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Personality functioning in adolescents and emerging adults with type 1 diabetes: A longitudinal approach

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Abstract

Purpose. Although prior research has stressed the role of personality in adjusting to type 1 diabetes, longitudinal research is lacking. The objectives of the present study were twofold: (1) to chart the development of patients' personality over a 2-year period; and (2) to examine prospective associations among personality, treatment adherence, glycemic control, and diabetes-specific distress. **Methods**. Adolescents and emerging adults with type 1 diabetes, aged 14 to 25 (M_{age}=18.86 years, 54% female), participated in a 3-wave longitudinal study spanning 2 years (*n*=560 at Time 1). Patients filled out questionnaires on Big Five personality traits, treatment adherence, and diabetes-specific distress. HbA_{1c}-values were obtained from treating physicians. We used latent growth curve modeling to examine the development of patients' personality. Cross-lagged path analysis was performed to examine prospective associations among the study variables. **Results.** First, we observed mean-level increases in extraversion, agreeableness, and conscientiousness over the course of the study. Second, we uncovered bidirectional associations between personality and several important indicators of adjustment. Lower conscientiousness and higher extraversion predicted a relative decrease in treatment adherence one year later. Poorer treatment adherence, in turn, predicted relative decreases in conscientiousness and agreeableness over time. Furthermore, lower emotional stability predicted a relative increase in distress one year later. Higher distress, in turn, predicted a relative decrease in agreeableness over time. Finally, lower conscientiousness predicted poorer glycemic control one year later. **Conclusions.** This study found young patients to move toward a more mature personality and stressed the importance of personality in adjusting to type 1 diabetes.

Keywords: Personality, the Big Five; Treatment adherence; Diabetes-specific distress; Glycemic control; Type 1 diabetes; Adolescents; Emerging adults; Longitudinal; Cross-lagged analysis; Latent growth curve modeling.

Implications and Contribution

The present study was the first to chart the development of the Big Five personality traits in a relatively large sample of adolescents and emerging adults with type 1 diabetes. Furthermore, this study uncovered important prospective associations linking patients' personality to treatment adherence, glycemic control, and diabetes-specific distress.

Adolescence may be a particular difficult time for managing type 1 diabetes, as evidenced by heightened distress, deteriorating glycemic control, and poor adherence rates, with less than half of adolescents meeting treatment targets [1]. Besides having to deal with various developmental challenges such as forming a mature sense of self, adolescents are expected to take increasing responsibility for their diabetes [2]. In emerging adulthood – the period from ages 18 to 25 – patients are continuing to negotiate these challenges while also facing various transitions such as going to college, moving out of the parental home, and transitioning from pediatric to adult care [3]. This accumulation of normative and diabetes-specific stressors may interfere with diabetes management and, hence, emerging adults with type 1 diabetes are typically considered a high-risk group as well.

Prior research has stressed the role of personality in understanding treatment adherence [4-6], glycemic control [6-8], diabetes-specific distress [9,10], and long-term health complications [11] among adolescents and adults with type 1 diabetes. Personality traits describe the most fundamental personality differences between individuals that account for consistencies in how they act across situations and over time [12]. Most researchers now agree that personality can be subsumed under five broad traits [12]: extraversion (energy, sociability, and frequent positive moods), agreeableness (kindness, empathy, and cooperativeness), conscientiousness (goal-directedness, perseveration, and self-discipline), emotional stability (the ability to deal with negative emotions), and openness to experience (the way an individual seeks and deals with new information). Unfortunately, the literature on the link between personality and adjustment to type 1 diabetes is characterized by important limitations.

First, little research on the role of personality in type 1 diabetes has focused on adolescents and emerging adults. During adolescence and emerging adulthood, young people tend to move toward a more mature personality, as they gradually take on more adult responsibilities and roles [13-15]. Therefore, these formative periods might be particularly

suitable for examining the development of patients' personality. In addition, prior research has shown that patterns of non-adherence are often maintained over time [16] and, hence, it is important to identify predictors of adherence at an early age.

Second, prior research linking personality to treatment adherence, glycemic control, and diabetes-specific distress has been mainly cross-sectional. Certain personality traits may increase the risk for poor adjustment, which is in line with the vulnerability model of personality [17]. However, according to the scar model of personality, adjustment difficulties may also lead to so called scars in an individual's personality [17]. Recent studies have shown that personality changes can be triggered by changing roles, life events, and daily challenges [18,19]. For instance, adversity in adolescence has been found to predict decreases in emotional stability, conscientiousness, and agreeableness from childhood to adulthood [20]. Unfortunately, longitudinal research examining the directionality of effects is scarce.

Third, most research has linked patients' personality to treatment adherence and glycemic control [4-8]. As diabetes imposes multiple demands on patients, studies examining the relationship between personality and diabetes-specific distress are needed as well [9,10]. Diabetes-specific distress – such as feeling overwhelmed by the responsibilities of diabetes management or feeling others do not understand the difficulty of managing diabetes – has been extensively studied, but not in relation to personality. Recent studies have shown that diabetes-specific distress is quite common and relates more strongly to glycemic control than depressive symptoms among adults with type 1 diabetes [21].

To fill these gaps, the present study had two objectives. First, we examined the development of personality over a 2-year period in a relatively large sample of adolescents and emerging adults with type 1 diabetes. We expected patients to move toward a more mature personality, as evidenced by mean-level increases in the different Big Five traits [13-15]. We also explored whether these Big Five trajectories differed among male and female patients,

adolescents and emerging adults, and patients with a shorter versus longer illness duration. Prior research observed sex differences in the timing of personality maturation, with girls reaching higher levels of agreeableness at an earlier age than boys [13].

Second, we examined prospective associations among personality, treatment adherence, glycemic control, and diabetes-specific distress. We expected that higher conscientiousness and emotional stability would predict better treatment adherence one year later [4-6]. Furthermore, higher conscientiousness and agreeableness would predict better glycemic control over time [6-8]. Finally, we expected that lower emotional stability – and to a lesser extent agreeableness and conscientiousness – would predict more distress one year later [9,10]. However, reverse pathways might emerge as well [18-20].

Methods

Subjects and procedure

Patients were selected from the Belgian Diabetes Registry using the following criteria: diagnosis of type 1 diabetes, 14-25 years old, sufficient cognitive abilities to fill out questionnaires, and Dutch-speaking. A total of 1,450 patients met these inclusion criteria and were invited to participate in the study. Patients received a package by surface mail, consisting of a set of questionnaires, an informed consent form, and a pre-stamped return envelope. Patients under 18 years old were asked to complete an assent form in addition to their parents completing a consent form. A total of 560 (41%) patients participated in wave 1. These patients were again invited to participate one and two years later. A total of 423 patients participated in wave 2 and 381 participated in wave 3. A total of 339 patients participated in all three waves. We performed Little's missing completely at random test [22], which was not significant [$\chi^2(1140)=1189.46$, $p=.150$], indicating that missing values could be reliably dealt with. In addition, no differences were observed between participants with and without complete data on

sex [$\chi^2(1)=3.37$, $p=.066$], age [$F(1,558)=0.44$, $p=.509$, $\eta^2=.00$], illness duration [$F(1,557)=0.29$, $p=.591$, $\eta^2=.00$], and study variables at Time 1 [$F(8,372)=1.54$, $p=.142$, $\eta^2=.03$]. Demographic and clinical information on the sample is provided in Table 1. The proposed study protocol was approved by the Institutional Review Board of the University Hospitals Leuven, Belgium.

Materials

To measure personality, we used the Big Five Inventory (BFI-25) which consists of 25 short-phrase items, rated on a Likert scale ranging from 1 *(strongly disagree*) to 5 (*strongly agree*) [23,24]. Sample items include: "I see myself as someone who is talkative" (extraversion), "I see myself as someone who is considerate and kind to almost everyone" (agreeableness), "I see myself as someone who does a thorough job" (conscientiousness), "I see myself as someone who is relaxed, handles stress well" (emotional stability), and "I see myself as someone who is original, comes up with new ideas" (openness). Cronbach's alphas at Times 1-3 ranged between .82 and .83 for extraversion, between .63 and .66 for agreeableness, between .73 and .74 for conscientiousness, between .81 and .83 for emotional stability, and between .71 and .78 for openness.

Diabetes-specific distress was measured using the Problem Areas in Diabetes Scale (PAID) which assesses treatment-related, food-related, emotional, and social support problems with a 5-point Likert scale ranging from 0 (*not a problem*) to 4 (*a serious problem*) [25,26]. Sample items are: "Feeling discouraged with your diabetes regimen (treatment), "Feelings of deprivation regarding food and meals" (food), "Feeling constantly burned out by the constant effort to manage diabetes" (emotional), and "Feeling alone with diabetes" (social support). The total score was calculated as the average of the four problem areas, with higher scores indicating more distress. Cronbach's alphas at Times 1-3 ranged between .94 and .95.

To measure treatment adherence, we used the Self-Care Inventory (SCI) [27,28], which asks patients to indicate how well they followed their prescribed regimen for diabetes care in

the past month on a 5-point Likert scale ranging from 1 (*never do it*) to 5 (*always do this as recommended without fail*), or they could indicate that the item was not applicable. The SCI includes items that focus on blood glucose testing and monitoring, insulin and food regulation, exercise, and emergency precautions. We omitted the item 'wearing a medic alert ID', as this is not standard practice in Belgium. A mean adherence score was calculated, with higher scores indicating better adherence. Cronbach's alphas at Times 1-3 ranged between .76 and .78.

Finally, HbA_{1c}-values in an approximate time-frame of three months before or after questionnaire completion were obtained from patients' treating physicians. HbA_{1c}-values below 7.0% are recommended (below 7.5% for adolescents) [29]. Information on glycemic control was available for 422, 402, and 277 patients at Times 1-3, respectively.

Statistical analyses

To examine the general developmental trend in patients' personality, we conducted latent growth curve modeling (LGCM) on all five traits simultaneously. The path from the slope to the indicators at Time 1 was fixed to zero so that the intercept would represent the initial level. Subsequent linear slope pattern coefficients were fixed at 1 and 2 for Times 2 and 3, respectively. To evaluate model fit, standard fit indices were used [30]. The robust Satorra-Bentler scaled chi-square statistic (S-Bχ^2) should be as small as possible, RMSEA should be <.08, and CFI should be >.90. Maximum likelihood estimation with robust standard errors (MLR) was used to take into account the non-normality of the data. To deal with missing values, we used the full information maximum likelihood procedure in Mplus 7.4.

Multigroup LGCM was conducted to investigate whether the intercepts or slopes of these Big Five trajectories differed among male and female patients, adolescents (14-17 years old at Time 1) and emerging adults (18-25 years old at Time 1), and patients with a shorter (below the median of 7 years at Time 1) versus longer illness duration (≥ 7 years at Time 1). First, for each personality trait separately, a fully unconstrained baseline model was estimated.

Next, we re-estimated the model with intercepts constrained equal across groups. Finally, we constrained linear slopes equal across groups. The null hypothesis of invariant growth parameters across groups would be rejected if at least two of the following criteria were satisfied [31,32]: ΔS-Bχ^2 significant at $p<.05$; ΔCFI$\geq$.010; and ΔRMSEA$\geq$.015.

To examine prospective associations among personality, treatment adherence, glycemic control, and diabetes-specific distress, we performed cross-lagged analysis. Separate models were fitted for each indicator of adjustment. All within-time associations, stability paths, and cross-lagged paths linking personality to treatment adherence, glycemic control, and diabetes-specific distress (and vice versa) were estimated. Age, sex, and illness duration were controlled for by estimating paths to each construct at Time 1. In addition, multi-group analyses were performed to investigate whether sex, age, or illness duration moderated the cross-lagged paths. Finally, in a set of ancillary analyses, we tested indirect relationships between personality and glycemic control via treatment adherence and diabetes-specific distress. A multiple panel model for testing mediation was used, including all within-time correlations, stability coefficients, paths from the independent variable to the mediators at subsequent time points, and paths from the mediators to the dependent variable at subsequent time points [33].

Results

General developmental trend in personality

Our LGCM model fitted the data adequately [S-B$\chi^2(55)=103.05$, $p<.001$; RMSEA=.039; CFI=.985]. Mean-level increases in extraversion [$M_{intercept}=3.40$, $p<.001$; $M_{slope}=0.04$, $p=.013$], agreeableness [$M_{intercept}=3.71$, $p<.001$; $M_{slope}=0.03$, $p=.030$], and conscientiousness [$M_{intercept}=3.48$, $p<.001$; $M_{slope}=0.03$, $p=.018$] were found over time. No changes were observed in emotional stability [$M_{intercept}=2.86$, $p<.001$; $M_{slope}= 0.00$, $p=.808$] or openness [$M_{intercept}=3.42$, $p<.001$; $M_{slope}= -0.01$, $p=.493$]. For emotional stability, constraining

intercepts to be equal among male and female patients significantly decreased model fit [ΔS-Bχ^2(1)=100.68, p<.001; ΔCFI=.206; ΔRMSEA=.337]. Female patients generally reported lower levels of emotional stability as compared to male patients. For conscientiousness, constraining intercepts to be equal among adolescents and emerging adults significantly decreased model fit [ΔS-Bχ^2(1)=14.40, p<.001; ΔCFI=.022; ΔRMSEA=.099]. Adolescents generally reported lower levels of conscientiousness as compared to emerging adults.

Prospective associations with diabetes-specific functioning

Cross-sectional associations among the study variables are presented in Table 2. Cross-lagged analysis was performed in two steps. First, all cross-lagged paths were freely estimated. Second, all cross-lagged paths were constrained as equal across both time intervals. The more parsimonious models fitted the data equally well and, hence, were retained. Fit indices are shown in Table 3. In Model 1, higher levels of conscientiousness were associated with relative increases in adherence over time. In contrast, higher levels of extraversion were associated with relative decreases in adherence one year later. This relationship was only significant from Times 2-3 (despite the fact that cross-lagged paths could be constrained as equal across both time intervals). With regard to the reverse pathways, we found that better treatment adherence was associated with a relative increase in conscientiousness across both time intervals and with a relative increase in agreeableness from Times 2-3. In Model 2, higher levels of emotional stability were associated with a relative decrease in diabetes-specific distress one year later. Lower levels of distress, in turn, were associated with relative increases in agreeableness one year later. In Model 3, higher levels of conscientiousness were associated with better glycemic control one year later. None of the cross-lagged paths were found to be moderated by sex, age, or illness duration. Figure 1 displays all significant standardized cross-lagged paths.

Indirect effects

The indirect models including paths from the Big Five personality traits to glycemic control via treatment adherence and diabetes-specific distress had an adequate fit to the data. Constraining cross-lagged paths as equal across time intervals did not significantly lower model fit and hence, these more parsimonious models were retained. Fit indices are shown in Table 2. The indirect paths from extraversion (p=.145) and conscientiousness (p=.073) to glycemic control via adherence were non-significant. Likewise, the indirect path from emotional stability to glycemic control via distress was non-significant (p=.060).

Discussion

The present study charted the development of the Big Five personality traits over a 2-year period in a relatively large sample of adolescents and emerging adults with type 1 diabetes. In line with prior research in community samples, patients tended to move toward a more mature personality, as evidenced by small mean-level increases in extraversion, agreeableness, and conscientiousness [13-15]. During adolescence and emerging adulthood, role expectations change substantially, with a transition taking place from being a child to becoming a responsible adult [13]. These changes toward maturation in psychosocial domains are assumed to be paralleled by changes in personality traits. Somewhat unexpectedly, we did not observe an increase in emotional stability. Prior research has shown that emerging adults with type 1 diabetes generally report lower levels of emotional stability as compared to healthy controls [34]. Future research should examine whether emotional stability also develops differently in young people with and without type 1 diabetes. However, our findings are in line with the findings of a recent study in community adolescents, in which an increase in emotional stability was observed for parent-reports but not for self-reports [14].

Furthermore, the present study uncovered bidirectional associations among personality, treatment adherence, glycemic control, and diabetes-specific distress. In line with the predisposition model, certain personality traits increased the risk of experiencing adjustment difficulties [17]. First, lower levels of conscientiousness were associated with poorer treatment adherence and glycemic control one year later [4-7]. Prior research has indeed found individuals low in conscientiousness to engage in poorer health behaviors such as drinking, smoking, unhealthy eating, and lower levels of exercise [35]. Prior research in young adults with type 1 diabetes has also linked lower levels of conscientiousness to the use of passive and avoidant coping strategies, whereas higher levels of conscientiousness have been linked to more active, problem-focused coping [10,36]. In the present study, treatment adherence did not function an intervening mechanism in the relationship between conscientiousness and glycemic control.

Second, higher levels of extraversion predicted poorer treatment adherence one year later. A central feature of extraversion is sociability, that is, the preference to be with others rather than alone and to seek close relationships [12]. Prior research has shown that adolescents with type 1 diabetes who are strongly oriented towards their peers generally show poorer self-care behaviors to avoid being viewed as different [37]. These findings may partially shed light on why patients high in extraversion were found to show poorer treatment adherence in the present study.

Third, lower levels of emotional stability predicted a relative increase in diabetes-specific distress one year later [9,10]. Prior research in young adults with type 1 diabetes has found patients low in emotional stability to use more passive and avoidant coping strategies, to perceive more consequences of their illness, and to experience less control over their illness, which all have been associated with heightened diabetes-specific distress [10]. Heightened distress, in turn, has been related to poorer glycemic control [21]. However, in the present study, distress did not function an intervening mechanism in the relationship between emotional

stability and glycemic control. Somewhat surprisingly, emotional stability was also not directly related to treatment adherence and glycemic control. Some studies have observed a curvilinear relationship, with both low and high levels of emotional stability being associated with poorer glycemic control and an increased risk for long-term health complications among adolescents and adults with type 1 diabetes [6,11]. These researchers have argued that a certain degree of worry may provide increased motivation for patients to follow the required regimen.

In line with the scar model of personality [17], the present study also found that adjustment difficulties may lead to changes in a patient's personality. More specifically, poorer treatment adherence predicted a relative decrease in conscientiousness one year later. In addition, poorer treatment adherence and higher levels of distress were associated with relative decreases in agreeableness one year later. Feeling distressed and being poorly committed to diabetes management may hinder a close collaboration with parents and healthcare professionals. Patients may start to rely less on others, adopt a less cooperative attitude, and be less open to shared decision making, eventually leading to lower levels of agreeableness over time [38]. In sum, these findings further support the idea that changes in an individual's personality can be triggered by changing roles, life events, and/or daily challenges [18-20].

Clinical implications

In the present study, personality traits were found to be important predictors of how well patients adjusted to their diabetes, pointing to the importance of assessing patients' personality during routine medical care. Personality may be assessed by a brief self-report questionnaire in which patients are asked to rate themselves on a series of adjectives. Ideally, all patients would be asked to fill out some standard questionnaires shortly after diagnosis, including a personality measure. The period of adolescence might be particularly suitable in this respect, as it constitutes a critical formative period for personality development. Personality assessment at

an early age may help clinicians in identifying patients at risk for adjustment difficulties later in life.

Another, perhaps more pragmatic, option would be to assess personality specifically in patients showing difficulties in managing their diabetes. In this way, healthcare professionals are provided with a context for understanding the problems that these patients report and it may help them to approach patients in a manner that fits their individual personality characteristics [39]. For instance, if patients show poor treatment adherence, it might be due to the fact that they are not so organized, self-disciplined, or goal-directed – pointing to relatively low levels of conscientiousness. In such cases, healthcare professionals might need to find ways to motivate these patients for better adhering to treatment guidelines to avoid future health complications. In addition, they could provide these patients with tools to help them get more organized (e.g., the use of smartphone reminders). However, patients may also feel very anxious, insecure, and pessimistic regarding their diabetes – pointing to relatively low levels of emotional stability – which may cause them to reject their diabetes as part of the self and ignore important treatment responsibilities. In such cases, healthcare professionals might need to be more attentive to how they provide certain information about their diabetes to prevent these patients from getting even more overwhelmed. However, before implementing such personality-informed interventions into clinical practice, our findings should be replicated in future research and the value of such interventions should be demonstrated in randomized controlled trials.

Finally, as better treatment adherence and lower levels of distress predicted relative increases in conscientiousness and agreeableness over time, optimizing adherence and minimizing distress at an early age may help patients in developing a mature personality which, in turn, can play into optimal illness adaptation later in life.

Limitations

First, as we did not have a longitudinal control group, we could not investigate whether personality develops differently in adolescents and emerging adults with and without type 1 diabetes. Second, despite our large sample, the relatively low response rate might reduce the generalizability of our findings. In addition, the voluntary nature of participation might have introduced sample bias. However, according to data from the Belgian Diabetes Registry, the mean glycemic control values in our sample were representative of the total population of youth with type 1 diabetes in the registry. Third, all measures, except for glycemic control, were based on self-reports which could induce shared method variance. Hence, future research could include other informants to assess the key variables. Finally, future research would benefit from a more in-depth assessment of patients' personality, using personality facets (i.e., more specific and narrow personality characteristics). Prior research in community samples has demonstrated that personality facets relate differently to various indicators of adjustment, highlighting the added value of facet-level research [40].

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Tables

Table 1. Demographic and clinical information on the sample at Time 1.

	Time 1 *n* = 560
Sex	
Male	257 (46%)
Female	303 (54%)
Insulin administration	
Injection	438 (79%)
Pump	118 (21%)
Civil status (more than 1 option)	
Living with parents	401 (72%)
Living with partner/(re)married	40 (7%)
Relationship (living separately)	131 (23%)
Single	67 (12%)
Working situation	
Student	419 (76%)
Working	108 (20%)
Unemployed	19 (4%)
Education	
University or college	115 (21%)
General secondary education	184 (34%)
Technical or vocational education	198 (36%)
Primary education	33 (6%)
Unqualified	14 (3%)
Mean age *(SD)*	18.86 (3.24)
Mean age at diagnosis (*SD*)	11.21 (5.52)
Mean illness duration (*SD*)	7.64 (4.98)
Mean HbA_{1c} % (*SD*)	7.74 (1.43)

Table 2. Correlations among study variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. EX	**.77***/.83*****	.25***/.23***/ .24***	.12**/.12*/ .16***	.15***/.14**/ .17***	.26***/.25***/ .21***	.03/.01/ .03	-.15***/-.10*/ -.19***	.00/.16**/ .03
2. AG		**.63***/.73*****	.32***/.34***/ .34***	.18***/.15**/ .19***	.26***/.13**/ .09	.16***/.18***/ .19***	-.18***/-.16***/ -.22***	-.20***/-.03/ -.15*
3. CON			**.73***/.83*****	.06/.09/ .15**	.17***/.10*/ .04	.29***/.30***/ .31***	-.18***/-.21***/ -.21***	-.12**/-.17**/ -.23***
4. EM				**.77***/.79*****	.09*/.03/ .05	.10*/.07/ .18***	-.36***/-.33***/ -.34***	-.06/-.06/ -.13*
5. OP					**.73***/.74*****	.01/.04/ .03	-.06/-.08/ -.06	.04/.05/ -.03
6. TA						**.67***/.63*****	-.34***/-.20***/ -.29***	-.28***/-.21***/ -.24***
7. DIS							**.65***/.65*****	.17***/.21***/ .24***
8. HbA_{1c}								**.70***/.67*****

Note. EX = Extraversion; AG = Agreeableness; CON = Conscientiousness; EM = Emotional stability; OP = Openness; TA = Treatment adherence; DIS = Diabetes-specific distress. The first coefficient is for Time 1; the second for Time 2; the third for Time 3. On the diagonal, the first coefficient represents the stability from Time 1 to Time 2 and the second coefficient represents the stability from Time 2 to Time 3. *$p < .05$. **$p < .01$. ***$p < .001$.

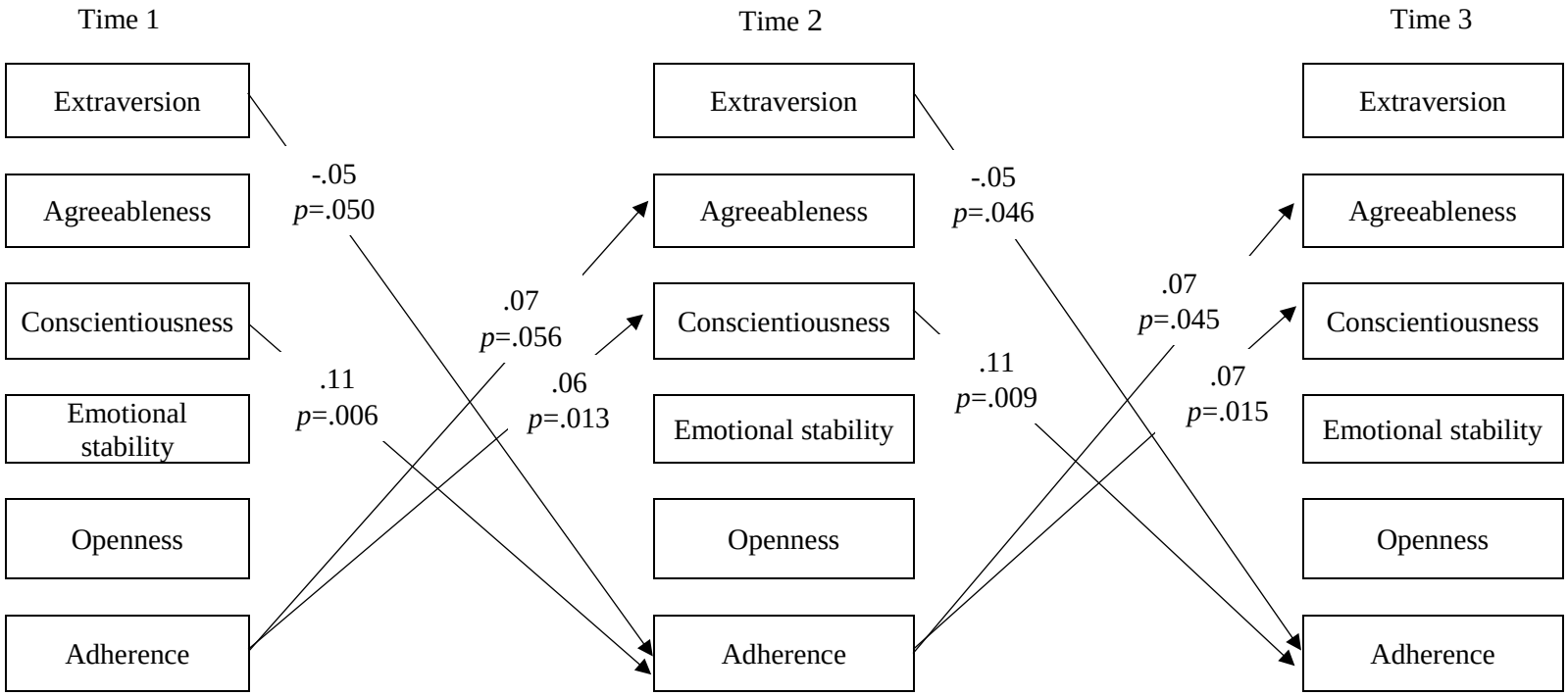
Table 3. Fit indices of the cross-lagged models linking personality to treatment adherence, diabetes-specific distress, and glycemic control.

	S-Bχ^2 (df), *p*-value	**CFI**	**RMSEA**
Model 1 (adherence) – free over time	340.44 (112), $p < .001$	.942	.060
Model 1 (adherence) – fixed over time	342.83 (122), $p < .001$	.944	.057
Model 2 (distress) – free over time	296.35 (112), $p < .001$	.955	.054
Model 2 (distress) – fixed over time	304.07 (122), $p < .001$	.955	.052
Model 3 (HbA_{1c}) – free over time	270.23 (112), $p < .001$	.960	.050
Model 3 (HbA_{1c}) – fixed over time	289.01 (122), $p < .001$	.958	.049
Mediational model 1 (adherence) – free over time	319.21 (121), $p < .001$	.947	.054
Mediational model 1 (adherence) – fixed over time	319.91 (127), $p < .001$	.949	.052
Mediational model 2 (distress) – free over time	285.99 (121), $p < .001$	.958	.049
Mediational model 2 (distress) – fixed over time	290.90 (127), $p < .001$	.958	.048

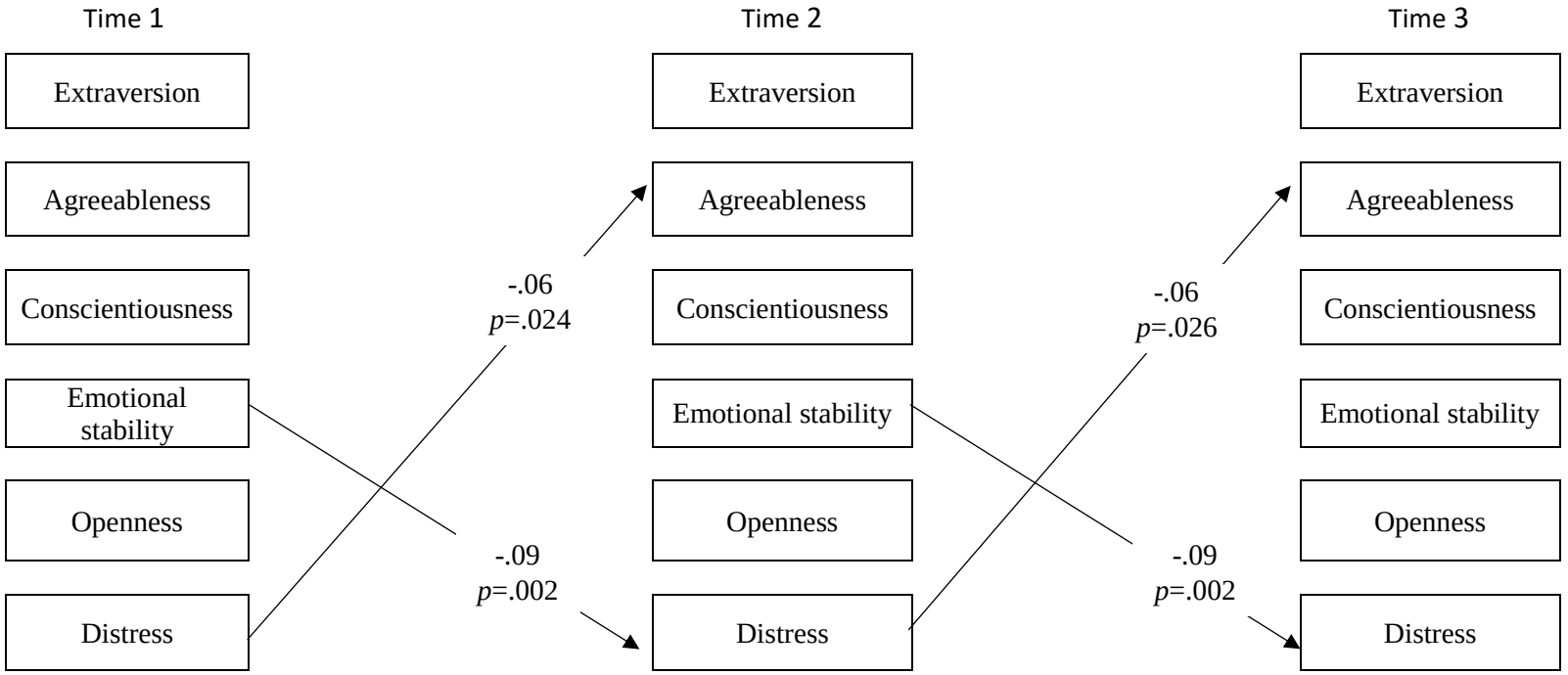
Note. S-B χ^2 = The robust Satorra-Bentler scaled chi-square statistic; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

Figures

Panel a



Panel b


Time 1
Time 2
Time 3
Extraversion
Agreeableness
Conscientiousness
Emotional stability
Openness
Distress
Extraversion
Agreeableness
Conscientiousness
Emotional stability
Openness
Distress
Extraversion
Agreeableness
Conscientiousness
Emotional stability
Openness
Distress
-.06
p=.024
-.09
p=.002
-.06
p=.026
-.09
p=.002

Panel c

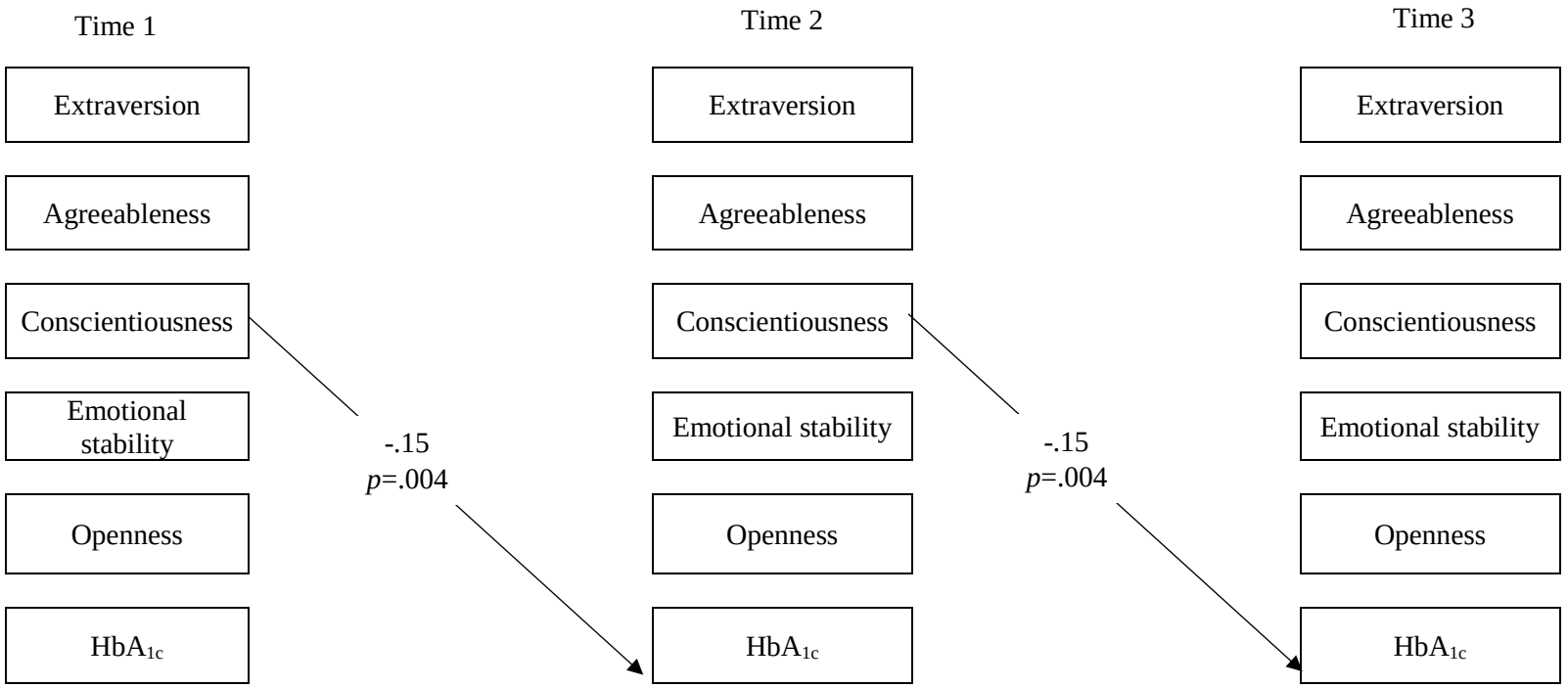


Figure 1. Cross-lagged path models linking the Big Five personality traits to treatment adherence (Panel a), diabetes-specific distress (Panel b), and glycemic control (Panel c) over time. Within-time associations, auto-regressive paths, and paths from sex, age, and illness duration are not presented for reasons of clarity. All path coefficients are standardized. Auto-regressive paths ranged between .62 and .83 (all *p*s < .001).