Personal and Illness Identity in Youth with Type 1 Diabetes: Developmental Trajectories and Associations

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Abstract

Objective. Having type 1 diabetes (T1D) may complicate the normative developmental task of personal identity formation in adolescence and emerging adulthood. Besides exploring and committing to identity choices in different life domains, youth with T1D need to integrate their illness into their identity, a process labeled as illness identity. The present study examined whether youth with T1D belonging to different personal identity trajectory classes developed differently on four illness identity dimensions (acceptance, enrichment, engulfment, rejection).

Methods. This four-wave longitudinal study over a three-year period used self-report questionnaires to examine how personal identity trajectory classes were related to illness identity over time in youth with T1D (baseline: $n = 558$; 54% female; age range = 14-25 years). Personal identity trajectory classes were identified using latent class growth analysis. Differential development of the four illness identity dimensions among these personal identity trajectory classes were examined using multigroup latent growth curve modeling.

Results. Five personal identity trajectory classes were identified: achievement, foreclosure, moratorium, carefree diffusion, and troubled diffusion. Individuals in achievement and foreclosure displayed highest levels of diabetes integration (i.e., high levels of acceptance and enrichment; low levels of engulfment and rejection), whereas individuals in troubled diffusion displayed lowest levels of illness integration (i.e., low levels of acceptance and enrichment; high levels of engulfment and rejection).

Conclusions. The present study confirms that personal identity development relates to illness identity development over time in youth with T1D. Understanding the intricate link between personal and illness identity may help clinicians to tailor their interventions to patients' individual needs.

Keywords. Personal identity · Illness identity · Adolescence and emerging adulthood · Type 1 diabetes · Developmental Trajectories

Introduction

Type 1 diabetes (T1D) is the most common chronic metabolic illness in youth worldwide and is typically diagnosed during childhood or adolescence (International Diabetes Federation, 2021). T1D requires life-long medical care including daily monitoring of blood glucose, insulin administration, and food intake (Schneider et al., 2007). Adolescence and emerging adulthood are two important life stages characterized by several developmental challenges, during which youth often experience self-management difficulties (Rassart et al., 2021; Schneider et al., 2007; Weissberg-Benchell et al., 2007). Studies have indeed demonstrated a decline in diabetes self-management and glycemic control (i.e., HbA1c levels) during these life stages (Bryden et al., 2001; Helgeson et al., 2018). The present longitudinal study focuses on the core developmental task of adolescence and emerging adulthood, that is, identity formation, and examines how personal and illness identity develop in tandem during these life stages.

Personal identity

From adolescence onwards, individuals are confronted with personal identity questions such as "Who am I?" and "What do I want to achieve in life?". Identity formation is a life-long process, but is particularly salient during adolescence and emerging adulthood (Erikson, 1968). Erikson (1968) described identity formation as the conflict between identity synthesis (characterized by adhering to a set of coherent ideals and future goals) and identity confusion (characterized by a lack of meaning and purpose in life). Several empirical operationalizations of Erikson's work have been introduced in which identity is increasingly approached as an ongoing process. Further extending the seminal identity status paradigm (Marcia, 1966), Luyckx, Schwartz et al. (2008) developed a dynamic process-oriented model with five processes capturing the degree to which individuals explore and commit to future-related identity options. Exploration in breadth and commitment making, respectively, refer to the questioning and weighing up of various identity alternatives, and to the subsequent choices

made in identity-relevant domains (Luyckx et al., 2006). Exploration in depth and identification with commitment, respectively, refer to the profound evaluation of current commitments and the degree to which individuals identify themselves with their commitments (Luyckx et al., 2006). However, many youth are uncertain as to where their explorations will lead them and may get stuck in their identity quest. Therefore, ruminative exploration captures the degree to which individuals keep on asking themselves the same identity questions over and over again (Luyckx, Schwartz, Berzonsky, et al., 2008).

Having T1D and being confronted with an intensive treatment regimen may complicate engaging in these identity processes, and youth may feel limited in their ability to explore and commit to future-related options in important life domains. Some studies have found that youth with T1D and other chronic illnesses explored somewhat less compared to healthy peers (Luyckx, Seiffge-Krenke, et al., 2008; Madan-Swain et al., 2000; Rassart et al., 2012; Verschueren et al., 2019). However, the key message across these studies was that youth with chronic illness were quite similar to their peers in engaging in personal identity processes. Further, similar to community youth, individual differences in personal identity processes have been linked to important differences in general and diabetes-specific functioning (Luyckx et al., 2016; Luyckx, Seiffge-Krenke, et al., 2008; Verschueren et al., 2019). Especially adhering to identity commitments was related to well-being (e.g., high levels of life satisfaction and low levels of depressive symptoms) and less diabetes-related problems. Ruminative exploration, in contrast, was related to ill-being and diabetes-related problems. More specifically, a study using baseline data from the current project (Verschueren et al., 2019) showed that clusters based on the personal identity processes were found to be clinically relevant as they differed in depressive symptoms, life satisfaction, diabetes-related problems (related to treatment, emotions, food, and social support), illness perceptions, and diabetes self-management. However, no significant differences in glycemic control were found.

Studies investigating the longitudinal development of commitment and exploration processes throughout adolescence and emerging adulthood in youth with T1D remain scarce. In community youth, previous studies have identified different personal identity trajectory classes resembling Marcia's (1966) identity statuses: achievement, foreclosure, moratorium, carefree diffusion, and troubled diffusion (Luyckx et al., 2013; Raemen et al., 2022; Vankerckhoven et al., 2022). Across studies, achievement was characterized by relatively (i.e., as compared to the sample mean) high scores on adaptive identity processes (commitment making, identification with commitment, exploration in breadth, exploration in depth) and relatively low on ruminative exploration over time. Foreclosure was also characterized by relatively high scores on the commitment dimensions (although not as high as achievement), but scores on all three exploration dimensions were relatively low over time. Moratorium was characterized by relatively low to moderate scores on the commitment processes and relatively high scores on all three exploration processes over time. Carefree diffusion was characterized by relatively low scores on all five personal identity processes over time. Finally, troubled diffusion was characterized by relatively low scores on the commitment processes, low to moderate scores on the adaptive exploration processes, and high scores on ruminative exploration over time. Trajectory classes with high levels of commitment and low levels of ruminative exploration (i.e., achievement and foreclosure) were generally characterized by the highest well-being (Raemen et al., 2022; Vankerckhoven et al., 2022). Research identifying personal identity trajectory classes in youth with T1D (or, by extension, other chronic illnesses) is lacking. Assessing the longitudinal development of commitment and exploration processes may provide new and useful insights into their personal identity formation.

Illness identity

Although the processes of commitment and exploration do not seem to be strongly affected by having T1D, youth with T1D face an additional identity challenge. Youth with T1D

need to find a way to integrate their chronic illness into their developing sense of self, a process captured by the concept of illness identity (Charmaz, 1983; Oris et al., 2016; Rassart et al., 2021). Oris and colleagues (2016, 2018) developed an overarching framework that distinguishes four different illness identity dimensions, which has been validated in several chronic illnesses such as T1D, congenital heart disease, and epilepsy (Luyckx et al., 2018; Oris et al., 2016, 2018). Individuals scoring high on acceptance have integrated their illness into their identity alongside other personal, relational, and social roles. They accept their illness and the challenges it brings without being overwhelmed by it. Individuals scoring high on enrichment experience that they have become a stronger person due to their illness. Enrichment is closely related to concepts such as benefit finding and posttraumatic growth, but it is more narrow as it refers specifically to the degree to which the illness has enabled positive changes in one's sense of self (Rassart et al., 2021). For individuals scoring high on engulfment, their illness dominates all domains of life, resulting in a "loss of self". They experience their illness as the most central part of their self and feel overwhelmed by it. Finally, individuals scoring high on rejection refuse to integrate their illness as part of their identity. They often perceive their illness as a threat and/or unacceptable to the self.

Previous cross-sectional and longitudinal studies have shown that illness identity, similar to personal identity, constitutes a key construct for both general and diabetes-specific functioning (Commissariat et al., 2020; Oris et al., 2016; Rassart et al., 2021; Schmitt et al., 2018). A longitudinal study (i.e., four waves over three years) using data from the current project uncovered clinically meaningful associations linking the illness identity dimensions and important diabetes-specific outcomes over time (Rassart et al., 2021). More specifically, bidirectional positive pathways were found between enrichment and diabetes self-management, and between engulfment and diabetes-related problems over time. Unidirectional pathways were found in which rejection negatively predicted diabetes self-management and positively

predicted diabetes-related problems, and in which diabetes self-management and glycemic control negatively predicted engulfment over time. Overall, previous research consistently demonstrated that acceptance was related to more adaptive psychological functioning and less diabetes-related problems and the reverse pattern of associations was found for engulfment (Oris et al., 2016; Rassart et al., 2021). In addition, whereas acceptance and enrichment were related to better diabetes self-management, engulfment and rejection were related to worse diabetes self-management and glycemic control (Oris et al., 2016; Rassart et al., 2021; Schmitt et al., 2018).

The importance of how different life domains (such as having a chronic illness) become integrated in one's sense of self was already emphasized by Erikson (1968). Such integration across different life domains or contexts (often referred to as contextual integration; Syed & Mclean, 2015) may result in feelings of coherence, which is a hallmark of healthy development. Importantly, such contextual integration does not refer to individuals behaving and feeling identical in all identity domains, but rather to their feeling that important life domains fit together (Syed & Mclean, 2015). In addition, the psychiatric disorder most pertinent to identity issues described in the DSM-V, namely the dissociative identity disorder, also emphasizes the importance of coherence or integration in one's sense of self (Syed & McLean, 2016). van Hoof and Raaijmakers (2002) found that having strong identity commitments was positively associated with a sense of integration across life domains. Studies investigating associations between commitment and exploration processes and the specific case of integrating one's chronic illness into one's identity, however, are lacking. Longitudinal research assessing such associations would enable us to examine, for instance, whether developing pro-active commitments and explorations would be associated with developing a more adaptive illness identity over time. Hence, examining the relationship between personal and illness identity may help clinicians to understand the complexity of identity problems these youth face, which, in

the long run, may benefit patients' well-being and diabetes-related outcomes such as diabetes self-management and diabetes-related problems.

The Present Study

The present longitudinal study examined how personal identity is related to illness identity over time in adolescents and emerging adults with T1D. Two main objectives were forwarded. First, as Objective 1, we investigated how commitment and exploration processes develop over time by identifying personal identity trajectory classes. As no previous research assessing individuals with T1D (or, by extension, other chronic illnesses) has examined personal identity trajectory classes, we based our hypotheses on research in community samples (Luyckx et al., 2013; Raemen et al., 2022; Vankerckhoven et al., 2022). We expected at least five classes to emerge, mainly based on differences in initial levels: achievement (high on adaptive identity processes and low on ruminative exploration), foreclosure (high on commitment dimensions and low on all three exploration processes), moratorium (low to moderate on commitment processes and high on all three exploration processes), carefree diffusion (low on all five identity processes), troubled diffusion (low on commitment processes, low to moderate on adaptive exploration processes, and high on ruminative exploration), and possibly an undifferentiated class (moderate scores on all personal identity processes). No hypotheses regarding changes over time were forwarded due to previous inconsistent findings.

Second, as Objective 2, we examined whether youth with T1D belonging to different personal identity trajectory classes developed differently on the four illness identity dimensions. Similar to Objective 1, we only forwarded hypotheses regarding differences in initial levels of illness identity, as changes over time were difficult to predict. As making commitments was positively associated with integration across identity domains (van Hoof & Raaijmakers, 2002), we expected achievement and foreclosure to score highest on acceptance and lowest on engulfment and rejection over time. As previous research in youth with T1D found a close

linkage between benefit finding and exploration (and less so identity commitment; Luyckx et al., 2016), we expected achievement and moratorium to score highest on enrichment. Given that moratorium also captures an in-crisis nature characterized by increased ruminative exploration, this trajectory class could also display relatively high scores on engulfment and/or rejection over time. The highest scores on engulfment and rejection (combined with the lowest scores on acceptance and enrichment) were expected to occur for troubled diffusion. No firm hypotheses could be forwarded with respect to individuals in carefree diffusion.

Methods

Participants and Procedure

Data were used from a larger longitudinal project in collaboration with the Belgian Diabetes Registry (Oris et al., 2016). Ethical approval was provided by the Ethics Committee Research UZ/KU Leuven. Participants were Dutch-speaking individuals (14-25 years) with T1D and without cognitive impairment. They completed questionnaires at home, resulting in four timepoints with 1-year time intervals. At T(ime) 1, questionnaires, informed consent forms, and stamped return envelopes were sent per post to 1397 individuals For minors, parents gave consent as well. A total of 558 individuals (Mage = 18.9, SDage = 3.2; 54% female) participated at T1, resulting in a response rate of 40%. All patients that responded at T1 were again invited at T2, T3, and T4, resulting in participation rates (PR) of 422 at T2 (Mage = 19.8, SDage = 3.3; 56% female; PR = 76%), 380 at T3 (Mage = 20.7, SDage = 3.3; 55% female; PR = 68%), and 323 at T4 (Mage = 21.8, SDage = 3.3; 58% female; PR = 58%). All participants received a movie ticket each time they participated.

Little's (1988) missing completely at random test was significant ($\chi^2(474) = 575.392$, $p = .001$), but the normed χ^2 was 1.21 (i.e., 575.392/474) indicating that missing data could be reliably dealt with (Bollen, 1989). Hence, the full information maximum likelihood (FIML) estimation was used to deal with missing data. Table 1 presents participants' characteristics at

baseline and differences between youth who participated at all four timepoints and those who did not. Youth who participated at all four timepoints scored higher on acceptance ($t(542.32) = 2.842$, $p = 0.005$) and diabetes self-management ($t(539) = 2.612$, $p = .009$), and were more likely to be female ($\chi^2(1) = 4.566$, $p = .033$).

Questionnaires

Personal identity. Participants completed the 25-item Dimensions of Identity Development Scale (DIDS), which has been shown to be valid and reliable (Luyckx, Schwartz, Goossens, et al., 2008). The DIDS taps into the five personal identity processes, each measured by five items which are rated on a 5-point Likert scale, ranging from 1 ("*strongly disagree*") to 5 ("*strongly agree*"). Cronbach's alphas ranged between .81 and .92 at T1; .81 and .92 at T2; .78 and .93 at T3; and .78 and .94 at T4.

Illness identity. Participants completed the 25-item Illness Identity Questionnaire (IIQ), which has been validated in the present sample at T1 by Oris et al. (2016). The IIQ taps into the four illness identity dimensions: acceptance (5 items), enrichment (7 items), engulfment (8 items), and rejection (5 items) (Oris et al., 2016). Items were rated on a 5-point Likert scale, ranging from 1 ("*strongly disagree*") to 5 ("*strongly agree*"). Cronbach's alphas ranged between .84 and .90 at T1; .84 and .90 at T2; .87 and .91 at T3; and .84 and .91 at T4.

Statistical AnalysesPearson correlations between the study variables were calculated at T1-4 using SPSS Version 28. The Expectation-Maximization (EM) algorithm was used to estimate missing data for the preliminary analyses. All longitudinal models were estimated in MPLUS 8.7 (Muthén & Muthén, 2012). To account for non-normality, the models were estimated with maximum likelihood estimation with robust standard errors (MLR).

To address Objective 1, latent class growth analysis (LCGA; Nagin, 2005) was performed on all five personal identity processes simultaneously. LCGA summarizes longitudinal data by modeling individual-level variability in developmental trajectories through a small number of classes defined by unique initial levels (intercepts) and rates of change

(slopes) (Nagin, 2005). The path from the slope to the indicator at Time 1 was fixed to 0 so that the intercept would represent the initial mean level. Given the equally spaced intervals, linear slope pattern coefficients were fixed at 1, 2, and 3 for Times 2, 3, and 4, respectively.

LCGA solutions with one to six classes were estimated and several fit indices and criteria were used to decide on the optimal number of classes (Muthén & Muthén, 2012; Nagin, 2005). The Bayesian Information Criterion (BIC) statistic for a solution with k classes should be lower than for a solution with k-1 classes, and both the Lo-Mendell-Rubin Loglikelihood Ratio Test (LMR-LRT) and the Bootstrap Loglikelihood Ratio Test (BLRT) should provide a significant p-value, suggesting that adding a class improves model fit., Entropy (E) should be .75 or higher (ranging from 0.00 to 1.00), indicating accurate classification (Reinecke, 2006). E is a standardized summary measure of the accuracy with which individuals are classified based on posterior classification probabilities. ,. Each class should include at least 5% of the sample to avoid variations of any of the other classes. After choosing the most optimal class solution, participants were assigned to the trajectory class for which their posterior probability of membership was highest. Next, differences among classes were examined for gender and insulin administration at T1 using χ^2 tests of independence, and for age, illness duration, diabetes self-management, and glycemic control at T1 using ANOVA's.

To address Objective 2, multigroup latent growth curve modelling (LGCM) was used to investigate whether individuals belonging to different personal identity trajectory classes developed differently on the four illness identity dimensions (i.e., whether intercepts or slopes for the illness identity dimensions differed across the personal identity trajectory classes). First, for each illness identity dimension, a fully unconstrained model was estimated. Standard model fit indices were used to evaluate model fit (Kline, 2005). The chi-square index should be as small as possible; the Root Mean Square Error of Approximation (RMSEA) should be < .08; the Comparative Fit Index (CFI) should be > .90; and the Standardized Root Mean Square

Residual (SRMR) should be < .10 for acceptable fit. Next, we re-estimated the model with intercepts constrained equal across classes; finally, we constrained slopes equal across classes. If these constrained models provided a significantly poorer fit than the baseline model (i.e., compared by means of the χ^2 difference test), it would suggest that the classes differ from each other on at least some of the parameters tested. In case of significant differences, follow-up multigroup models estimated which intercepts or slopes could be held equal for each pair of classes using χ^2 difference tests.

Results

Preliminary Analyses

Supplementary Table 1 provides the Pearson correlations between the study variables at T1-4. Both commitment processes were consistently positively related to acceptance and enrichment, and consistently negatively related to engulfment and rejection. Exploration in breadth and exploration in depth were consistently positively related to enrichment, and exploration in depth was consistently negatively related to rejection. Finally, ruminative exploration was consistently negatively related to acceptance, and consistently positively related to engulfment and rejection.

Latent Class Growth Analysis: Personal Identity Trajectory Classes

Table 2 presents all BIC, E values, and p-values accompanying LMR-LRT and BLRT, as well as the class frequencies for LCGA solutions with 1 through 6 classes. In the six-class solution, one of the classes consisted of only 4% of the sample and appeared to be a variation of one of the other classes. Hence, the more parsimonious five-class solution was selected. This final solution had a lower BIC than the four-class solution, had an acceptable entropy value, and although the LMR-LRT value of the five-class solution was not significant, the BLRT value was significant.

Table 3 presents the final parameter estimates of LCGA. As expected, an achievement class (15%) was identified consisting of individuals scoring highest on the adaptive identity

processes and relatively low on ruminative exploration. No significant changes over time in these identity processes were observed. The foreclosure class (27%) consisted of individuals scoring high on the commitment processes, but moderate to low on the adaptive exploration processes. Individuals in foreclosure scored lowest on ruminative exploration. Again, no significant changes over time were observed. The moratorium class (27%) scored moderate on the commitment processes and moderate to high on all three exploration processes. Commitment making and (to a lesser extent) exploration in depth increased over time. The carefree diffusion class (21%) consisted of individuals scoring low on both commitment processes, lowest on exploration in breadth and in depth, and moderate on ruminative exploration. All identity processes except ruminative exploration increased over time. Finally, the troubled diffusion class (10%) consisted of individuals scoring lowest on the commitment processes, low to moderate on exploration in breadth and in depth, and highest on ruminative exploration. Both exploration in breadth and in depth increased over time. Figure 1 presents the observed mean trends for the five personal identity processes in the different personal identity trajectory classes across T1-4.

No differences among the trajectory classes were found on gender ($\chi^2(4) = 2.968$, $p = .563$), insulin administration ($\chi^2(4) = 4.047$, $p = .400$), illness duration ($F(4, 549) = 0.335$, $p = .854$, $\eta^2 = .002$), or glycemic control ($F(4,416) = 0.479$, $p = 0.751$, $\eta^2 = .005$) We found age differences ($F(4, 553) = 2.936$ $p = .020$, $\eta^2 = .021$) with individuals in achievement ($M = 19.42$; $SD = 3.11$) being older than individuals in carefree diffusion ($M = 18.02$; $SD = 3.51$) and differences in diabetes self-management ($F(4,529) = 3.380$, $p = .010$, $\eta^2 = .025$) with individuals in foreclosure ($M = 3.83, SD = 0.49$) reporting better diabetes self-management than individuals in troubled diffusion ($M = 3.54$, $SD = 0.58$).

Multigroup Latent Growth Curve Modeling: Developmental Trajectories of Illness Identity

Multigroup LGCMs were conducted to investigate whether individuals belonging to the five personal identity trajectory classes developed differently on the illness identity dimensions. All fit indices of the different models are presented in Supplementary Table 2. All baseline parameter estimates of multigroup LGCMs are presented in Table 4. The observed mean trends for the four illness identity dimensions in the five personal identity trajectory classes are presented in Figure 2.

With respect to acceptance, the CFI and RMSEA of the unconstrained model indicated an acceptable fit, while the SRMR indicated a suboptimal fit. Constraining intercepts of acceptance equal among the five classes significantly decreased model fit ($\Delta\chi^2(4) = 25.833$, $p < .001$), indicating that there were significant baseline differences in acceptance among the five personal identity classes. Foreclosure and achievement scored highest on acceptance, followed by carefree diffusion and moratorium, for which only the difference with foreclosure was statistically significant. Troubled diffusion scored significantly lower on acceptance than all other classes. Although some differential developmental changes seemed to take place (with acceptance significantly increasing in achievement), slopes could be fixed as equal among the five classes ($\Delta\chi^2(4) = 1.841$, $p = .765$).

With respect to enrichment, the unconstrained model provided an acceptable fit. Constraining intercepts of enrichment equal among the five classes significantly decreased model fit ($\Delta\chi^2(4) = 46.860$, $p < .001$). Achievement scored highest on enrichment, followed by foreclosure and moratorium. Both diffusion classes scored lowest. All pairs of classes differed significantly from another, except for foreclosure and moratorium, and carefree diffusion and troubled diffusion. Further, analyses indicated that slopes could be fixed as equal among the five classes ($\Delta\chi^2(4) = 4.390$, $p = .356$).

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With respect to engulfment, the unconstrained model provided an acceptable fit. Constraining intercepts of engulfment equal among the five classes significantly decreased model fit ($\Delta\chi^2(4) = 34.294$, $p < .001$). Troubled diffusion scored highest on engulfment, with moratorium, carefree diffusion, and achievement not significantly different from troubled diffusion. Achievement also did not differ from foreclosure, which scored lowest on engulfment. Further, although some differential developmental changes seemed to take place (with engulfment significantly increasing in troubled diffusion), slopes could be fixed as equal among the five classes ($\Delta\chi^2(4) = 7.800$, $p = .0992$).

Finally, with respect to rejection, the unconstrained model provided an acceptable fit. Constraining intercepts of acceptance equal among the five classes significantly decreased model fit ($\Delta\chi^2(4) = 31.748$, $p < .001$). Troubled diffusion scored highest on rejection. Foreclosure and achievement scored lowest on rejection, with moratorium not differing from achievement and carefree diffusion not differing from moratorium. Further, analyses indicated that rejection decreased in all classes and that slopes could be fixed as equal among the five classes ($\Delta\chi^2(4) = 1.566$, $p = .211$).

Discussion

The present study was the first to examine associations linking personal identity to illness identity over time in youth with T1D. First, similar to research in community samples, five personal identity trajectory classes were identified. Second, significant differences in the mean levels of illness identity were found among these personal identity trajectory classes. These findings show that personal and illness identity co-develop in youth with T1D and may guide clinicians to detect and target identity issues in this population.

Personal Identity Trajectory Classes

Consistent with research in community youth (Luyckx et al., 2013; Raemen et al., 2022), five personal identity trajectory classes were identified: achievement, foreclosure, moratorium,

carefree diffusion, and troubled diffusion. First, individuals in the achievement class were exploring different alternatives as well as committing to identity options without being hindered by ruminative thoughts. They identified strongly with choices made. Second, an identity trajectory class resembling foreclosure emerged with individuals who adhere to identity choices without exploring other alternatives. No significant changes in personal identity processes over time were observed in both achieved and foreclosed individuals, indicating stability in their identity development (Luyckx et al., 2013; Raemen et al., 2022).

Third, individuals in the moratorium class explored different options in breadth and in depth, with exploration in depth increasing slightly over time. However, these youth ruminated extensively about their identity choices as well and, although commitment making increased over time, the ability to form a strong set of commitments was lacking compared to youth in achievement and foreclosure.

Fourth, two diffusion trajectory classes were distinguished. Individuals in the carefree diffusion class seemed less motivated and were less proactive in their identity quest than individuals in other classes, as they evidenced relatively low scores on the identity processes. However, our findings showed that these individuals increasingly engaged in an adaptive identity search over time. Further, in line with Verschueren et al. (2019), individuals in carefree diffusion were somewhat younger than individuals in achievement. One possible explanation for this finding is that, on average, youth in early adolescence are under less pressure from societal norms and treatment responsibilities, leading them to be less active in commitment and exploration processes (i.e., the carefree diffusion class), whereas, on average, pressures increase in later adolescence and emerging adulthood, leading to more commitment and exploration as they get older (i.e. the achievement class). In addition, consistent with previous studies (Raemen et al., 2022; Vankerckhoven et al., 2023), the personal identity trajectory classes were predominantly defined by distinct initial levels of the five identity processes and to a smaller

extent by differential changes in these processes over time. Overall, in line with previous studies, the present study seems to be suggestive of a rather slow and gradual process of identity maturation (Marcia, 1980; Meeus et al., 1999; Raemen et al., 2022; Verschueren et al., 2018; Waterman, 1993).Finally, in contrast to carefree individuals, individuals in troubled diffusion worried extensively about identity issues and got stuck in a ruminative cycle. Interestingly, in line with findings in community youth (Vankerckhoven et al., 2022), troubled diffused individuals did show an increase in both exploration in breadth and in depth over time. These findings suggest that these youth seem motivated to find their own direction in life, but they are overwhelmed by identity uncertainty. In addition, partially in line with Verschueren et al. (2019), individuals in troubled diffusion reported the worst diabetes self-management and differed significantly from those in foreclosure. Some of these individuals may perceive a conflict between possible future plans and the demands of diabetes care (Commissariat et al., 2016).

Developmental Trajectories of Illness Identity

Next, we examined whether individuals with T1D belonging to these personal identity classes developed differently over time on the illness identity dimensions of acceptance, enrichment, engulfment, and rejection. As hypothesized, differences in all four illness identity dimensions were found between personal identity classes, mainly based on initial levels of illness identity.

As expected, individuals in achievement and foreclosure were most successful in accepting diabetes as part of their identity, without feeling engulfed by it. Previous studies have already found that identity commitments were associated with a sense of integration across different life domains in community adolescents (van Hoof & Raaijmakers, 2002). The current findings suggest that having strong identity commitments is also associated with integrating chronic illness into one's sense of self.

As previous research in youth with T1D has found a positive association between benefit finding and identity exploration (and less so identity commitment; Luyckx et al., 2016), we expected individuals in achievement and moratorium (and not so much foreclosure) to score highest on enrichment. Rather unexpectedly, we found that individuals in achievement reported higher levels of enrichment than those in foreclosure and moratorium, and that the foreclosure and moratorium classes did not differ significantly. Whereas benefit finding refers to a variety of positive changes that may occur in the context of a chronic illness (i.e., a closer relationship with family or renewed interests), enrichment specifically refers to the extent to which the illness has enabled someone to grow as a person (Rassart et al., 2021). This set of findings suggest that, whereas commitment did not seem to be closely related to benefit finding (Luyckx et al., 2016), both proactively exploring and committing to options seem to be key to specifically experience personal growth through diabetes. Future research is encouraged to examine the directionality of effects linking enrichment to commitment and exploration processes over time.

As expected, youth with T1D in troubled diffusion were least able to integrate their illness into their identity. These individuals differed significantly from the four other classes on acceptance and rejection, with youth in troubled diffusion reporting the lowest levels of acceptance and the highest levels of rejection. They may perceive their illness as a threat to other aspects of themselves and tend to avoid thinking or talking about it to limit the impact of T1D on their daily lives. Rejecting diabetes, however, can be a maladaptive strategy as it has been linked to poor diabetes self-management and glycemic control (Oris et al., 2016; Rassart et al., 2021). Although the differences with regard to enrichment and engulfment were less pronounced, individuals in troubled diffusion reported the lowest levels of enrichment and highest levels of engulfment compared to the other classes. Collectively, youth in the troubled diffusion class are characterized by suboptimal personal and illness identity. Given that both

suboptimal personal and illness identity have been associated with, for instance, avoidant coping (Luyckx, Seiffge-Krenke, et al., 2008), less healthy peer relationships (Becht et al., 2019; Raymaekers et al., 2020), and depressive symptoms and poor diabetes self-management (Rassart et al., 2021; Verschueren et al., 2019), it is important to identify these individuals and focus on difficulties in commitment and exploration in various identity domains as well as integrating diabetes into the self.

Youth with T1D in the moratorium and the carefree diffusion classes were generally situated in between achievement/foreclosure and troubled diffusion. For instance, they experienced more feelings of engulfment and rejection compared to those in foreclosure, but were more able to accept their diabetes and rejected diabetes less than those in troubled diffusion. Youth in moratorium and carefree diffusion engage very differently in personal identity processes, with youth in moratorium engaging more in all personal identity processes compared to youth in carefree diffusion. Whereas moratorium is considered to capture an identity crisis characterized by uncertainty, carefree diffusion reflects a relative unworried attitude (Luyckx et al., 2006; Verschueren et al., 2019). Interestingly, however, youth in these classes showed similar levels of acceptance, rejection and engulfment of diabetes. Therefore, these findings suggest that engaging in adaptive commitment and exploration is not beneficial for diabetes acceptance when accompanied by ruminative identity thoughts. Youth with T1D in the moratorium and the carefree diffusion classes differed in their levels of enrichment. Youth in moratorium reported more personal growth as a result of diabetes than youth in carefree diffusion. This is consistent with the idea that cognitive processing, even if it involves a lot of rumination, plays an important role in experiencing positive change as a result of highly challenging life circumstances (Tedeschi & Calhoun, 2004).

Similar to developmental changes in personal identity processes, changes in illness identity dimensions were rather subtle and again were suggestive of a rather gradual process (i.e., acceptance increased significantly in achievement, rejection decreased in all five classes). Youth who had the most difficulty committing to and exploring several identity options (i.e., troubled diffusion) displayed a rather maladaptive change as they became increasingly overwhelmed by their diabetes. This finding makes it especially important for clinicians to help these youth to come to terms with their diabetes.Limitations and Suggestions for Future Research

Several limitations of the present study need to be considered. First, we have to acknowledge a potential sample bias, which may limit the generalizability of our study. The initial response rate (40%) was relatively low andno information was available on nonresponders. All participants were Dutch-speaking patients from the Belgian Diabetes Registry. Most of them were highly educated, had the Belgian nationality, and had relatively good glycemic control (Rassart et al., 2021). It is possible that individuals with poorer diabetes management were underrepresented. Furthermore, the screening and management of T1D vary widely across ethnic and racial groups (International Diabetes Federation, 2021). For example, glycemic control is generally better in Belgian samples compared to U.S. samples, which may be the result of multiple factors (e.g., less diabetes education, less access to diabetes care, and/or less access to adequate food) (Foster et al., 2019; Hermann et al., 2020). Future studies are encouraged to replicate our findings in samples including underrepresented groups and, thus, be more representative for youth with T1D worldwide (Hermann et al., 2020; Raymond et al., 2019).

Second, all study variables were measured by self-report questionnaires. Future research is encouraged to use a multi-method (i.e., including a narrative approach) and/or multi-informant approach (e.g., parents or clinicians).Third, no conclusions can be made about directionality of effects. Bi-directional associations may be at work. Engaging in pro-active identity work may predict how well one can integrate one's chronic illness into one's sense of

self., We may also expect that how youth with T1D manage to integrate diabetes into their identity predicts how they explore and commit to different identity choices over time. Future studies should examine the temporal sequence of personal and illness identity to inform clinical practice. If difficulties in identity commitment and exploration precede the development of poor illness integration in youth with T1D, or vice versa, clinicians can identify risk factors and focus on preventing or treating specific identity issues.

Conclusion

The present study shows how personal and illness identity develop in youth with T1D throughout adolescence and emerging adulthood. First, we identified five different personal identity trajectory classes. Second, differences in all illness identity dimensions were found among these personal identity classes. These findings add to the growing literature on identity formation in youth with T1D and offer new insights into the complexity of identity issues these youth face. Individuals who show difficulties in exploring and committing to identity choices in several life domains, may also struggle with integrating diabetes into their sense of self. The conjunction of these identity issues may place a significant burden on these youth and make them more vulnerable toward maladaptive general and diabetes functioning.

The present study can be seen as an initial study demonstrating the importance of integrating both personal and illness identity challenges into clinical care. Although researchers need to be careful about drawing too strong clinical conclusions from non-interventional research, these findings suggest the need to be aware of difficulties in accepting diabetes when personal identity questions remain unanswered, or vice versa. Health care providers are encouraged to discuss with their patients whether they experience difficulties related to their personal and illness identity, and to be aware that these difficulties often go hand in hand. This may lead to better detection of identity problems in this specific population. In addition, by simultaneously targeting both personal and illness identity issues, we may be able to better increase self-understanding, self-exploration, and self-validation, which are important goals in

working with identity issues (Biere & Lanktree, 2013), and therefore better prevent and intervene in a wide range of psychosocial problems and may optimise diabetes care routines. To further inform clinical practice, we encourage future research to scrutinize the longitudinal associations linking personal identity to illness identity in youth with T1D and, by extension, other chronic illnesses.

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Tables and figures

Table 1

Participants' characteristics at baseline (T1)

	All participants (*n* = 558)	Participation at all timepoints (*n* = 277)	No participation at all timepoints (*n* = 281)	t/χ²-test *p*-value
HbA1c % [a]	7.74 (1.43)	7.63 (1.27)	7.86 (1.57)	.090
Gender				.033
Male	257 (46.06%)	115 (41.52%)	142 (50.53%)	
Female	301 (53.94%)	162 (58.48%)	139 (49.47%)	
Age [a]	18.85 (3.24)	18.86 (3.35)	18.84 (3.15)	.933
Age at diagnosis [a]	11.22 (5.52)	11.48 (5.59)	10.96 (5.45)	.262
Ethnicity				.463
Belgian	544 (98.00%)	273 (98.9%)	271 (97.1%)	
Dutch	7 (1.30%)	3 (1.1%)	4 (1.4%)	
Others	4 (0.7%)	/	4 (1.4%)	
Education level parents				
Mother	3.59 (0.84)	3.68 (0.82)	3.54 (0.92)	.577
Father	3.60 (0.91)	3.72 (0.83)	3.47 (1.00)	.025
Insuline administration				.912
Injection	437 (78.74%)	216 (78.55%)	221 (78.93%)	
Pump	118 (21.26%)	59 (21.45%)	59 (21.07%)	
Diabetes self-management [a]	3.58 (0.82)	3.67 (0.79)	3.48 (0.74)	.009
Personal identity				
Commitment making	3.55 (0.90)	3.55 (0.89)	3.55 (0.92)	.941
Identification commitment	3.45 (0.86)	3.41 (0.80)	3.49 (0.91)	.280
Exploration in breadth	3.48 (0.83)	3.52 (0.76)	3.43 (0.89)	.228
Exploration in depth	3.13 (0.87)	3.16 (0.83)	3.09 (0.91)	.378
Ruminative exploration	2.40 (0.96)	2.38 (0.90)	2.43 (1.01)	.569
Illness identity [a]				
Acceptance	3.84 (0.95)	3.95 (0.86)	3.72 (1.02)	.005
Enrichment	2.95 (0.97)	3.01 (0.98)	2.89 (0.96)	.150
Engulfment	2.19 (0.87)	2.13 (0.76)	2.25 (0.96)	.102

Rejection	2.25 (0.99)	2.18 (0.94)	2.31 (1.04)	.118

Note. [a] Mean value with standard deviation in brackets.

Table 2

Results of Latent Class Growth Analyses on the Five Identity Dimensions

| | BIC | Entropy | LMR-LRT | BLRT | Trajectory Group Prevalence (%) | | | | | |
					1	2	3	4	5	6
1 Class	20827.047	/	/	/	100					
2 Class	19112.011	0.876	*p* < .001	*p* < .001	58	42				
3 Class	18735.444	0.862	*p* = .344	*p* < .001	57	21	23			
4 Class	18371.703	0.851	*p* = .134	*p* < .001	22	27	8	43		
5 Class	*18142.785*	*0.814*	*p* = .329	*p* < .001	*15*	*27*	*10*	*27*	*21*	
6 Class	17955.010	0.826	*p* = .155	*p* < .001	26	24	20	12	15	4

Note. BIC = Bayesian Information Criterion; LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test; BLRT = Bootstrapped Likelihood Ratio Test; The solution in italics was selected.

Table 3

Final Parameter Estimates of Latent Class Growth Analysis

Parameters	Total sample	Identity Trajectory Class				
		Achievement	Foreclosure	Moratorium	Carefree Diffusion	Troubled Diffusion
Commitment making						
mean intercept	3.572***	4.279***	4.082***	3.479***	2.954***	2.728***
mean slope	0.054**	0.039	0.021	0.064*	0.163 ***	-0.064
Identification commitment						
mean intercept	3.438***	4.299***	3.898***	3.383***	2.801***	2.413***
mean slope	0.028*	0.017	0.013	0.004	0.134***	-0.022
Exploration in breadth						
mean intercept	3.459***	4.219***	3.396***	3.731***	2.743***	3.268***
mean slope	0.059***	-0.003	0.043	0.040	0.130**	0.114*
Exploration in depth						
mean intercept	3.105***	4.013***	3.136***	3.406***	2.176***	2.811***
mean slope	0.067***	-0.011	0.022	$0.046^{\dagger}$	0.198***	0.107*
Ruminative exploration						
mean intercept	2.412***	2.126 ***	1.768***	2.759***	2.405***	3.641***
mean slope	-0.005	-0.049	-0.019	-0.011	-0.017	0.109

$^{\dagger} p < .10.$ $* p < .05.$ $** p < .01.$ $*** p < .001.$

Table 4

Baseline Parameter Estimates of Multigroup Latent Growth Curve Modeling

Parameters	Identity Trajectory Class				
	Achievement	Foreclosure	Moratorium	Carefree Diffusion	Troubled Diffusion
Acceptance					
mean intercept	3.963***[ab]	4.061***[a]	3.746***[b]	3.754***[b]	3.310***[c]
mean slope	0.075*	0.032	0.041	0.045	0.067
Enrichment					
mean intercept	3.467***[a]	3.063***[b]	2.965***[b]	2.628***[c]	2.541***[c]
mean slope	0.005	-0.006	-0.027	0.046[†]	0.023
Engulfment					
mean intercept	2.033***[ab]	1.947***[a]	2.269***[b]	2.158***[b]	2.664***[b]
mean slope	0.030	0.033	0.024	-0.006	0.116**
Rejection					
mean intercept	2.101***[ab]	2.015***[a]	2.312***[bc]	2.402***[c]	2.732***[d]
mean slope	-0.136**	-0.071**	-0.085**	-0.087*	-0.083[†]

Note. Within rows, intercepts and slopes differ at $p < .05$ if they have different superscripts. [†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1

Observed Mean Trends for the Five Personal Identity Processes in the Five Identity Trajectory Classes
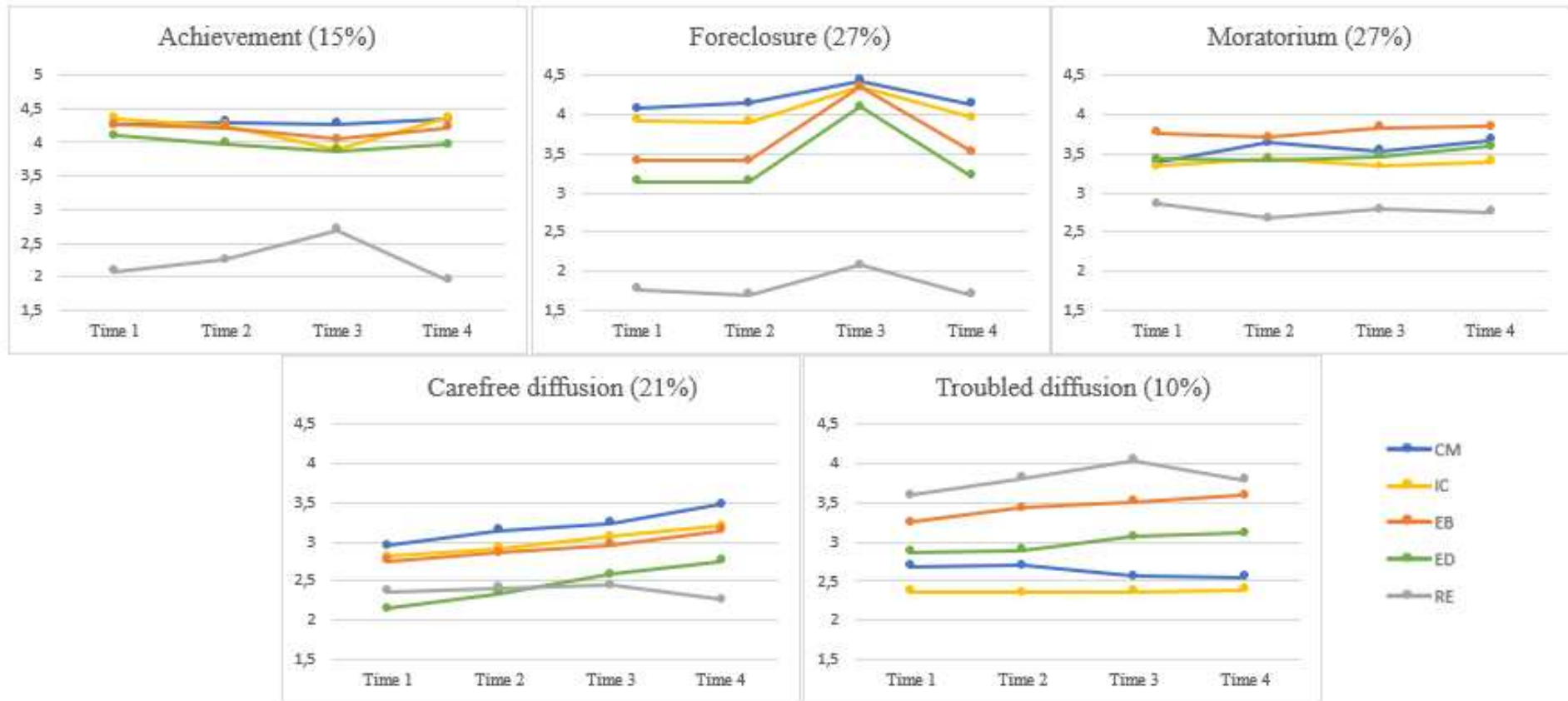
Note. CM = commitment making; IC = identification with commitment; EB = exploration in breadth; ED = exploration in depth; RE = ruminative exploration. "*" indicates significant changes over time.

Figure 2

Observed Mean Trends for the Four Illness Identity Dimensions in the Five Personal Identity Trajectory Classes
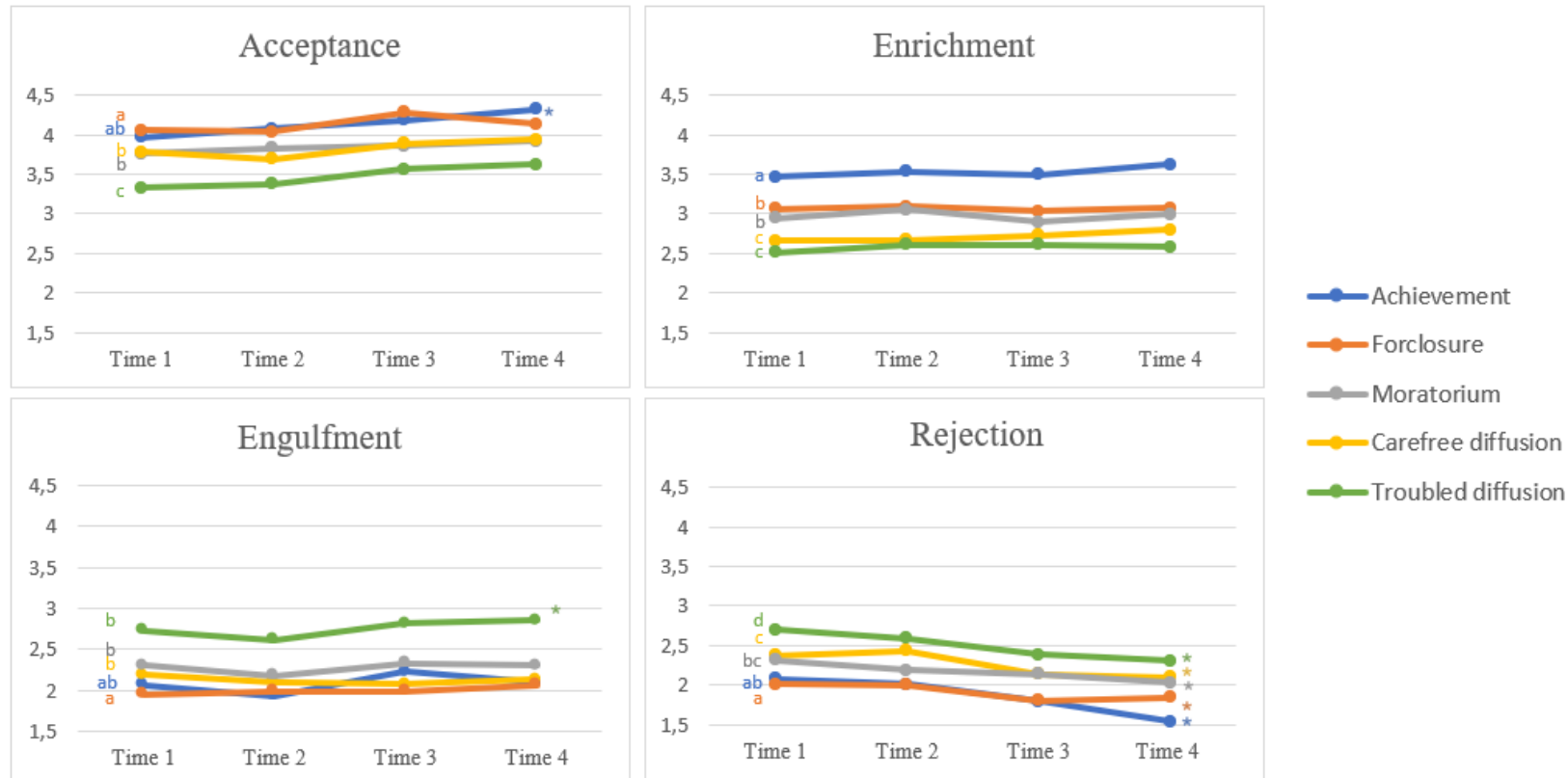
Note. Intercepts differ at $p < .05$ if they have different superscripts. "*" indicates significant changes over time.

Supplementary Table 1

Correlations Between Personal Identity and Illness Identity Dimensions at Times 1-4

	Commitment making	Identification with commitment	Exploration in breadth	Exploration in depth	Ruminative exploration
Acceptance	.21*** / .21*** / .20*** / .18***	.23*** / .25*** / .25*** / .31***	.11** / .17*** / .08 / .04	.07 / .18*** / .15** / .16**	-.24*** / -.19*** / -.23*** / -.22***
Enrichment	.27*** / .26*** / .19*** / .13*	.29*** / .33*** / .31*** / .27***	.27*** / .29*** / .19*** / .14*	.30*** / .34*** / .34*** / .21***	-.07 / -.08 / -.08 / -.10
Engulfment	-.20*** / -.15** / -.14** / -.23***	-.27*** / -.22*** / -.16** / -.35***	-.10* / -.10* / .13* / -.01	-.03 / -.07 / .07 / -.07	.35*** / .25*** / .36*** / .35***
Rejection	-.14*** / -.11** / -.13* / -.17**	-.18*** / -.18*** / -.15** / -.29***	-.12** / -.13** / -.07 / -.07	-.13** / -.18*** / -.17*** / -.21***	.19*** / .23*** / .21*** / .21***

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

Supplementary Table 2

Fit Indices of the Different Multigroup Latent Growth Curve Models

	df	χ^2	RMSEA	CFI	SRMR
Acceptance					
Free	28	26.91	.000	1.000	.138
Intercepts fixed	32	50.01	.071	.951	.175
Slopes fixed	32	28.78	.000	1.000	.138
Enrichment					
Free	25	23.73	.000	1.000	.065
Intercepts fixed	29	72.34	.116	.923	.160
Slopes fixed	29	27.96	.000	1.000	.070
Engulfment					
Free	26	45.34	.082	.964	.087
Intercepts fixed	30	77.285	.119	.911	.169
Slopes fixed	30	52.04	.081	.959	.089
Rejection					
Free	26	39.02	.067	.981	.056
Intercepts fixed	30	69.08	.108	.942	.132
Slopes fixed	30	40.98	.057	.984	.057

Note. df = degrees of freedom; RMSEA = Root Mean Square of Approximation; CFI Comparative Fit Index; SRMR = Standardized Root Mean Residual.

Supplementary Table 3

Overview Table Of Identity Constructs

Construct	Refers to	Questionnaire	Sample items
Personal identity processes		The Dimensions of Identity Development Scale (DIDS)	
Commitment making	The degree to which choices are made in identity-relevant domains		"I have decided on the direction I want to follow in my life"
Identification commitment	The degree to which individuals identify themselves with their commitments		"I sense that the direction I want to take in my life will really suit me"
Exploration in breath	The degree to which various identity alternatives are questioned		"I regularly think over a number of different plans for the future"
Exploration in depth	The degree to which current commitments are thoroughly evaluated		"I regularly talk with other people about the plans for the future I have made for myself"
Ruminative exploration	The degree to which individuals keep on asking themselves the same identity questions over and over again		"It is hard for me to stop thinking about the direction I want to follow in my life"
Identity trajectory classes		/ (*Classes derived from personal identity processes*)	
Achievement	Individuals scoring highest on the adaptive identity processes and relatively low on ruminative exploration		
Foreclosure	Individuals scoring high on the commitment processes, moderate to low on the adaptive exploration processes, and lowest on ruminative exploration		
Moratorium	Individuals scoring moderate on the commitment processes and moderate to high on all three exploration processes		
Carefree diffusion	Individuals scoring low on both commitment processes, lowest on exploration in breadth and in depth, and moderate on ruminative exploration		
Troubled diffusion	Individuals scoring lowest on the commitment processes, low to moderate on exploration in breadth and in depth, and highest on ruminative exploration		

Illness identity dimensions		The Illness Identity Questionnaire (IIQ)	
Acceptance	The degree to which their illness is integrated into their identity alongside other personal, relational, and social roles		"I accept being a person with diabetes"
Enrichment	The degree to which they experience themselves as a stronger person due to their illness		"Because of my diabetes, I have become a stronger person"
Engulfment	The degree to which their illness dominates all domains of life, resulting in a "loss of self"		"My diabetes dominates my life"
Rejection	The degree to which they perceive their illness as unacceptable to the self and refuse to integrate their illness as part of their identity		"I just avoid thinking about my diabetes"