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Elucidating the links between personality traits and diabetes mellitus: examining the role of facets, assessment methods, and selected mediators

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Abstract

The aim of this paper is three-fold. First, we identified self- and informant-rated Five-Factor Model (FFM) personality domains and facets associated with diabetes diagnosis. Second, we tested whether the associations were independent of the rater method-specific variance. Lastly, we examined whether the observed associations were mediated by BMI, alcohol intake, dietary habits, and exercise. The participants were members of the Estonian Biobank (N = 3592; 1145 men; M_{age} = 46.6 ± 7.0 years). We fit a series of logistic regression models predicting diabetes diagnosis from one self-or informant-rated personality domain or facet at a time, controlling for age, sex, and education. Diabetes diagnosis was significantly associated with the N5: Impulsiveness, E4: Activity, and C2: Order facets. Method-independent variance, estimated by means of bi-factor models, was significantly related with diabetes for two of the facets, E4: Activity (β = - 0.106, p = .007) and C2: Order (β = - 0.089, p = .037), but not for N5: Impulsiveness. The strongest mediator of the personality-diabetes association was BMI, explaining 30-50% of the observed associations. We discuss implications of the current results.

Keywords: personality traits; facets; diabetes mellitus; mediation; self-reports, informant-ratings

1. Introduction

Inconsistent associations between the Five-Factor Model (FFM) personality domains and diabetes have been reported in the literature. Cross-sectional studies have found that low conscientiousness and openness, and higher agreeableness and neuroticism are associated with diabetes diagnosis (Goodwin, Cox, & Clara, 2006; Goodwin & Friedman, 2006). Although longitudinal findings have also suggested that lower conscientiousness may be linked with higher risk of developing diabetes (Cheng, Treglown, Montgomery, & Furnham, 2015; Jokela et al., 2014), they have implicated *lower* neuroticism as a correlate of the disease (Čukić & Weiss, 2014) and found no association for openness.

One possible explanation for this inconsistency is that the associations between personality and diabetes might be facet-specific, namely because different brief measures of personality domains used in previous studies may represent underlying personality traits or their specific facets to varying degrees. However, no study to date has considered this possibility despite the fact that facet-specific associations between personality traits and diabetes risk factors such as smoking and body mass index (BMI) have been observed (Terracciano & Costa, 2004; Vainik, Mõttus, Allik, Esko, & Realo, 2015). Facet-specific associations, however, should not be generalized to the FFM domains (Mõttus, 2015) .

Similarly, personality-diabetes associations may depend on assessment methods. For example, self- and observer rated personality traits may have different links with health outcomes (Jackson, Connolly, Garrison, Leveille, & Connolly, 2015), as method-specific biases such as socially desirable responding may drive the observed associations. Although socially desirable responding might reflect substantive variance (McCrae & Costa, 1983), it would not be correct to interpret its associations with health outcomes as pertaining to the

FFM traits[1]. All previous studies have been conducted using the self-report method. Multi-method studies could help to disentangle the method-specific and trait-relevant associations between personality traits and diabetes.

Lastly, mechanisms of associations between personality and diabetes, currently poorly understood, may involve health behaviours such as unhealthy diet and physical inactivity that are associated with both diabetes (International Diabetes Federation, 2012), and personality traits. Particularly, lower neuroticism and higher extraversion, openness and conscientiousness have all been associated with healthier dietary choices (Mõttus, Realo, Allik, Deary, Esko, & Metspalu, 2012; Mõttus, McNeill, Jia, Craig, Starr, & Deary, 2013). Similarly, a meta-analysis of thirty two studies showed associations between higher levels of physical activity and higher extraversion and conscientiousness and lower neuroticism (Rhodes & Smith, 2006). Likewise, higher neuroticism has been associated with diabetes precursors such as metabolic syndrome (Phillips, Batty, Weiss, Deary, Gale, &Thomas, 2010) and heightened BMI (Vainik et al., 2015). Finally, agreeableness and conscientiousness may moderate the expression of diabetes genetic risk, possibly via their associations with behavioural and metabolic risk factors (Čukić, Mõttus, Luciano, Starr, Weiss, & Deary, 2015). However, direct tests of these potential mediating pathways are still lacking.

Using a large national sample of Estonians, the present study expands previous literature in three novel ways. First, it employed both self- and informant-ratings of personality to assess whether the associations with diabetes are method-specific. Second, it explored whether the associations between personality and diabetes are driven by specific personality facets rather than domains. Finally, it tested whether any of these associations is mediated by dietary and drinking habits, physical activity, and BMI.

[1]Different traits might reflect socially desirable responding or other biases to a different degree and thereby have distinct associations with outcomes even with the associations being completely driven by method-specific variance.

2. Method

2.1. Sample

The sample was derived from the Estonian Biobank (EB) cohort (approximately 52,000 individuals), a volunteer-based sample of the Estonian resident adult population (Leitsalu et al., 2014). The EB participants were recruited randomly by general practitioners (GPs), physicians, or other medical personnel in private practices and hospitals or in the recruitment offices of the EGC. Participants signed an informed consent form (available at www.biobank.ee), underwent a standardized health examination, and completed a Computer Assisted Personal Interview (CAPI) on health-related topics such as lifestyle, diet and clinical diagnoses described in WHO ICD-10 (Leitsalu, et al., 2014). The subsample of the cohort used in this study (N = 3592; age range: 18-91 years; mean age 43.2 ± 16.3 years; 59.3% females) also completed a self-report personality questionnaire, and asked an informant to rate them using the same instrument. The informants included participants' spouses or partners (47.07%), friends (15.56%), parents (17%), (grand)children (7.36%), siblings (6.34%), other relatives (3.5%) and acquaintances (3.17%). Data collection took place between 2008 and 2014 (see also Allik, Borkenau, Hrebickova, Kuppens, & Realo, 2015; Mõttus, Allik, Hřebíčková, Kööts-Ausmees, & Realo, 2015; Realo, Teras, Kööts-Ausmees, Esko, Metspalu, & Allik for the sample description).

2.2. Measures

2.2.1. Personality. Personality traits were assessed using the Estonian translation of the NEO Personality Invertory-3 (NEO PI-3), (De Fruyt, De Bolle, McCrae, Terracciano, & Costa, 2009; McCrae & Costa, 2010). The NEO PI-3 consists of 240 items that tap 30 facets of the five FFM domains. The responses are given on a 5-point Likert scale ranging from *completely disagree* to *completely agree.* Participants completed the self-report form and informants the observer-report form of the NEO PI-3.

2.2.2. Diabetes. Diabetes diagnoses were initially self-reported during the CAPI but the information was combined with objective medical records to increase the reliability of diagnoses. The International Classification of Diseases (ICD-10) codes E10, E11, E12, E13 and E14 indicated presence of diabetes.

2.2.3. Covariates. Age was treated as a continuous variable. Sex was coded as 0 for males and 1 for females. Highest educational attainment was coded as: elementary (7.7%), secondary (24.0%), secondary vocational (28.3%), and higher education (40.1%).

2.2.4. Mediators

2.2.4.1. Alcohol. Alcohol consumption frequency was assessed using the question "How often do you usually consume alcoholic drinks? – 4 or more times per week (4.4%), 2-3 times per week (14.0%), 2-4 times per month (27.7%), once a month (14.6%), a few times per year (16.1%), less than once a year (3.7%)". The data was not available for 701 (19.5%) participants.

2.2.4.2. Physical Activity. Physical activity was assessed using the question "How many hours per week do you on average spend on the following activities outside working hours? – Physical Exercise". The responses quantified the hours participants engaged in physical exercise in a typical week (M = 1.09 ± 1.3h).

2.2.4.3. BMI. Height and weight were recorded by the GPs or physicians during the standardized health examination. BMI was calculated using the standard formula: weight (kg)/height^2 (m^2). BMI was log-transformed and used as a continuous variable.

2.2.4.4. Dietary habits. Participants were asked to report the frequency of consumption of 16 food and drink items in the previous week or in a typical week in case the previous week was atypical regarding eating behaviour. The answers were given on a 4-point scale: "never", "1-2 days", "3-5 days" and "6-7 days". The items were residualised for age, sex and education,

and subjected to principal components analysis (PCA), followed by oblimin rotation. Similarly to Mõttus et al. (2012), two components were extracted accounting for 25% of the variance. Three items were removed from the analyses due to low loadings (< 0.2) on either of the factors ("rice/pasta"), or loading equally on both factors (0.26 and 0.27 - "eggs"; 0.39 and 0.31 - "compote/jam"). The final two-component solution contained 13 items and explained 28% of the variance. Consistently with Mõttus et al. (2012), the two components were interpreted as health aware diet and traditional diet (See Table S1 for the full list of factor loadings). Individual scores on the two components were used in subsequent analyses.

3. Results

One hundred and one participants (4.5%) had a diabetes diagnosis, which is somewhat lower than the national prevalence estimate of 7.5% (Aguiree et al., 2013). Participants with diabetes were significantly older, had a higher BMI, engaged in more physical activity, and reported drinking more alcohol than those without the condition. The full list of descriptive statistics is presented in Table S2 of Supplementary material.

To investigate the associations of personality domains and facets with diabetes diagnosis, we fitted a series of logistic regression models, for one self- or informant-rated domain or facet at a time (cf. Mõttus, Realo, Allik, Esko, & Metspalu, 2012), controlling for age, sex and education (Table 1). Scores of two self-reported personality domains (neuroticism and openness), and four self-reported facets (N5: Impulsiveness, E4: Activity, O6: Values, and C2: Order) were significantly associated with diabetes diagnosis (*p*s < .05). In informant-ratings, none of the personality domains but facets predicted diabetes diagnosis: N5: Impulsiveness, E2: Gregariousness, E4: Activity, and C2: Order. Therefore, the N5: Impulsiveness, E4: Activity and C2: Order facets were significant predictors of diabetes diagnosis in both methods of assessment, with fairly similar effect sizes.

Table 1

Odd Ratios, 95% Confidence Intervals and significance levels for self-reports and ratings of all personality facets and domains predicting diabetes diagnosis

	Self-reports		*Informant-ratings*	
	OR [95% CIs]	*P*-value	*OR* [95% CIs]	*P*-value
Neuroticism	1.20 [1.01, 1.42]	**.0392**	1.13 [0.95, 1.35]	.1706
N1: Anxiety	1.13 [0.95, 1.34]	.1675	1.09 [0.91, 1.30]	.3686
N2: Angry Hostility	1.14 [0.97, 1.35]	.1168	1.12 [0.94, 1.32]	.1953
N3: Depression	1.17 [0.98, 1.40]	.0791	1.06 [0.89, 1.28]	.5050
N4: Self-Conscientiousness	1.09 [0.92, 1.28]	.3254	1.09 [0.91, 1.29]	.3538
N5: Impulsiveness	1.26 [1.06, 1.49]	**.0076**	1.21 [1.02, 1.43]	**.0301**
N6: Vulnerability	1.10 [0.93, 1.30]	.2653	1.02 [0.86, 1.21]	.7890
Extraversion	0.86 [0.72, 1.04]	.1137	0.86 [0.72, 1.02]	.0881
E1: Warmth	1.05 [0.89, 1.24]	.5837	0.97 [0.82, 1.15]	.7157
E2: Greagariousness	0.89 [0.75, 1.05]	.1726	0.84 [0.70, 1.00]	**.0455**
E3: Assertiveness	1.00 [0.84, 1.19]	.9560	0.95 [0.80, 1.13]	.5661
E4: Activity	0.80 [0.67, 0.95]	**.0136**	0.81 [0.68, 0.97]	**.0205**
E5: Excitement-Seeking	0.84 [0.69, 1.02]	.0824	0.89 [0.74, 1.08]	.2419
E6: Positive Emotions	0.86 [0.72, 1.03]	.0995	0.92 [0.77, 1.10]	.3841
Openness	0.82 [0.67, 0.99.]	**.0416**	1.00 [0.83, 1.20]	.9934
O1: Fantasy	0.96 [0.79, 1.17]	.6959	1.06 [0.89, 1.27]	.5158
O2: Aesthetics	0.93 [0.78, 1.10]	.3902	1.04 [0.87, 1.24]	.6873
O3: Feelings	0.91 [0.76, 1.10]	.3240	0.98 [0.81, 1.18]	.8045
O4: Actions	0.85 [0.70, 1.03]	.0892	0.92 [0.76, 1.11]	.3607
O5: Ideas	0.85 [0.70, 1.03]	.0696	1.02 [0.85, 1.22]	.8370
O6: Values	0.74 [0.60, 0.91]	**.0040**	0.98 [0.82, 1.17]	.8102
Agreeableness	0.99 [0.82, 1.19]	.9336	0.97 [0.82, 1.14]	.7066
A1: Trust	0.93 [0.78, 1.11]	.4384	0.97 [0.81, 1.15]	.7169
A2: Straightforwardness	0.94 [0.79, 1.13]	.5264	0.90 [0.77, 1.07]	.2369
A3: Altruism	0.97 [0.82, 1.14]	.6938	0.89 [0.76, 1.05]	.1799
A4: Compliance	0.92 [0.77, 1.09]	.3488	0.99 [0.84, 1.17]	.9491
A5: Modesty	1.13 [0.93, 1.36]	.2155	1.07 [0.90, 1.27]	.4455
A6: Tender-Mindedness	1.12 [0.94, 1.35]	.2060	1.04 [0.87, 1.23]	.6803
Conscientiousness	0.90 [0.76, 1.05]	.1852	0.87 [0.73, 1.03]	.1028
C1: Competence	0.99 [0.84, 1.16]	.8709	0.92 [0.78, 1.08]	.3021
C2: Order	0.82 [0.69, 0.97]	**.0185**	0.81 [0.68, 0.96]	**.0181**
C3: Dutifulness	0.93 [0.78, 1.10]	.3918	0.93 [0.78, 1.11]	.4055
C4: Achievement Striving	0.86 [0.72, 1.01]	.0707	0.90 [0.76, 1.07]	.2279
C5: Self-Discipline	0.92 [0.77, 1.08]	.3024	0.87 [0.74, 1.03]	.1137
C6: Deliberation	1.04 [0.87, 1.24]	.6418	0.95 [0.80, 1.12]	.5224

Note. All models control for age, sex, and highest educational attainement.

We assumed that personality-diabetes associations that replicate across self- and informant-ratings are more likely to be substantive than those specific to one method. However, given the high number of associations we tested for, it is possible that the three facets appeared significant only due to chance. To rule this out, we randomly reshuffled participants' diabetes diagnosis and re-ran the analyses 10,000 times. Based on this analysis, the probability of three facets being significantly associated with diabetes in both self- and informant-ratings due to chance was .0001. Thus, the likelihood of the observed findings resulting from Type I error was small. Therefore, in the remaining analyses we focused on the three facets that were significantly associated with diabetes in both types of assessment.

It has been suggested that trait-outcome analyses should be supplemented by item-level analyses (Mõttus, 2015; McCrae, In press). For N5: Impulsiveness, the association was clearly driven by two items, which were the only significant correlates of diabetes diagnosis (Table S3). For the other facets, the association did not pertain to all items either, but the significant ones somewhat differed across rater methods. These findings motivate testing the personality facet-diabetes associations in greater detail by separating common (across items and rater methods) and method/item-specific variance.

In the next step, therefore, we fitted a bi-factor model for each of the three facets in order to remove method-specific variance from the trait-only, method-independent variance. Each bi-factor model posited three latent variables: the common method variance latent variable was defined by all 16 self- and informant-rating items measuring the facet, and two method-specific latent variables, each defined by either eight self-report or eight informant-report items. The three latent variables were specified as orthogonal, meaning that trait-only variance was effectively separated method-specific variance (Figure 1).

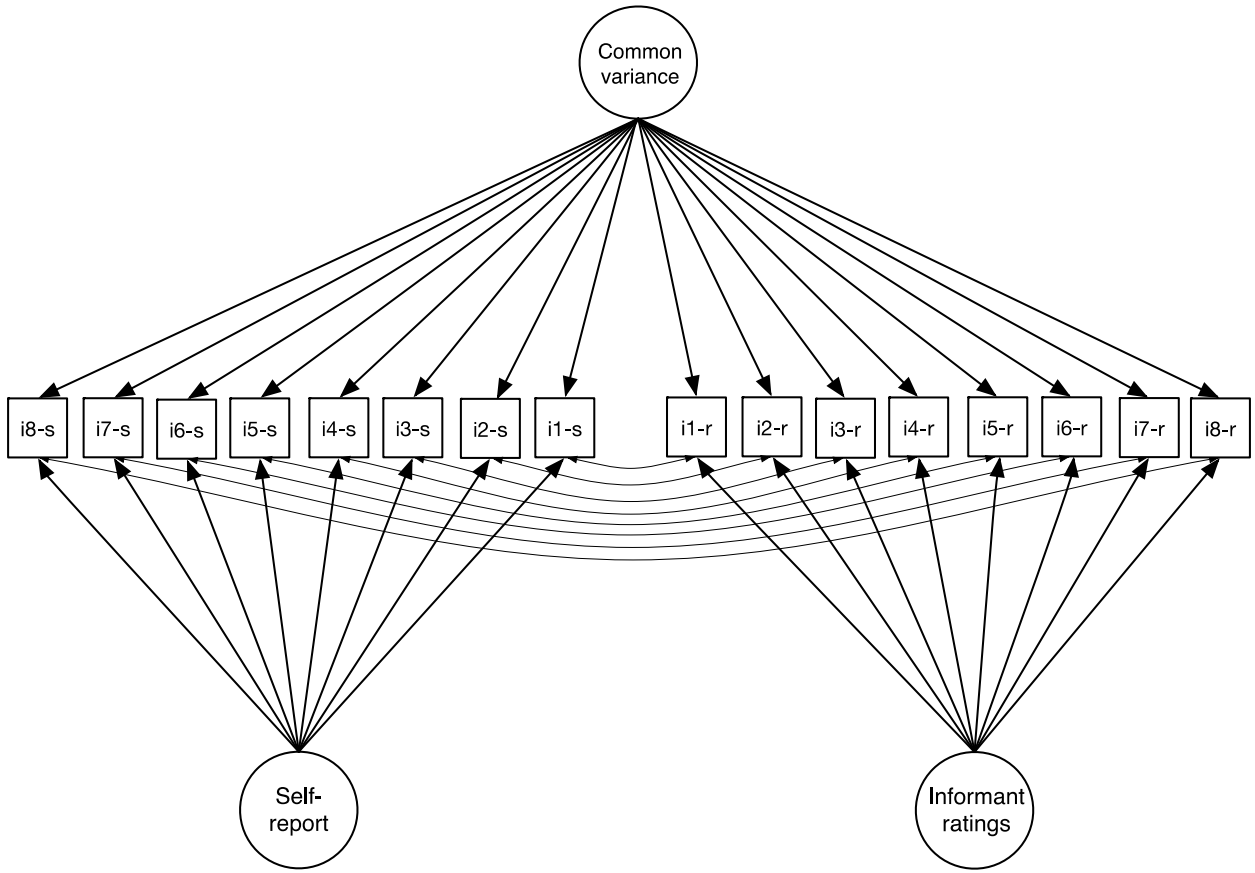

Figure 1

Conceptual bi-factor model fitted to separate method-specific and common variance in personality traits and facets

Note. i = item; s = self-report; r = informant ratings

All three latent factors were allowed to predict diabetes, controlling for sex, age and education. The models were fit with 'lavaan' structural equation modelling package (Rosseel, 2012), treating diabetes diagnosis and item responses as binary/ordered categorical variables and using the weighted least squares means and variance adjusted (WLSMV) estimator. This estimation assumed that diabetes and item responses reflected underlying continuous variables and that observed categories represented thresholds of the underlying variables. This seems a justified assumption because even diabetes varies in strength and diagnosis only corresponds to a cutoff (e.g., fasting plasma glucose concentration ≥ 7 mmol/l). Models for all three facets demonstrated good fit to the data (CFI > 0.95; RMSEA < 0.06; Hu & Bentler, 1999). The models explained from 20% (E4: Activity and C2: Order) to 22% (N5: Impulsiveness) of variance in diabetes (i.e., in the posited underlying continuous variable). The full list of path estimates is presented in Table 2.

Curiously, for N5: Impulsiveness the latent trait representing the common variance of the 16 items used for its measurement was not significantly associated with diabetes, whereas the two method-specific latent traits were. To better understand this, we ran a series of regression models predicting diabetes diagnosis from the levels of items constructing the N5: Impulsiveness facet, both for self- and informant-reports. The only item that had a consistent association with diabetes across both methods of assessment was “When I am having my favourite food, I tend to eat too much” (N5.4). The other N5 items differed in sign and strength of the associations, likely cancelling each other out in the common latent factor. We excluded this item from the initial bi-factor model and re-run the analysis predicting diabetes diagnosis with one method independent and two method specific latent variables, controlling for age, sex and education. When the single significant item was removed, none of the three latent traits was significantly related to diabetes diagnosis (*p*s ranging from .09 to .20). Thus, the initially observed associations were driven by a single item, and not by any substantive

facet variance. We, therefore, excluded the N5: Impulsiveness facet from further analyses. For the other two facets, E4: Activity and C2: Order, however, the associations with diabetes pertained to the common variance rather than method-specific latent traits.

Table 2

Results of bi-factor models predicting diabetes diagnosis.

	Common variance		Self-report variance		Informant-report variance	
	Estimate[*]	*p*	*Estimate*[*]	*p*	*Estimate*[*]	*p*
N5: Impulsiveness	0.020	.660	0.142	.002	0.131	.004
E4: Activity	-0.106	.007	-0.000	.996	-0.041	.316
C2: Order	-0.089	.037	-0.062	.212	-0.032	.531

Note. All models control for age, sex, and highest educational attainement.

[*] *Per 1-SD increase in personality facets.*

Finally, to address potential mechanisms by which personality may be associated with diabetes, we expanded the previously described bi-factor models for E4: Activity and C2: Order by including mediators. The latent factors representing the common variance of self- and informant-report items were specified to predict the selected mediators: BMI, alcohol intake, physical activity, and diet (first one at a time, and in the final model all of them simultaneously) as well as diabetes diagnosis. The mediators were also allowed to predict diabetes diagnosis (Figure 2). The models estimated both direct effects from personality facets on diabetes, and indirect effects via mediators (Table 3). Diabetes status was considered a binary variable and the WLSMV estimator was used.

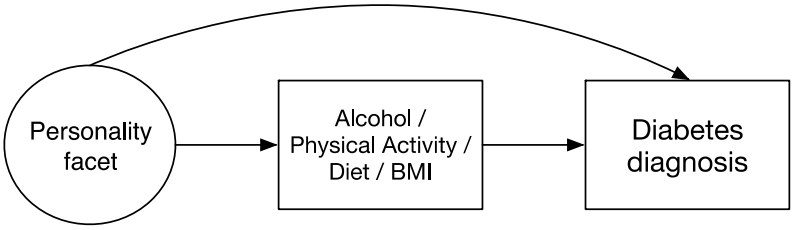

Figure 2

Mediation models for the two significant personality facets

Note. Models also control for age, sex, and highest level of education (not included here for clarity).

For C2: Order, the mediators significantly accounted for a substantial proportion (36.7%) of its association with diabetes, and BMI acted as the strongest mediating variable. However, for E4: Activity, the mediators could collectively account a notable but non-significant proportion (49.3%) of its association with diabetes. The overall mediation was non-significant likely because the indirect (positive) effect of diet ran contrary to the negative indirect effects of other mediators, particularly alcohol use (Table 3). We conclude that BMI could account for a substantial proportion of the links between C2: Order with diabetes, whereas the potential mediating mechanism for the E4: Activity-diabetes association remained unclear.

Table 3

Paths and estimates for the baseline and mediation models for the two significant method-Independent personality facetes predicting diabetes diagnosis.

	Direct Effect		Indirect Effect		Total Effect		R^{2*}
	Est.	*P*-value	*Est.*	*P*-value	*Est.*	*P*-value	
E4: Activity							
Baseline					-0.106	.007	0.20
BMI	-0.115	.005	-0.006	.33	-0.122	.004	0.30
Alcohol	-0.069	.16	-0.013	.010	-0.081	.09	0.23
Physical Activity	-0.111	.009	-0.010	.21	-0.121	.004	0.21
Diet	-0.117	.007	0.015	.022	-0.102	.017	0.22
All mediators	-0.034	.48	-0.033	.055	-0.067	.163	0.34
C2: Order							
Baseline					-0.089	.037	0.20

BMI	-0.080	.042	-0.034	< .001	-0.114	.007	0.29
Alcohol	-0.105	.034	0.000	.099	-0.105	.034	0.23
Physical Activity	-0.111	.009	-0.005	.14	-0.116	.006	0.21
Diet	-0.120	.006	0.008	.037	-0.112	.010	0.22
All mediators	-0.062	.21	-0.036	.001	-0.098	.051	0.34

Note. Est. = estimate per 1-SD increase in personality facet or mediator. All models control for age, sex and highest educational atteinment. *R^2 for diabetes diagnosis, assuming an underlying continuous variable (derived from the bi-factor models fitted with the WLSMV estimator).

4. Discussion

The present study expands previous literature on personality and diabetes in three novel ways: it addresses the association on the level of facets, takes into account the method of personality assessment, and directly tests mediating effects of known diabetes risk factors. At the level of the FFM domains, the association with diabetes only emerged as significant for self-reported Neuroticism and Openness. However, for three facets, N5: Impulsiveness, E4: Activity and C2: Order, the association with diabetes was significant in both methods of assessment, either directly, or indirectly via BMI.

We assumed that the associations that replicate across methods of assessment are more likely to pertain to substantive personality trait variance than those specific to one or another method. This provided us with greater statistical power as opposed to single-method studies, in addition to the possibility to focus on robust trait-diabetes associations: had we used only self-reports, none of the observed trait-diabetes associations would have survived adjustment for multiple testing such as Bonferroni correction. A simulation demonstrated that it was very unlikely for three facets to be significant correlates of diabetes simultaneously in both methods, even with a typical alpha level.

The association of N5: Impulsiveness with diabetes appeared to be to some extent specific to the method of personality assessment as opposed to pertaining to the common variance of assessed trait manifestations—unlike the associations of E4: Activity and C2: Order. However, the method-specificity did not pertain to either self- or informant-report

method—it pertained to item-specificity. Namely, when we decomposed the variance of the facet indicators into the common (method-independent) and method-specific variance components, the direct association of the common variance of N5: Impulsiveness was not significantly associated with diabetes, whereas the variance components specific to both the self- and informant- reports were significant. This could be explained by a single item of the scale being associated with diabetes diagnosis: none of the latent factors was linked with diabetes after the removal of this item. Clearly, thus, the association did not pertain to the trait but to the assessment method—choice if items—and has to be interpreted as such (Mõttus, 2015).

Finally, in order to further elucidate the links between personality and diabetes, we considered several variables that may represent the mechanisms of the associations. We found that personality-diabetes associations were to a significant extent mediated by BMI, alcohol, physical activity, and diet. Furthermore, the strongest mediator was BMI, especially with respect to C2: Order. This means that some of the correlations between the personality facets and diabetes could be explained by the facets contributing to BMI, which in turn might have contributed to the diagnosis. Of course, a large proportion of the associations still remained unaccounted for. This may have been because the list of mediators that we considered was not exhaustive and/or perfectly measured, or because a fuller account of the mechanisms require longitudinal data with mediating variables measured at appropriate time-points (e.g., in between the predictor and outcome).

Our results regarding C2: Order, a facet of conscientiousness, support previous findings that personality traits are related to diabetes mellitus (Jokela, et al., 2014). Čukić et al. (2015) showed that low conscientiousness may facilitate the manifestation of type 2 diabetes genetic risk. Our results indicate that the low scores on the facet C2: Order may be driving this relationship, most notably through its links to BMI and alcohol intake. If so, the

association should be interpreted as being specific to this facet and not generalized to the Conscientiousness domain.

Our study was not without limitations. First, we used a combined measure of type 1 and type 2 diabetes in order to maximise power. While it is conceivable that the two types of the disease with their different aetiologies and manifestations (Cnop et al., 2005) have differential links to personality and mediating variables, previously conducted studies used the same treatment of a diabetes measure (Čukić et al., 2015; Goodwin & Friedman, 2006). Furthermore, although the self-reported diagnoses were generally confirmed using participants medical record, some cases of misreporting were possible. Second, the data in our study was collected continuously, making us unable to specify temporal precedence of the variables. This may be one of the reasons why the links between mediators and diabetes diagnosis is in some circumstances negative – it is possible that when diagnosed with diabetes, participants adopt healthier lifestyles. This may have obscured the results. Future studies should utilise longitudinal designs in addressing the issue of potential mechanisms of the personality-diabetes associations. Finally, our choice of variables in mediation models was not informed by any specific theoretical framework, but by a collection of independent empirical findings. We do believe, however, that the previously identified associations between personality traits and known diabetes risk factors, such as unhealthy dietary habits (Mõttus et al., 2013; Mõttus et al., 2012), suboptimal levels of physical activity (Rhodes & Smith, 2006), and higher BMI (Phillips et al., 2010; Vainik et al., 2015), were sufficient to form the present hypotheses.

In summary, we found that specific personality facets rather than FFM domains are consistently related to diabetes diagnosis, and that these relationships were mediated by BMI, alcohol intake, physical activity, and dietary habits. We conclude that utilising detailed (facet-level) measures of personality and multiple personality assessment methods provides a

fruitful direction in studies of personality and health outcomes in general, and diabetes mellitus in particular.

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