ann. behav. med. (2020) XX:1–11
DOI: 10.1093/abm/kaaa025

REGULAR ARTICLE

A Person-Centered Perspective on the Role of Peer Support and Extreme Peer Orientation in Youth with Type 1 Diabetes: A Longitudinal Study

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Published online: 24 April 2020

Abstract

Background Despite clear evidence that peers are crucial for youth development, research on the role of peers for youth with Type 1 diabetes (T1D) is scarce.

Purpose The present study identified trajectory classes of perceived peer functioning in youth with T1D, based on peer support and extreme peer orientation (EPO). Further, classes were compared with respect to their trajectories of depressive symptoms, diabetes-specific distress, treatment adherence, and HbA_{1c} values.

Methods Five hundred and fifty-nine youth (14–25 years) with T1D completed questionnaires at baseline, 1, 2, and 3 years later. Latent class growth analysis identified classes of perceived peer functioning. Multigroup latent growth curve modelling assessed whether these classes were characterized by different trajectories of general and diabetes-specific functioning.

Results A socially normative class (48%) was characterized by trajectories of high support and low EPO over time. A socially reserved class (29%) was characterized by low support and EPO, and a socially oriented class (17%) by high support and EPO. Finally, a socially vulnerable class (6%) was characterized by low support and high EPO. The normative class functioned significantly better over time than the other classes. The vulnerable class functioned significantly worse compared to the reserved class, despite experiencing equally low levels of support.

Conclusions The results underscore the need to take youths' orientation toward the peer context into account alongside support when tapping into the role of peers, because individuals with low levels of support and EPO functioned substantially better than individuals with similar low levels of support but high levels of EPO.

Keywords Type 1 diabetes · Youth · Peers · Emotional support · Extreme peer orientation · Person-centered

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Having Type 1 diabetes during adolescence and emerging adulthood is challenging. Adolescents are expected to become increasingly independent from parents and form strong emotional ties with peers, while undergoing substantial psychological, hormonal, and bodily changes. Emerging adults are expected to commit to a career path, decide on a place of residence, and engage in a romantic relationship, all being life choices that may impact one's social relationships [1, 2]. As managing diabetes is a demanding and time-intensive task, being confronted with such normative challenges may interfere with a healthy adjustment to

diabetes. The daily intensive treatment accompanying Type 1 diabetes, in turn, may interfere with achieving normative challenges. In line with socioecological theorizing, feeling supported by significant others is thus vital in navigating these challenges [3].

From adolescence onward, youth spend increasingly more time with peers, while parental monitoring and involvement declines [4, 5]. In general, strong emotional bonds with peers contribute positively to socioemotional development and well-being [4, 6]. Conversely, not receiving the emotional support one needs or being ignored by peers may lead to physical and emotional ill-being [7, 8]. Studies have shown that peers play a major role in the onset and continuation of health risk behaviors as well [9, 10]. This is particularly relevant in studying chronic illness, due to the vital importance of adhering to treatment guidelines. In qualitative accounts, youth with Type 1 diabetes have indicated that their peers can both be helpful for and interfere with diabetes self-care and well-being [11]. However, quantitative research is lagging behind and there is no consensus in the literature on when and how exactly peers may affect self-care and well-being. Developing a better understanding of linkages is important for both theory and clinical practice; hence, more research is needed on the role of peers for youth with Type 1 diabetes [12].

The decline of parental involvement in youths' lives and diabetes management increases the opportunity for peers to impact diabetes management, both positively and negatively [13]. Most quantitative research to date investigated associations between peer support, treatment adherence, and glycemic control, but mixed findings have emerged [14]. Some studies found beneficial effects of peer support on diabetes management, whereas other studies found no association or even an association in the opposite direction. Tapping into negative indicators of the peer context alongside positive ones (such as support) may provide a broader perspective on the role of peers. Similarly, a focus on well-being alongside diabetes management may increase our understanding on this topic as well.

Peers have been identified by patients as important providers of general emotional support [15]. Emotional support comprises behaviors that provide comfort, affirmation, or communicate caring [14]. Previous studies found a positive relation between emotional support, well-being, and physical functioning in healthy and diabetes samples [7, 14, 16]. In a previous manuscript, bidirectional relationships among peer variables and diabetes outcomes were investigated at time points 1 and 2 in the present sample. General emotional support was found to predict less diabetes-specific distress over time. Support did not predict glycemic control and treatment adherence [17]. Peers have been found to affect diabetes management in a negative way as well [18]. One important variable in this respect is extreme peer orientation, which refers to the degree to which important age- and diabetes-specific tasks, such as treatment adherence, are neglected in favor of fitting in with peers [19]. Extreme peer orientation is somewhat similar to unmitigated communion which also captures the degree of being overinvolved with peers at the expense of taking care of oneself [18]. Both extreme peer orientation and unmitigated communion were found to predict worse glycemic control throughout adolescence [18, 20]. In emerging adults of the present sample, extreme peer orientation was found to positively predict HbA_{1c} values, and HbA_{1c} values, in turn, positively predicted extreme peer orientation [17].

In summary, having a supportive peer network during adolescence and emerging adulthood may help youth with diabetes in transitioning through these challenging life phases. When youth experience difficulties relying upon their peer context for emotional support, and/or when youth experience an extreme need to fit in with peers, general and diabetes-specific functioning may be at risk. The present study extends the findings reported in the manuscript by Raymaekers, Oris, Prikken, Moons, Goossens, Weets, and Luyckx [17] by charting trajectory classes of perceived peer functioning and investigating how they relate to trajectories of general and diabetes-specific functioning across four time points (spanning 3 years) in a large sample of adolescents and emerging adults.

The Present Study

The research objectives of the present study were twofold. First, a person-centered perspective was applied to assign individuals to trajectory classes of perceived peer functioning, based on levels of perceived support and extreme peer orientation over time. Whereas the primary goal of a variable-centered approach is charting relationships among variables, the aim of a person-centered approach is to identify distinct behavioral profiles of scores based on a single variable or on a combination of two or more variables (of which time can be one). Substantial heterogeneity among behavioral profiles is to be expected at the level of individuals. From a global viewpoint, however, such behavioral heterogeneity may be captured into a parsimonious number of classes consisting of profiles that are more alike within classes than between classes [21, 22]. Second, a variable-centered approach was applied to investigate whether individuals belonging to different classes differed from each other with respect to developmental trajectories of general and diabetes-specific functioning over time. Thus, person- and

variable-centered approaches were combined to obtain a detailed picture on the role of peers.

Due to the data-driven nature of identifying these developmental trajectory classes [21], it was unclear how many classes and which specific classes would emerge. Based on general developmental theorizing [5], at least two classes were expected to emerge. The majority of these youth were expected to function adaptively with respect to the peer context, that is, they would experience high peer support without being extremely oriented toward peers over time (a socially normative class). These youth, in turn, were expected to have less depressive symptoms, diabetes-specific distress, lower HbA_{1c} values, and better treatment adherence over time. However, a smaller part of the sample was expected to experience low levels of emotional support but high levels of extreme peer orientation over time. This socially vulnerable class was expected to have more depressive symptoms, diabetes-specific distress, higher HbA_{1c} values, and worse treatment adherence.

Research Design and Methods

Participants and Procedure

Data were used from a larger project in which patients were addressed via the Belgian Diabetes Registry [17]. Ethical approval was provided by the Medical Ethics Committee and Social and Societal Ethics Committee of KU Leuven. Dutch-speaking youth (14–25 years) with Type 1 diabetes and without cognitive impairment annually completed questionnaires at home, resulting in four data time points. At baseline, 1,450 patients were sent a mail package including questionnaires, informed consent forms, and stamped return envelopes (53 packages were returned due to wrong addresses and 5 additional patients were excluded due to cognitive impairments). For minors, parents provided written consent. Participants were rewarded a cinema ticket at each time point. At baseline [T(ime)1], 571 bundles were returned, of which 559 cases were eligible for analysis (response rate = 41%). For the following time points, patients were invited when they participated in at least one of the previous time points. This resulted in 422 participants at Year 1 (T2; RR = 75%), 381 at Year 2 (T3; RR = 68%), and 324 at Year 3 (T4; RR = 58%). In the present study, all available data were used (n = 559), except for analyses involving HbA_{1c}, for which only cases were used from which at least one HbA_{1c} value was available (n = 486). Table 1 summarizes participants' characteristics at baseline for the full sample and for the restricted sample, excluding cases without HbA_{1c} value.

Table 1. Participants' Characteristics at Baseline

	All participants (n = 559)	With HbA_{1c} (n = 486)
HbA_{1c} %[a]	—	7.7 (1.4)
mmol/mol[a]	—	61 (15.3)
Sex		
Male	46.0%	46.5%
Female	54.0%	53.5%
Age[a]	18.6 (3.2)	18.7 (3.3)
Mean age at diagnosis[a]	11.2 (5.5)	11.4 (5.6)
Illness duration[a]	7.6 (5.0)	7.2 (4.9)
Insulin administration		
Injection	78.8%	79.1%
Pump	21.2%	21.0%
Civil status (more than one option)		
Living with parents	72.9%	74.5%
Living with partner/ (re)married	7.3%	6.5%
Relationship (living separately)	23.8%	23.2%
Living alone	12.4%	12.1%
Work		
Student	76.7%	78.2%
Working	19.8%	18.8%
Unemployed	3.5%	3.0%
Education		
University or university college	21.0%	21.1%
General secondary education	33.9%	34.0%
Technical or vocational education	36.5%	35.1%
Primary education	6.1%	7.0%
Unqualified	2.6%	2.8%

[a]Mean value with standard deviation between brackets.

Measures

General emotional support from peers

The peer-related "quality of communication" and "degree of trust" subscales (eight items) from the Inventory of Parent and Peer Attachment were used to measure general emotional support from peers ([23]; Dutch translation by Beyers, Goossens, Vansant and Moors [24]). Answers were scored on a four-point Likert scale ranging from "almost never" (1) to "almost always" (4). A sample item reads: "My friends encourage me to talk about my difficulties." Cronbach's alpha was .84 at T1 and T4, and .85 at T2 and T3.

Extreme peer orientation

To measure Extreme Peer Orientation, a questionnaire developed by Fuligni and Eccles [25] that was supplemented with three diabetes-specific items [19] was used. The questionnaire (seven items) was translated using the back-translation procedure. Items were answered on a four-point Likert scale ranging from "almost never" (1) to "almost always" (4). A sample item reads "Would you ignore your diabetes management needs in order to make someone like you?." Cronbach's alpha was .71 at T1, .73 at T2, .72 at T3, and .76 at T4.

Diabetes-related distress

The Problem Areas in Diabetes Scale (PAID; 20 items; [26]; Dutch version [27]) was used to measure diabetes-related distress. For the present analyses, we omitted the "lack of social support" subscale, to avoid inflated estimates for the association between diabetes-related distress and the peer variables. Items tap into the degree to which patients experienced food-, emotional-, and treatment-related problems. Patients answered on a five-point Likert scale ranging from "not a problem" (0) to "a serious problem" (4). Cronbach's alpha was .94 at T1, T2, and T4, and .95 at T3.

Depressive symptoms

Depressive symptoms were measured using the Center for Epidemiologic Studies Depression scale (CES-D; 20 items; [28]). Items were answered on a four-point Likert scale ranging from "seldom or never" (0) to "most of the time or always" [3]. Cronbach's alpha was .93 at T1 and T4, .92 at T2, and .94 at T3.

Treatment adherence

The Self-Care Inventory was used to measure treatment adherence during the past month [29]. The item "wearing a medic alert ID" was omitted from the questionnaire as such an ID in Belgium is uncommon, leaving the scale with 13 items. Items were answered on a five-point Likert scale from "never do it" (1) to "always do this as recommended without fail" (5). An additional "not applicable" option was also available. Cronbach's alpha was .76 at T1, .77 at T2 and T3, and .73 at T4.

Glycemic control

HbA_{1c} values obtained within a time frame of three months before or after questionnaire completion were used as an indicator of glycemic control. They were obtained via patients' treating endocrinologists. Following a statement by the American Diabetes Association, values below 7.0% in adults and 7.5% in children are considered healthy [30]. Analyses involving HbA_{1c} were conducted on a restricted dataset including participants of whom at least one HbA_{1c} value was obtained at any of the time points (n = 486).

Statistical Analyses

Research objective 1: Identifying perceived peer functioning classes

All models were estimated with maximum likelihood estimation with robust standard errors (MLR) to account for non-normality and analyses were conducted in Mplus 7.0. Multivariate latent class growth analysis (LCGA; 21) was conducted to identify trajectory classes of peer support and extreme peer orientation. Utilizing four repeated measures of both extreme peer orientation and peer support as indicators, a unique initial level (intercept) and rate of change (slope) for both variables were estimated in each class separately. To decide upon the number of classes, models from one up to five classes were estimated. The final decision was based on combining a priori theorizing, model parsimony, and the following four criteria [31]. First, the Bayesian Information Criterion (BIC) for a solution with k classes should be lower than for a solution with k-1 classes. Second, Entropy (E) indicates the degree to which subjects are correctly classified. Values of .75 and higher indicate accurate classification [32]. Third, a significant p-value for the bootstrap likelihood ratio test (b-LRT) indicates added value of k classes over k-1 class. Finally, each class should comprise a minimum of 5% of the sample size.

To explore whether gender, type of insulin administration (pump/injection), illness duration, and age were differently distributed among the four classes, additional analyses were performed. Chi-squared tests of independence were performed to analyze the associations with categorical variables (i.e., gender and type of insulin administration), and multivariate analysis of variance were performed to analyze the association with the continuous variables. Finally, as the role of peers and their significance may change across adolescence and emerging adulthood [2], a sensitivity analysis was performed to investigate whether obtained classes would differ when including age in the modeling of these classes. Hence, LCGA was repeated, but now with age at baseline included in the model in addition to the slopes and intercepts of peer support and extreme peer orientation.

Research objective 2: Associations with functioning

Multigroup latent growth curve modeling (LGCM) was performed to assess whether classes differed in their trajectories of depressive symptoms, diabetes-specific distress, treatment adherence, and glycemic control. First, unconstrained latent growth models with intercepts and

slopes freely estimated across classes were estimated for each variable. Adequate model fit is reflected by the root mean square error of approximation (RMSEA) below .08, the standardized root mean square residual (SRMR) below .10, the comparative fit index (CFI) above .90, and the χ^2 value as small as possible [33]. Second, a constrained model with fixed intercepts and slopes across classes was compared to the unconstrained model. A significant worse model fit of the constrained model over the unconstrained model indicates meaningful differences between classes with respect to the trajectory of the outcome variable. A significant difference is reflected by a significant Yuan-Bentler scaled $\Delta\chi^2$. Finally, in case of such a significant difference, intercepts and slopes were fixed in a pairwise fashion across classes to uncover which specific classes significantly differed from each other with respect to development of the outcome variables.

Results

Identifying Perceived Peer Functioning Classes

Model fit indices favored a four-class solution (BIC = 3356.18; E = .80) over a three-class solution (BIC = 3457.20; E = .79), with a b-LRT significant at $\alpha = .001$. Despite somewhat better fit indices, the five-class solution was not chosen, as one class consisted of only 3% of the sample. Class 1 ($n = 276$) was labeled as "socially normative," as it consisted of 49% of the sample with relatively high scores for support and low extreme peer orientation over time. Class 2 ($n = 33$) was labeled as "socially vulnerable" because it had low levels of support and high levels of extreme peer orientation over time. Class 3 ($n = 156$) was labeled as "socially reserved" as it was characterized by low levels of support and extreme peer orientation over time. Class 4 ($n = 94$) was labeled as "socially oriented," because of its elevated levels of support and extreme peer orientation over time. LCGA was repeated in the restricted HbA_{1c} sample, and results were virtually identical. Figure 1 (LCGA panel) displays the estimated linear trajectories of peer support and extreme peer orientation for each class. Table 2 displays the estimated mean intercept and slope terms. The nonsignificant slopes in each class indicated that both peer support and extreme peer orientation remained stable over time in all classes. There were gender differences among the classes ($\chi^2(3) = 22.47$, $p < .001$). Women were overrepresented in the socially normative class (64%), and somewhat underrepresented in the socially vulnerable (42%), reserved (44%), and oriented (45%) classes. There were no significant differences among the classes with respect to insulin administration type (pump/injection; $\chi^2(3) = 1.28$, $p = .73$), and age and illness duration (F (3,551) = .99, $p = .56$. Finally, the LCGA including age at baseline showed that peer classes scoring relatively high on extreme peer orientation (i.e., vulnerable and oriented) had slightly lower age than peer classes scoring relatively low on extreme peer orientation (i.e., normative and reserved). However, the LCGA with age resulted in the same amount and type of classes as in the LCGA without age (results not shown). These findings indicate that the peer classes do not differ across age.

External Developmental Correlates

Baseline multigroup LGCM estimates can be found in Table 4. Figure 1 (LGCM Panel) displays the final multigroup trajectories for depressive symptoms, diabetes-specific distress, treatment adherence, and HbA_{1c} values. The depressive symptoms model had adequate fit ($\chi^2(24) = 35.57$, $p = .060$; RMSEA = .059, 90% CI [0, 0.097]; CFI = .97; SRMR = .073). Fit indices for multigroup comparisons can be found in Table 3. Multigroup analyses indicated that slopes could be fixed, and intercepts could not be fixed across classes. The socially vulnerable class scored significantly higher on depressive symptoms than the socially oriented, socially reserved, and socially normative classes. There were no significant differences between the socially reserved and socially oriented classes. The socially normative class, in turn, scored significantly lower on depressive symptoms compared to the socially reserved and socially oriented classes.

With respect to diabetes-specific distress, multigroup LGCM indicated adequate fit ($\chi^2(20) = 28.28$, $p = .103$; RMSEA = .055, 90% CI [0, 0.098]; CFI = .981; SRMR = .072). Slopes could be fixed, and intercepts could not be fixed across classes. The socially vulnerable class scored significantly higher on distress than the socially oriented, socially reserved, and socially normative classes. The mean intercept levels of the socially reserved and socially oriented classes did not differ from each other. The socially normative class, in turn, had lower mean distress levels than the socially reserved and socially oriented classes.

The treatment adherence model had an adequate fit, except for SRMR ($\chi^2(22) = 29.06$, $p = .143$; RMSEA = .048, 90% CI [0,0.091]; CFI = .99; SRMR = .19). Again, slopes could be fixed, and intercepts could not be fixed. The socially vulnerable class scored lower than the socially reserved and the socially normative classes, but did not differ from the socially oriented class. The socially oriented class scored lower than the socially reserved and socially normative classes. The socially reserved class in turn scored lower than the socially normative class.

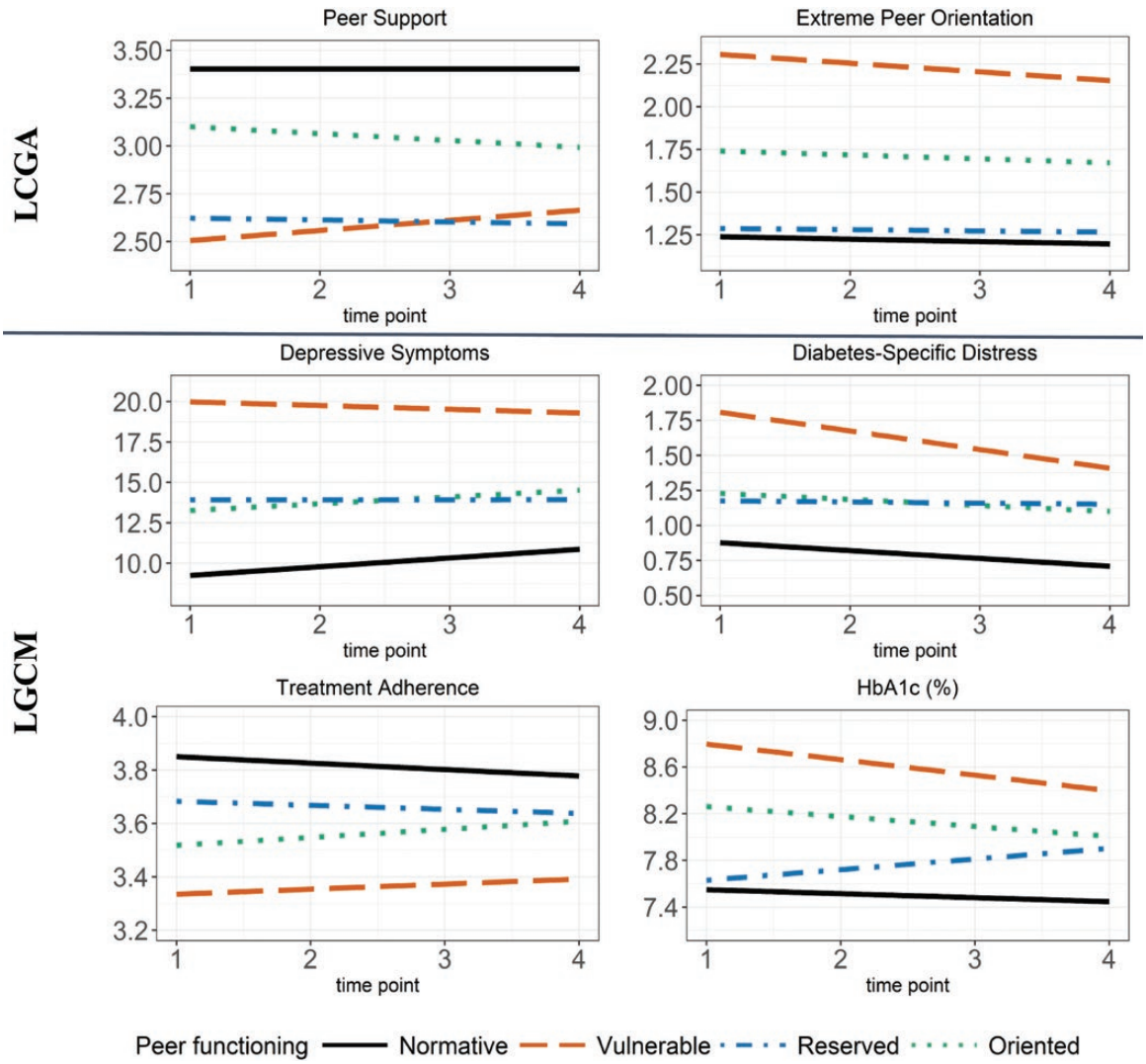

Fig. 1. Trajectories for the four perceived peer functioning classes (i.e., normative (49%), vulnerable (6%), reserved (28%), and oriented (17%)). Trajectories of peer support and extreme peer orientation were obtained through latent class growth analysis (LCGA). Trajectories of depressive symptoms, diabetes-specific distress, treatment adherence, and HbA_{1c} values (in %) were obtained through multigroup latent growth curve modeling (LGCM). Tables 2 and 3 contain the intercept and slope estimates and significance levels of LCGA and LGCM, respectively.

Table 2. Parameter Estimates for Intercepts and Slopes in the Four-Class Solution Obtained with Latent Class Growth Analysis

		Perceived peer functioning class			
Parameter	Total sample (100%)	Normative (49%)	Vulnerable (6%)	Reserved (28%)	Oriented (17%)
Support mean intercept	3.08***	3.40***	2.45***	2.63***	3.14***
Support mean slope	<.01	<.01	.053	−.010	−.036
EPO mean intercept	1.41***	1.25***	2.36***	1.29***	1.76***
EPO mean slope	−.025***	−.014†	−.051	−.007	−.023

Note. Support = Peer support; *EPO* Extreme peer orientation. *p < .05; **p < .01; ***p < .001; †p <. 1.

Finally, although CFI indicated adequate fit, SRMR and RMSEA indicated poor model fit for the HbA_{1c} model ($\chi^2(23) = 52.09$, $p < .001$; RMSEA = .102, 90% CI [0.065,0.139]; CFI = .92; SRMR = .31). The poor model fit is likely a result of low sample size within the socially vulnerable class in combination with FIML estimation and a deviation of the observed data from a linear trajectory [34]. A model including a quadratic growth

Table 3. Baseline Parameter Estimates for the Multigroup LGCM Models

		Peer trajectory class			
Parameter	Total sample (100%)	Normative (48%)	Vulnerable (6%)	Reserved (29%)	Oriented (17%)
Depressive symptoms					
Mean intercept	11.70***	8.71***$_a$	20.13***$_c$	13.89***$_b$	12.83***$_b$
Mean slope	.29†	.53*$_a$	−.23$_a$	0.01$_a$	.51$_a$
Diabetes-specific distress					
Mean intercept	1.16***	.98***$_a$	1.99***$_c$	1.22***$_b$	1.30***$_b$
Mean slope	−.03*	−.04**$_a$	−.10$_a$	<0.001$_a$	−.02$_a$
Treatment adherence					
Mean intercept	3.73***	3.88***$_a$	3.35***$_c$	3.69***$_b$	3.48***$_c$
Mean slope	.025**	.010$_a$	.014$_a$	.018$_a$	.062**$_a$
HbA_{1c} values (%)					
Mean intercept	7.73***	7.54***$_a$	8.91***$_c$	7.58***$_a$	8.18***$_b$
Mean slope	.001	−.04$_a$	−.18$_a^\dagger$	.09$_a$	−.04$_a$

Note. Within rows, intercepts and slopes differ at $p < .05$ if they have different subscripts. *$p < .05$; **$p < .01$; ***$p < .001$; $^\dagger p <$. 1.

factor was estimated for multigroup HbA_{1c} trajectories to investigate whether curved trajectories would fit the data better. Unfortunately, the model did not converge without estimating negative variances and correlations greater than one, and thus could not be reliably interpreted. Slopes could be fixed, and intercepts could not be fixed across classes. The socially vulnerable class had significantly higher HbA_{1c} values than the socially reserved, socially oriented, and socially normative classes. The socially oriented class had significantly higher HbA_{1c} values than the socially reserved and socially normative classes. The socially normative and socially reserved classes did not differ with respect to mean HbA_{1c} values.

Conclusions

The present study combined person- and variable-centered analysis techniques within a large longitudinal sample. This approach is unique within the research domain on the role of peers for youth with Type 1 diabetes, providing novel and important insights into this topic. Assessing one positive (i.e., support) and one negative indicator (i.e., extreme peer orientation) of the peer context, a nuanced pattern of findings emerged on the role of peers for general- and diabetes-specific functioning.

Four developmental trajectory classes could be distinguished with respect to perceived peer functioning: a socially normative (49% of the sample), socially reserved (28%), socially oriented (17%), and socially vulnerable class (6%). Levels of experienced support and extreme peer orientation remained stable over the 3-year course of follow-up within each of the classes. Women were overrepresented in the socially normative class (64%) and somewhat underrepresented in the other classes. This finding is not surprising, given that the socially normative class is characterized by high levels of experienced support and low levels of extreme peer orientation. Previous studies found that women with or without diabetes experience more social support compared to men. Moreover, on average, women perform better than men at self-regulation and controlling their impulses, possibly making them less likely to be with their peers at the expense of important tasks like managing diabetes [35, 36].

The present sample provided no indication that age, illness duration, or type of insulin administration differed among the four classes. Especially the finding that the classes were not different on age is noteworthy, as peers may play different roles across the transition to adulthood [2]. Life events that occur mostly at a later age, such as starting a career or living together with a romantic partner, often drive changes in one's peer network [37]. Rather than tapping objective changes in one's peer network, the present study measured perceived emotional support and extreme peer orientation which may be somewhat more of a trait-like nature and therefore less time-variant than changes in one's peer network. Across the sample as a whole, however, extreme peer orientation declined somewhat across time, indicating that youth may become somewhat less extremely oriented toward the peer context when they grow older.

Previous research found that youth with a chronic illness were somewhat less socially competent and experienced less support as compared to healthy controls [36, 38]. Nevertheless, 48% of youth in the present sample functioned relatively adequate in their peer context (i.e., the socially normative class). Hence, although diabetes may complicate bonding with peers, many patients seem to function well. The adaptive value of belonging to this

Table 4. Multigroup LGCM Comparisons Based on the Yuan-Bentler Scaled $\Delta\chi^2$

	$\Delta\chi^2$	df	*p*-value
Depressive symptoms			
Fixed vs. free slopes	2.76	3	.429
Fixed vs. free intercepts	94.42	3	<.001
Vulnerable vs. oriented	11.64	1	.001
Vulnerable vs. reserved	8.50	1	.004
Vulnerable vs. normative	95.07	1	<.001
Reserved vs. oriented	0.61	1	.435
Reserved vs. normative	58.95	1	<.001
Oriented vs. normative	25.83	1	<.001
Diabetes-specific distress			
Fixed vs. free slopes	3.02	3	.388
Fixed vs. free intercepts	55.90	3	<.001
Vulnerable vs. oriented	245.89	1	<.001
Vulnerable vs. reserved	257.44	1	<.001
Vulnerable vs. normative	214.34	1	<.001
Reserved vs. oriented	0.58	1	.448
Reserved vs. normative	9.95	1	.002
Oriented vs. normative	11.00	1	.001
Treatment adherence			
Fixed vs. free slopes	6.74	3	.081
Fixed vs. free intercepts	74.67	4	<.001
Vulnerable vs. oriented	1.62	2	.445
Vulnerable vs. reserved	11.20	2	.004
Vulnerable vs. normative	24.47	2	<.001
Reserved vs. oriented	20.36	2	<.001
Reserved vs. normative	20.42	2	<.001
Oriented vs. normative	90.74	2	<.001
HbA1c values			
Fixed vs. free slopes	6.70	3	.082
Fixed vs. free intercepts	28.89	3	<.001
Vulnerable vs. oriented	9.65	1	.002
Vulnerable vs. reserved	27.02	1	<.001
Vulnerable vs. normative	26.30	1	<.001
Reserved vs. oriented	6.00	1	.014
Reserved vs. normative	0.07	1	.797
Oriented vs. normative	13.64	1	<.001

socially normative class became clear by its association with beneficial trajectories of general and diabetes-specific functioning. These youth had slightly increasing but low levels of depressive symptoms, decreasing and low levels of diabetes-specific distress, and had good and stable treatment adherence. Moreover, their glycemic values were stable and on target of what is considered healthy and prescribed by the American Diabetes Association Association [30]. A small increase in depressive symptoms throughout adolescence and the transition to adulthood, as was obtained in the present sample, seems to be normative and not confined to chronically ill youth [39].

The remaining youth deviated from what general developmental theories consider normative [5]. First, youth belonging to the socially vulnerable class experienced low levels of support. In addition, they had substantially higher levels of extreme peer orientation compared to the other classes. As expected, these individuals experienced most diabetes-specific distress and had relatively low treatment adherence. In addition, their glycemic values were approximately 1.4% higher than the 7.5% target value proposed by the American Diabetes Association Association [30]. Moreover, these youth had on average (at baseline) a total score of 20.13 on the CES-D measure of depressive symptoms. This score is substantially higher than the cutoff of 16, which is considered a benchmark possibly signaling clinically relevant symptomatology [40].

Second, similar to the normative class, individuals belonging to the socially reserved class were little oriented toward peers. In contrast with the normative class, however, they experienced little emotional support. Moreover, they had higher levels of depressive symptoms and diabetes-specific distress, and they adhered less to their treatment than the socially normative class. With respect to glycemic control, their values were stable low and on target. These findings are in line with two studies that found negative associations between general emotional support and distress, but no association with glycemic control [41, 42]. There is some evidence that diabetes-specific peer support that is not experienced as intrusive, is associated with lower HbA_{1c} in emerging adulthood [16], but more research is needed to increase our understanding of the role of different types of peer support [14].

Finally, individuals in the socially oriented class experienced more support than individuals in the socially reserved class, while at the same time being more oriented toward peers compared to the socially reserved and normative classes. Despite that individuals in the socially oriented class experienced more support than individuals in the socially reserved class, they had similar levels of depressive symptoms and diabetes-specific distress. Moreover, the socially oriented class was characterized by worse treatment adherence and glycemic control compared to the socially reserved and normative classes. Thus, considering all four outcome measures, our results suggest that extreme peer orientation is an important factor to take into account alongside support when studying depressive symptoms, and in particular diabetes-specific distress, treatment adherence, and glycemic control. Future research should continue to examine these different indicators of the peer context and how they may interact in the prediction of patient functioning.

For clinical practice, it is important to identify individuals at risk for maladaptive functioning. The present findings emphasize that the role of peers for youth with diabetes is complex and cannot be captured by merely tapping into the amount of support that an individual experiences. Some individuals in the sample experienced significantly less support than youth in the socially normative class, but despite somewhat worse well-being, their glycemic values were on target. Hence, while these results suggest that perceived general emotional peer support seems to contribute to the well-being of youth with Type 1 diabetes, it may not be the primary target for clinical interventions that aim to improve glycemic control. To improve treatment adherence and glycemic control, clinicians should tap into youths' tendency to be with their peers at the expense of regulating treatment as well. Youth experiencing low support in combination with being extremely oriented toward peers were at high risk for both ill-being and maladaptive diabetes-specific functioning. Nevertheless, more research is necessary to get more insight into the key factors that render youth vulnerable with respect to the peer context and, consequently, making them at risk for poor well-being and diabetes-management as well.

One such key factor that may distinguish between individuals in the socially vulnerable and socially reserved classes are youths' attitudes toward being alone. Youth in the socially reserved class may have positive attitudes toward being alone [43]. Having a positive attitude toward being alone may protect youth from becoming overinvolved with peers at the expense of managing diabetes. However, it may also be the reason that the socially reserved class experienced somewhat fewer emotional support, and possibly as a consequence, experienced somewhat elevated depressive symptoms.

The socially vulnerable class on the other hand may have negative attitudes toward being alone, and consequently experience a gap between desired and actual received support [43]. In the present study, perceived rather than actual support was measured, thus it is possible that the actual support that youth in the socially vulnerable class received did not differ from other youth. From a social information-processing perspective, socially vulnerable youth may incorrectly appraise their friends' intentions and potential support behaviors. These youth may fear their friends to react in a disapproving way with respect to their diabetes treatment, and therefore neglect their treatment to feel well in the presence of their peers [44]. Future studies could compare actual and perceived support and take into account youths' attitudes toward the peer context when investigating the role of peers.

Finally, one may think of Type 1 diabetes as a challenging or adverse event that youth must learn to cope with [45]. The combination of internal and external protective factors may render some youth more resilient than others. In that respect, extreme peer orientation and general emotional peer support can be two interpersonal indicators of resilience [46]. Experiencing much support without being extremely oriented toward the peer context may render youth capable to successfully manage their Type 1 diabetes and their well-being, while missing out on support and/or being extremely peer oriented may diminish youths' resilience.

Study Limitations

Some limitations should be taken into account. First, the obtained findings are mostly discussed as if perceived peer functioning sets the stage for diabetes-specific functioning and well-being, rather than the other way around. In the present sample, peer support has been found to negatively predict diabetes-specific distress and extreme peer orientation positively predicted HbA_{1c} values in emerging adults [17]. Nevertheless, we want to stress that directionality of effects were not explicitly tested in the present manuscript, and that such claims cannot be made based on the present manuscript only. Previous research has indeed indicated that well-being has a substantial impact on peer relationships as well [3, 9, 47]. Second, future research could investigate whether similar peer functioning groups exist in a healthy population. For example, if a vulnerable group would be obtained in a healthy population with equally high amounts of depressive symptoms as a vulnerable group in a population of youth with Type 1 diabetes, this may suggest that perceived peer functioning relates to ill-being, irrespective of one's health status.

Third, the baseline response rate (41.16%) was rather low, and there was some drop-out during the study. Moreover, the present sample was largely well-educated and was homogenous with respect to race. These features may limit the generalizability of our results. Nevertheless, based on data from the Belgian Diabetes Registry, the mean (7.7%) and median (7.5%) HbA_{1c} for the present sample come close to the median HbA_{1c} of all youth in the Belgian Diabetes Registry (7.8%; $n = 3{,}885$). Due to ethical considerations, it was not possible to obtain additional data of nonresponders. Finally, HbA_{1c} values were used as an indicator of glycemic control within a time frame of 3 months before or after questionnaire completion. As these values merely provide an indication of the average blood glucose concentration across a period of three months, they are not suited as a one-on-one indicator for blood glucose values at the level of the individual [48]. The results here merely suggest that socially vulnerable individuals have relatively worse glycemic control compared to the other perceived peer functioning groups.

In summary, the conclusions of the present study are in line with previous findings that peers play an important role for the functioning of youth with Type 1 diabetes. In applying a person-centered analysis approach, four classes of peer functioning were identified that differed substantially from each other in their levels of general and diabetes-specific functioning. These findings thus emphasize that the exact role that peers play is complex. Researchers and clinicians should look beyond the amount of peer support experienced by patients, and tap into the extent to which patients are oriented toward the peer context as well.

Acknowledgments

The authors would like to thank Chris Groven and the staff of the Belgian Diabetes Registry for their help in collecting the data. The authors also would like to thank Bart Meuleman for his advice on the write-up of the manuscript. Funding was provided through research project G.0B35.14N granted by Fonds Wetenschappelijk Onderzoek - Vlaanderen Flanders to the last author.

Compliance with Ethical Standards

Conflict of Interest We have no relevant conflict of interest to disclose.

Ethical Approval I certify that this manuscript has not been published elsewhere and was not submitted elsewhere for review. The authors have full control of all primary data and they agree to allow the journal to review their data if requested. All co-authors are in agreement with the content of the manuscript and the study was conducted in accordance with the ethical standards of the American Psychological Association. The authors have no actual or potential conflicts of interest with the organization that sponsored the research (i.e., Research Foundation Flanders).

Authors' Contributions K.R. researched data and wrote the manuscript. K.L. helped in researching the data, contributed to the write-up of the manuscript and reviewed/edited the manuscript. L.O., S.P., and I.W. helped with data collection and reviewed/edited the manuscript. J.V. contributed to the write-up of the manuscript. E.G. and P.M. reviewed/edited the manuscript. K.R. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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