Personality and self-esteem in emerging adults with Type 1 diabetes

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A R T I C L E   I N F O

A B S T R A C T

Objective: The present study examined (1) mean-level differences in self-esteem and Big Five personality traits between individuals with and without diabetes; and (2) demographic, clinical, and psychological correlates of patients' self-esteem and Big Five.

Research design and methods: A total of 478 emerging adults with Type 1 diabetes (18–35 years old) were selected from the Belgian Diabetes Registry and completed questionnaires on personality, self-esteem, and diabetes-related distress. The control group consisted of 341 healthy participants who were matched (1:1) on sex and age with the patient group.

Results: First, mean-level differences between patients and controls differed according to patients' sex and illness duration. Women with diabetes reported lower self-esteem and were less extraverted and emotionally stable as compared to female controls. In contrast, men with diabetes reported higher self-esteem and were more agreeable but less emotionally stable as compared to male controls. Furthermore, whereas both patients with shorter and longer illness duration were less extraverted and emotionally stable as compared to controls, only patients with longer illness duration reported heightened agreeableness. Second, self-esteem and Big Five were found to relate to patients' sex and (to a lesser extent) age and illness duration. Finally, patients reporting elevated diabetes-related distress reported lower self-esteem, and were less agreeable and emotionally stable as compared to patients not reporting such distress.

Conclusions: Patients' personality and self-esteem might be important targets for future prevention and intervention efforts. The present findings can assist healthcare professionals in identifying those patients who might benefit the most from such programs.

Introduction

Type 1 diabetes is a metabolic condition which requires a complex regimen of diet, exercise, blood glucose monitoring, and daily insulin administrations [1]. Emerging adults with Type 1 diabetes are generally seen as a high-risk group partially because they experience many stressful changes in their lives, such as searching for a job, establishing romantic relationships, and leaving the parental home [2–4]. Such developmental demands could interfere and even detract from focused diabetes management [3]. Hence, the accumulation of normative and illness-specific stressors makes this developmental period ideally suited to investigate patients' psychosocial functioning.

Developing a strong sense of self is a key developmental task during emerging adulthood [5]. According to a recent model of personality development, an individual's self-concept has to be assessed at different levels [5]. Personality traits are seen as the basic level of analysis and describe the most fundamental personality differences between

individuals. Nowadays, most researchers agree that personality can be subsumed under five broad traits: *Extraversion* (energy, sociability, and experiencing frequent positive moods), *Agreeableness* (kindness, empathy, and cooperativeness), *Conscientiousness* (self-discipline, organization, and responsibility), *Emotional Stability* (the ability to deal with negative emotions), and *Openness to Experience* (the way that an individual seeks and deals with new information) [6]. However, people do more than act in more-or-less consistent ways as determined by these traits; they also make life choices and build a self-concept from which they derive a sense of self-worth [5,7]. Hence, studies should focus on both personality traits and self-esteem, representing important core and surface characteristics of one's self-concept.

Several models within the chronic illness literature have emphasized the importance of patients' sense of self for their physical and psychosocial functioning [8–10]. According to the transactional stress and coping model [11,12], adjusting to chronic illness results from a complex interplay of demographic (e.g., sex and age) and clinical parameters (e.g., illness type and severity), coping strategies, and perceptions of the self. A modified version of this model was adopted in the present study (see Fig. 1). In this model, personality and self-esteem play a key role in understanding how patients adjust to their illness. This pathway

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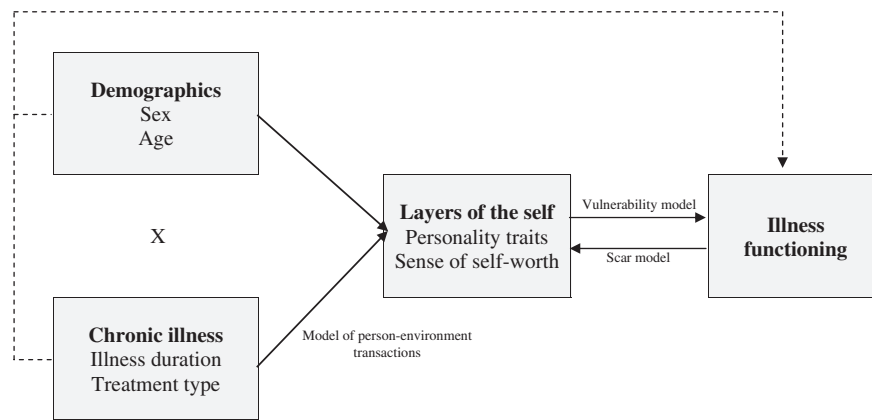 *E-mail address:* Jessica.Rassart@ppw.kuleuven.be (J. Rassart).

Fig. 1. Theoretical framework guiding the current study. Based on the transactional stress and coping model of adjustment to chronic illness proposed by Thompson et al. [11].

is in line with the vulnerability or predisposition model which states that a weak sense of self may put youngsters at risk for maladjustment, whereas youngsters with a mature sense of self are better equipped to cope with stressors (including diabetes-related challenges) [13]. Recent studies have indeed demonstrated the importance of personality traits and self-esteem for glycemic control, treatment adherence, quality of life, and coping in Type 1 diabetes [14–21]. However, according to the scar or complication model of personality [13], the experience of psychosocial difficulties can also shape one's self. This view fits with the model of person–environment transactions which emphasizes the malleability of the self [22–24]. The latter model assumes that changes in the self can be triggered by changing roles, life events, and daily challenges. As chronic illness is viewed as a biographical disruption [25,26], it may also shape youngsters' sense of self. Unfortunately, few studies to date have compared patients' sense of self with that of healthy controls.

Objective 1: Comparing patients and controls

Although studies have investigated whether individuals with diabetes have lowered self-esteem as compared to healthy controls, no consensus has yet been reached [27–33]. Such inconsistencies are mainly due to small sample sizes and a lack of matching on socio-demographic variables [27]. With regard to personality, a recent study found adolescents with congenital heart disease to display similar Big Five levels as compared to controls, except for a lower score on extraversion [34]. Because diabetes generally has a greater impact on daily life as compared to congenital heart disease, more pronounced differences might emerge when comparing patients to controls. Specifically, emerging adults with diabetes could show higher levels of conscientiousness, given the importance of treatment adherence for avoiding future health complications [35]. Because such a strict treatment regimen might hinder patients in their social activities [8], patients may also report lowered extraversion [34]. Finally, patients might show lower levels of emotional stability, given the elevated depression rates observed in this population [36].

However, differences in personality traits and self-esteem between patients and controls may differ according to sex and illness duration. Stahl and colleagues [19] reported improved self-esteem especially in boys with Type 1 diabetes. Indeed, female patients have been found to cope less well with their illness, as evidenced by higher rates of depression and diabetes-related worries [37–39]. Hence, one might expect more pronounced differences in self-esteem, extraversion, and emotional stability between female patients and controls. Further, individuals diagnosed with diabetes for a longer time could feel less engulfed because they might have developed coping mechanisms earlier in life [40]. Hence, one might hypothesize that patients with longer illness duration would have integrated their illness more strongly into

their self-concept, resulting in self-esteem and Big Five scores that are similar or even higher (in the case of personal growth [41]) as compared to healthy controls. However, the role of illness duration remains unclear as a longitudinal study in Type 1 diabetes found illness duration to be unrelated to adolescents' coping strategies and symptomatology [8].

In sum, the present study investigated whether emerging adults with Type 1 diabetes have an increased risk for developing a weak sense of self. Given that patients' sense of self has been proven a substantial predictor of their physical and psychosocial functioning, it is important to identify the factors that optimize or, conversely, reduce these patients' opportunities to attain a strong sense of self.

Objective 2: Demographic, clinical, and psychological correlates

According to the transactional stress and coping model [11,12], both sex and illness duration can be expected to shape patients' sense of self [19,37–40]. Associations with age might also emerge, given that cognitive maturation gradually allows adolescents to arrive at balanced self-views [42]. Furthermore, there are some indications that insulin pump therapy positively impacts on glycemic control, diabetes self-efficacy, and quality of life [43,44]. Hence, patients using an insulin pump can be expected to report higher self-esteem as compared to patients using injections. However, having an insulin pump could evoke body image concerns and, hence, might be associated with lower self-esteem among certain patients [43]. With regard to the Big Five, the increased flexibility in daily life which generally accompanies insulin pump therapy might allow patients to engage in more social activities, resulting in higher extraversion scores [44].

Besides looking at demographic and clinical correlates, the present study also focuses on psychological correlates, that is, the level of diabetes-related distress. Although patients with a strong sense of self are typically assumed to be better equipped to cope with diabetes [17], the transactional stress and coping model also states that elevated diabetes-related distress might negatively impact on patients' self-concept [11,12]. Specifically, patients experiencing elevated diabetes-related distress can be expected to report lowered self-esteem as well as lower levels of extraversion, emotional stability, and agreeableness as compared to patients not experiencing such distress [14,34].

Methods

Participants and procedure

Patients were recruited from the Belgian Diabetes Registry [45]. They were eligible for inclusion if they met the following criteria:

Dutch speaking, presence of Type 1 diabetes, age 18–35 years, and the availability of contact details. In April 2012, the database included 8957 patients, of which 997 patients met the inclusion criteria. All eligible patients were sent a questionnaire, information letter, informed consent form, and pre-stamped return envelope by surface mail. Control participants were selected from a sample of 996 individuals between 14 and 35 years old, recruited in different settings such as high schools, universities, and companies. A total of 28 controls reporting the presence of a chronic illness were excluded for matching. This study was approved by the Institutional Review Board at the KU Leuven. All participants gave written informed consent to participate in the study.

Measures

Personality traits

Personality traits were measured using the Quick Big Five [46]. Participants rated themselves on 30 adjectives (six items per trait) using a 7-point Likert scale, ranging from 1 (*completely untrue*) to 7 (*completely true*). Each Big Five scale was computed by taking the mean of the six respective item scores, resulting in scales ranging from 1 to 7. Cronbach's alphas ranged between .77 and .92 in patients and between .75 and .90 in controls.

Self-esteem

Self-esteem was measured using the Rosenberg Self-esteem Scale (RSES) [7]. This scale contains 10 items scored on a 4-point Likert-type rating scale, ranging from 1 (*does not apply to me at all*) to 4 (*applies to me very well*). The scale score was computed by taking the mean of these ten individual item scores, resulting in a scale ranging from 1 to 4. Cronbach's alphas were .91 in patients and .87 in controls.

Diabetes-related distress

We used the Problem Areas in Diabetes Scale (PAID) [47], measuring diabetes-related treatment, food, and emotional and social support problems. Patients rated themselves on 30 items using a 5-point Likert-type rating scale, ranging from 0 (*no problem at all*) to 4 (*a very serious problem*). Scores were transformed to a 0–100 scale, with a cut-off score of 40 indicating seriously elevated diabetes-related distress [48]. Cronbach's alpha for the total scale was .94.

Illness duration

Illness duration was computed by subtracting the age of diagnosis from patients' current age.

Statistical analysis

For Objective 1 (i.e., examining mean-level differences in self-esteem and Big Five between patients and controls), paired-samples *t*-tests were conducted. By conducting paired-samples *t*-tests for men and women separately, we explored whether these mean-level differences between patients and controls varied among men and women. Similarly, we examined the role of illness duration in these mean-level differences. A median-split procedure was used to create two groups of illness duration: an illness duration of eight years or less and an illness duration of nine years or more [49]. As with sex, paired-samples *t*-tests comparing patients with controls were conducted separately for both of these groups.

For Objective 2 (i.e., examining demographic, clinical, and psychological correlates of self-esteem and Big Five in patients), a multivariate analysis of variance (MANOVA) was conducted with sex, illness duration, treatment type, and diabetes-related distress entered simultaneously as independent variables and self-esteem and the Big Five as dependent variables. All two-way interactions among the independent variables were explored. To this end, two groups of diabetes-related distress were created: patients experiencing elevated levels of diabetes-related distress (as indicated by a score of 40 or more on the PAID) and patients scoring within the normal range (as indicated by a score below 40 on the PAID) [48]. Finally, correlations with age and illness duration were computed.

Results

Participant characteristics

Of the 997 eligible patients, a total of 478 patients (48%) returned completed questionnaires. Of these 478 patients, a total of 341 (71%) could be matched (1:1) with a healthy control participant based on sex and age. Matched patients did not differ on any of the study variables from non-matched patients, except for lower scores on conscientiousness ($F(1,470) = 13.16$, $p < .001$, $\eta^2 = .03$) and openness ($F(1,470) = 5.90$, $p < .05$, $\eta^2 = .01$). Further, matched patients were significantly younger as compared to non-matched patients ($F(1,470) = 332.26$, $p < .001$, $\eta^2 = .41$). Due to these differences

Table 1
Demographic and clinical characteristics of the participants.

	Patient sample	Control sample	Test statistic
Sex (combined $n = 682$)			
Men	163 (48%)	163 (48%)	
Women	178 (52%)	178 (52%)	
M age (*SD*) (combined $n = 682$)	22.81 (4.39)	22.81 (4.39)	
Working status (combined $n = 679$)			$\chi^2(2) = 18.46$; $p < .001$; Cramér's $V = 0.17$[a]
Studying	166 (49%)	199 (58%)	
Full- or part-time work	146 (43%)	136 (40%)	
Unemployed	27 (8%)	5 (2%)	
Marital status (combined $n = 679$)			$\chi^2(3) = 5.49$; $p = .139$; Cramér's $V = 0.09$
Living with parents	193 (57%)	196 (57%)	
Single	50 (15%)	35 (10%)	
In a relationship/married/co-habiting	95 (28%)	108 (32%)	
Divorced	0	2 (1%)	
Children (combined $n = 642$)			$\chi^2(1) = 0.85$; $p = .356$; Cramér's $V = 0.04$
Yes	38 (11%)	41 (14%)	
No	302 (89%)	261 (86%)	
M Illness duration (*SD*) ($n = 340$)	8.93 (5.20)		
Insulin administration type ($n = 339$)			
Injections	281 (83%)	–	
Pump	58 (17%)	–	
Diabetes related distress ($n = 341$)			
Levels of distress within normal range (Score on PAID < 40)	247 (72%)	–	
Elevated levels of distress (Score on PAID ≥ 40)	94 (28%)	–	

Note. With respect to working status, standardized residuals indicated that the patient and control sample differed only on the category "Unemployed".

Table 2

Paired-samples *t*-tests for mean-level differences between patients and controls.

Variable	Patients	Controls		
	M (SD)	M (SD)	95% CI of difference	t-Value
Self-esteem	3.26 (0.67)	3.29 (0.51)	(−0.12 to 0.07)	−0.53
Extraversion	4.60 (1.44)	4.95 (1.23)	(−0.55 to −0.15)	−3.40**
Agreeableness	5.73 (0.71)	5.65 (0.64)	(−0.02 to 0.18)	1.56
Conscientiousness	4.50 (1.33)	4.43 (1.20)	(−0.11 to 0.25)	0.77
Emotional stability	3.88 (1.21)	4.25 (1.13)	(−0.53 to −0.21)	−4.56***
Openness	4.61 (1.04)	4.65 (0.96)	(−0.19 to 0.10)	−0.63
Diabetes-related distress	28.72 (20.20)	–	–	–

Note. M = Mean; SD = Standard Deviation; CI = Confidence Interval. Self-esteem can range from 1 to 4; the Big Five traits can range from 1 to 7; diabetes-related distress can range from 0 to 100.

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

(and given that ancillary analyses conducted on all 478 patients resulted in highly similar findings), we focused on the 341 matched patients. Because data from the control group were collected in the context of two different projects (one of which did not include a self-esteem measure), data on self-esteem were available for only 278 out of 341 control participants. Table 1 provides clinical and demographical information on both the patient and the control sample.

Objective 1: Comparing patients and controls

As shown in Table 2, paired-samples *t*-tests indicated that patients and controls differed on extraversion and emotional stability, with patients scoring significantly lower than controls. Ancillary analyses, displayed in Table 3, showed that female patients reported lower self-esteem, extraversion, and emotional stability as compared to female controls. Male patients, however, reported higher self-esteem and were more agreeable but less emotionally stable as compared to male controls. Furthermore, as shown in Table 3, mean-level differences between patients and controls were found to differ according to patients' illness duration. Whereas both patient subgroups were found to be less extraverted and emotionally stable as compared to controls, only the patients with longer illness duration reported heightened agreeableness scores.

Objective 2: Demographical, clinical, and psychological correlates

The multivariate analysis of variance indicated that women were lower in self-esteem ($F(1,327) = 5.20, p < .05, \eta^2 = .02$) and emotional stability ($F(1,327) = 12.40, p < .001, \eta^2 = .04$) as compared to men, but were higher in conscientiousness ($F(1,327) = 4.41, p < .05, \eta^2 = .01$). No effect was found for treatment type or illness duration. However, for conscientiousness, an interaction between illness duration and sex was observed ($F(1,327) = 9.82, p < .01, \eta^2 = .03$). Whereas women with longer illness duration were found to be less conscientious as compared to women with shorter illness duration ($p < .001$), no such difference was observed for men (see Fig. 2). Further, patients experiencing elevated diabetes-related distress ($n = 94$) reported lower self-esteem ($F(1,327) = 60.46, p < .001, \eta^2 = .16$) and were less agreeable ($F(1,327) = 7.58, p < .01, \eta^2 = .02$) and emotionally stable ($F(1,327) = 13.60, p < .001, \eta^2 = .04$) as compared to patients not reporting such distress ($n = 247$). Finally, conscientiousness was found to be positively associated with patients' age ($r(339) = 0.18, p = 0.001$) and negatively with illness duration ($r(338) = −.11, p = 0.039$).
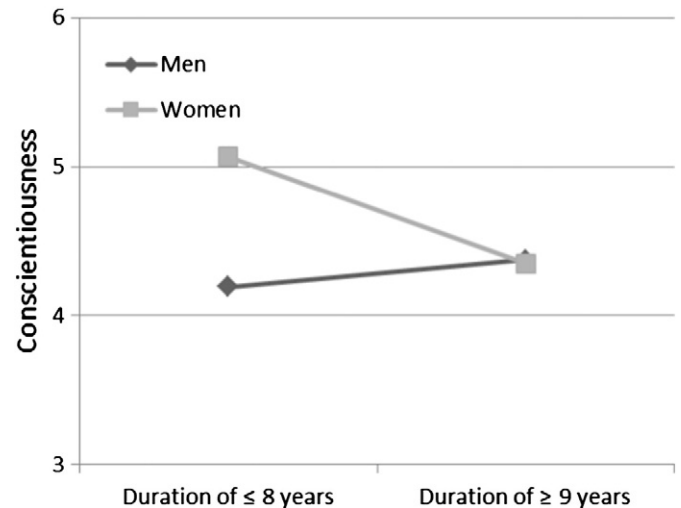

Fig. 2. Graphical representation of the interaction between sex and illness duration for conscientiousness.

Discussion

Previous research has demonstrated the importance of self-esteem and Big Five personality traits for glycemic control, treatment adherence, and quality of life in Type 1 diabetes [14–20]. The present study adds to this body of knowledge by examining mean-level differences in self-esteem and Big Five between emerging adults with Type 1 diabetes and healthy individuals matched on sex and age. Mean-level differences between patients and controls were found to differ according to sex and illness duration. Further, several important demographic, clinical, and psychological correlates of patients' self-esteem and personality traits were identified.

Objective 1: Comparing patients and controls

In line with previous research in other clinical samples [34], patients were less extraverted as compared to controls. As energy level constitutes a central feature of extraversion [50], patients' lower extraversion scores might be partially explained by their lower energy levels. Empirical research has indeed shown that individuals with Type 1 diabetes experience greater fatigue as compared to healthy controls [51], resulting from a complex interplay of physiological, psychosocial, and behavioral factors (e.g., alternations in blood glucose levels emotional distress, and reduced physical activity) [52]. Further, patients were found to be less emotionally stable as compared to controls. Low emotional stability is generally considered an important risk factor for developing depressive symptoms [53]. Hence, this finding is in line with the

Table 3

Paired-samples *t*-tests for mean-level differences between patients and controls according to patients' sex and illness duration.

Variable	Sex						Illness duration					
	Women (n = 178)			Men (n = 163)			≤8 years (n = 178)			≥9 years (n = 162)		
	Patients M (SD)	Controls M (SD)	t-Value	Patients M (SD)	Controls M (SD)	t-Value	Patients M (SD)	Controls M (SD)	t-Value	Patients M (SD)	Controls M (SD)	t-Value
SE	3.07 (0.74)	3.22 (0.54)	−2.01*	3.51 (0.48)	3.38 (0.45)	2.16*	3.34 (0.64)	3.32 (0.50)	0.32	3.19 (0.69)	3.27 (0.51)	−1.19
EX	4.62 (1.48)	5.13 (1.19)	−3.65***	4.59 (1.40)	4.75 (1.24)	−1.10	4.68 (1.44)	5.04 (1.22)	−2.47*	4.51 (1.44)	4.86 (1.23)	−2.41*
AG	5.73 (0.71)	5.75 (0.58)	−0.22	5.72 (0.71)	5.54 (0.69)	2.39*	5.74 (0.73)	5.72 (0.65)	0.18	5.72 (0.69)	5.58 (0.61)	2.01*
CO	4.70 (1.31)	4.67 (1.18)	0.27	4.27 (1.32)	4.16 (1.18)	0.81	4.63 (1.32)	4.50 (1.24)	1.02	4.36 (1.33)	4.35 (1.17)	0.10
EM	3.54 (1.11)	3.88 (1.06)	−3.02**	4.26 (1.21)	4.67 (1.05)	−3.43***	3.92 (1.21)	4.34 (1.13)	−3.84***	3.83 (1.21)	4.15 (1.12)	−2.69**
OP	4.47 (1.08)	4.63 (1.00)	−1.45	4.76 (0.98)	4.68 (0.91)	0.81	4.63 (1.05)	4.58 (0.99)	0.32	4.58 (1.03)	4.73 (0.92)	−1.39

Note. SE = Self-esteem; EX = Extraversion; AG = Agreeableness; CO = Conscientiousness; EM = Emotional Stability; OP = Openness; M = Mean; SD = Standard Deviation. Self-esteem can range from 1 to 4; the Big Five traits can range from 1 to 7.

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

increased prevalence rates of depression typically observed among individuals with Type 1 diabetes [36]. Patients' lowered emotional stability might be due to the psychosocial distress resulting from the demands imposed by diabetes [36]. However, less than one third of patients reported elevated diabetes-related distress. Nonetheless, even mild psychosocial distress outside the clinical range has been shown to predict negative outcomes and, in some cases, to spill over in more serious psychosocial problems later on [54,55]. Hence, also mild diabetes-related problems may require clinical attention.

Contrary to our expectations, patients did not show higher levels of conscientiousness as compared to controls. Indeed, based on the recent model of person–environment transactions [22,23], one would expect patients to show higher levels of conscientiousness, given the strong self-discipline that is needed to achieve favorable glycemic control [15,16]. However, previous research has shown that many parents tend to take personal responsibility for their child's diabetes [56]. This high parental involvement might keep some children from developing strong feelings of self-discipline in dealing with their diabetes and, hence, might partially explain why conscientiousness scores later on in life are not elevated in these individuals as compared to healthy controls.

Similarly, no differences in self-esteem were observed between patients and controls. However, when examining mean-level differences for men and women separately, significant differences in self-esteem emerged. Whereas women with diabetes reported lowered self-esteem as compared to female controls, men with diabetes reported higher self-esteem. This is partially in line with Stahl and colleagues who found that particularly boys with diabetes report heightened self-esteem [19]. Furthermore, previous research demonstrated that female patients generally show poorer physical and psychosocial functioning (e.g., lower glycemic control and quality of life), use more maladaptive coping strategies, and feel less confident about their body, as evidenced by the relatively high prevalence of eating disorders [37–39,57]. One consequence of this lowered self-esteem might be that these women are more inhibited about making use of available social support [8]. In line with this hypothesis, women but not men with diabetes were found to be less extraverted as compared to controls.

Furthermore, men with diabetes reported higher agreeableness as compared to healthy controls. Possibly, growing up with diabetes and keeping glycemic control within the normal range requires close cooperation with parents and healthcare professionals. In this way, men with diabetes might have learned to adopt a more dependent role and to rely on others more strongly as compared to healthy men [58]. The finding that women with diabetes did not report heightened agreeableness scores might be explained by the fact that these behaviors are rather normative in women [58]. Finally, whereas both patients with shorter and longer illness duration were less extraverted and emotionally stable as compared to controls, only patients with longer illness duration reported heightened agreeableness scores. Individuals diagnosed with diabetes for a longer time might have learned to accept their illness as part of the self, resulting in stronger diabetes integration and even personal growth [40,41].

Objective 2: Demographic, clinical, and psychological correlates

Demographic correlates

In line with previous research, women reported lower self-esteem, emotional stability, and openness, and higher conscientiousness as compared to men [19,34]. These findings confirm once again that young women with diabetes constitute a high risk group in need for prevention and intervention efforts, given the importance of self-esteem and emotional stability for glycemic control [14,15]. However, women were higher in conscientiousness as compared to men. Nonetheless, women have typically been found to show poorer treatment adherence as compared to men, with depressive symptoms functioning as a mediator in this relationship [59]. Hence, these findings suggest

that programs aimed at improving patients' treatment adherence should adopt a somewhat different focus for men and women. Whereas it might be effective to target the behaviors underlying the trait of conscientiousness (e.g., self-discipline) in men, for women it might be particularly important to focus on the underlying emotional difficulties that hinder treatment adherence. Age was found to be unrelated to the study variables, except for a positive association with conscientiousness.

Clinical correlates

First, increasing illness duration was associated with lowered conscientiousness in women but not in men. Hence, our findings suggest that, although women with diabetes have typically been found to show poorer treatment adherence as compared to men [59], especially women with longer illness duration may be at risk. Austin and colleagues [60] indeed demonstrated that longer diabetes duration was related to poorer dietary self-care. With increasing illness duration, patients are expected to assume more responsibility for their own self-care and, hence, they might experience less support from parents and healthcare professionals, potentially resulting in poorer adherence [60]. The fact that women tend to seek more social support in dealing with challenging situations as compared to men [58] may explain why the effect of illness duration was observed in women only. Second, patients using insulin pump therapy did not show significantly different levels of self-esteem and Big Five as compared to patients using insulin injections. Hence, although some studies found insulin pump therapy to be associated with better quality of life and glycemic control [43,44], the present findings indicate that treatment type is not related to patients' sense of self.

Psychological correlates

Patients experiencing elevated diabetes-related distress reported lower self-esteem, emotional stability, and agreeableness as compared to patients not experiencing such distress. Patients with a weak sense of self are typically assumed to be less well equipped to cope with the daily challenges of diabetes, which is in line with the vulnerability model of personality [13]. For instance, patients low in emotional stability generally experience more negative affect, report more symptoms, and use dysfunctional coping [53,61]. In contrast, individuals high in agreeableness typically use more positive reappraisal in dealing with their illness and tend to hide their illness less for others, resulting in more social support [61,62]. However, in line with the scar model of personality [13], elevated diabetes-related distress might also be assumed to negatively impact on patients' sense of self. Longitudinal research is needed to investigate the direction of effects.

In sum, the present findings suggest that personality and self-esteem might be important targets for prevention and intervention efforts, given that (1) emerging adults with Type 1 diabetes were at increased risk for developing a weak sense of self and (2) patients' sense of self is associated with a variety of outcomes including glycemic control. Although personality traits have generally been conceptualized as stable, relatively unchangeable patterns of thoughts, feelings, and actions [6], emerging research has demonstrated that personality traits can be changed through interventions [24,63]. In addition, there is some evidence suggesting that a strong sense of self can be fostered by low-cost programs, thereby improving health and reducing costs [64]. Further, our findings could help healthcare professionals in identifying those individuals that might benefit the most from such programs, as particularly female patients and patients with elevated diabetes-related distress were vulnerable for developing a weak sense of self.

Limitations

First, data were gathered through self-report questionnaires only. Although self-report is the most valid measure to assess variables such as personality, future research would benefit by using data from multiple sources. Relatedly, future research should include objective indicators of illness functioning such as levels of glycosylated hemoglobin

(HbA$_{1C}$). Second, because of the cross-sectional design, we were unable to determine the degree to which personality and self-esteem actually influenced, or were influenced by, diabetes-related distress. Assessing these variables longitudinally would allow for examining their developmental interplay. Finally, the only way to truly establish how diabetes may impact on patients' personality and self-esteem is to assess these variables both prior and following diagnosis. However, to conduct such a study, a very large sample would have to be followed over a long period in time.

Notwithstanding these limitations, the present study generated important information on how emerging adults with diabetes differ from healthy individuals on self-related variables such as personality and self-esteem. In addition, this study identified several demographic, clinical, and psychological correlates of patients' self-esteem and personality, thereby informing health care professionals working with these patients.

Conflict of interest

The authors have no conflicts of interest to state.

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