fitting in with their peers. Additionally, patients are encouraged to develop emotional support skills, which they may use to form emotional bonds with peers who also do not have diabetes. Relatedly, because higher treatment adherence predicted less extreme peer orientation and treatment distress, optimizing patients' treatment adherence at an early age may help patients to cope with their treatment and may make them less inclined to neglect their treatment in favor of fitting in with peers. If patients feel confident about their illness and the accompanying treatment, the possible tension between adhering to the treatment and fitting in with peers that some youth struggle with may decrease (14).

Study Limitations

Some study limitations should be taken into account when interpreting the results. First, our design does not allow us to infer causality because other variables that are not included in the model may modulate the prospective relations obtained. Second, our sample was rather homogeneous concerning race, educational level, and type of insulin administration. In addition, our initial response rate (41.16%) was rather low, limiting the generalizability of our results. However, according to data from the Belgian Diabetes Registry, the mean glycemic control values in our sample (mean HbA_{1c} 7.7% [61 mmol/mol]) were representative of the total population of youth with type 1 diabetes in the registry (median HbA_{1c} 7.8% [62 mmol/mol]; n = 3,885). Except for HbA_{1c} values, we did not have access to other characteristics of nonresponders because of ethical considerations. Third, all measures, except for glycemic control, were based on self-reports, which could induce shared method variance. Hence, future research could include peer and parent reports to assess key variables. Fourth, our time interval of 1 year may have been too long to capture relevant mechanisms between the study variables because some effects may operate only in the short term. For example, extreme peer orientation may affect treatment adherence mainly during schooldays and not so much on weekends when parents are around (41). Hence, future studies should use more intensive prospective designs, such as diary or ecological momentary assessment.

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