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Personality, Tobacco Consumption, Physical Inactivity, Obesity Markers, and Metabolic Components as Risk Factors for Cardiovascular Disease in the General Population

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Abstract

The aim of this study was to investigate the relationship between personality traits, tobacco consumption, physical inactivity, obesity markers and metabolic components as cardiovascular risk factors (CVRFs). A total of 2,543 participants from the general population (CoLaus|PsyCoLaus) had provided complete information on physical health and unhealthy behaviors and completed the Revised NEO Five-Factor Inventory. Our results show a strong cross-correlation between obesity markers and metabolic components suggesting that their combination could represent an important CVRF. Moreover, socio-demographic characteristics, tobacco consumption, and physical inactivity, were associated with both obesity markers and metabolic components latent traits. The conscientiousness personality trait was significantly associated with obesity markers, but played a modest role. Indeed, higher conscientiousness was associated with lower level of obesity indicators. However, no link between personality and metabolic components were found. In sum, our data suggest that health related behaviours have more effect on the development of cardiovascular diseases than personality traits.

Keywords: personality, obesity markers, metabolic components, and cardiovascular risk factors

Personality, Tobacco Consumption, Physical Inactivity, Obesity Markers, and Metabolic Components as Risk Factors for Cardiovascular Disease in the General Population

Despite considerable progress in understanding disease mechanisms and risk factors, improved treatments, and public education efforts, cardiovascular diseases (CVD) remain the major causes for mortality worldwide (Finegold et al., 2012). Increasing age, male gender, obesity, metabolic components, as well as lack of physical activity and tobacco consumption are well-established cardiovascular risk factors (CVRFs) (Compare et al., 2013). Many epidemiological studies show that the risk of cardiovascular events increases with age. More than half of individuals who had suffered from a heart attack were 65 or older, and about four out of five who died of such attacks were over age 65 (Finegold et al., 2012). Men are more likely than women to develop CVD (Vartiainen & Puska, 1999). Additionally, elevated blood pressure often occurs together with high HDL-cholesterol, triglycerides, and fasting glucose metabolic components (Kaur, 2014). This suggests that there may be a common cause for these conditions, but it may simply be that some unhealthy behaviours or environmental factors might lead to CVD. Among the unhealthy behaviors is included the smoking, even though smokers tend to be thinner and to have lower blood pressure than nonsmokers (Chiolero et al., 2008). The causal chain leading from physical inactivity to CVD is due to various physiological mechanisms that links changes in insulin and adrenalin metabolic hormones to detrimental effects on blood pressure, cholesterol, triglycerides, and abdominal fat (Shiroma & Lee, 2010).

Over time, the hypothesis that personality influences the physical illness has also appeared as an interesting track (Smith & MacKenzie, 2006). A wide variety of personality measures have been used as predictors of health, posing challenges for the interpretation and integration of findings (Contrada & Coups, 2003). Thus, the type D personality, characterized by tendency to experience negative emotions while avoiding social contacts, may play a significant role in the CVD

pathogenesis (Habra et al., 2003; Sher, 2005). The effect of neuroticism on the development of CVD were initially met by thoughtful and heuristically valuable critiques (Eysenck, 1985) and later appears with more convincing support (Chida & Steptoe, 2009; Suls & Bunde, 2005). High neuroticism and low conscientiousness have been associated with both the presence of harmful health practices, like tobacco consumption with impact on coronary heart diseases (Roberts & Bogg, 2004), as well as the absence of positive health behaviors as physical activity (Lodi-Smith et al., 2010). Therefore, personality could contribute directly, by physiological mechanisms, and indirectly, by unhealthy lifestyles, to CVD (Eory et al., 2014), but the details of these mechanisms remain poorly understood (Deary et al., 2010).

In this study, we described the possible relationships between personality, demographical characteristics, and well-established CVRFs. More specifically, we categorized manifest CVRFs as latent obesity markers and metabolic components. Given that the two latent traits are interrelated, we expect that age, gender, socioeconomic status, tobacco consumption, physical inactivity, and specific personality traits are associated with these CVRFs.

Methods

Participants and Procedure

A total of 3,959 individuals, aged between 40 and 80 years, underwent both the physical and psychiatric evaluations during the first follow-up (2009-2012) of the (CoLaus|PsyCoLaus) study. Sixty-four percent of them had also completed the Revised NEO Five-Factor Inventory resulting in a sample of 2,543 subjects who could be included for this analysis. The ethics committee of the University of Lausanne approved this project. All participants signed a written informed consent after having received a detailed description of the goal of the study.

Measures

Personality. We used the French version of the NEO-FFI-R, a short version of the Revised

NEO Personality Inventory (Costa & McCrae, 1992), measuring the five main personality dimensions of the five-factor model. The participants were asked to respond to 60 items using a 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). Internal reliability coefficients of this French version ranged from .70 to .82 for the five scales (*Mdn* = .76) (Aluja et al., 2005). In our study the alphas indices were high (neuroticism: α = .83, extraversion: α = .75, openness: α = .71, agreeableness: α = .66, and conscientiousness: α = .79).

Physical and Biochemical Evaluation. Participants had to have fasted for at least 8 hours and to have abstained from strenuous physical activity for 12 hours before the exam. The body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Systolic blood pressure (SBP) was measured three times on the left arm after at least a 10-minutes rest in the seated position. The mean of the two last measures was used. Fasting blood samples were drawn to measure the levels of glucose, high-density lipoprotein (HDL)-cholesterol, and triglycerides (Firmann et al., 2008).

Following their responses to the questionnaires, participants were considered as physically inactive if they reported practicing leisure time physical activity less than once a week. Tobacco consumption was defined as current or past history of cigarettes consumption.

Socioeconomic Status (SES). The SES was assessed using the Hollingshead Scale (Hollingshead, 1975) based on four domains (marital status, retired/employed status, educational attainment, and occupational prestige) resulting in five indices.

Statistical Analysis

After evaluating descriptive findings for demographic, physical, biochemical, and psychological characteristics, we computed the Pearson correlations between key study variables.

To reduce the physical conditions (BMI, hip and waist circumferences, SBP, HDL-cholesterol, triglycerides, fasting glucose) to a limited factors number, exploratory factor analysis (EFA) for the continuous variables with an oblique Promax rotation was performed.

To adjust for the effects of medication prescribed, values for treated subjects were assigned according to documented mean changes under medication (Licht et al., 2013). For subjects treated with antihypertensive drugs 10 mmHg was added to the SBP, for those using fibrates 0.10 mmol/liter was subtracted from HDL-cholesterol and 0.67 mmol/liter was added to triglycerides, and for those using antidiabetic medication a value of 7.0 mmol/liter was assigned when the glucose level was less than 7.0 mmol/liter.

Associations between personality and obesity markers and metabolic components were determined by hierarchical multiple regressions. First set of models included obesity markers as dependent variable. In Model 1, we only controlled for socio-demographic characteristics. In Model 2, we added tobacco consumption and physical inactivity variables and in Model 3 the personality dimensions. By analogy, second set of models included latent trait of metabolic components as dependent variable.

Results

Descriptive statistics and correlations for all central variables are presented in Table 1. Women participation in this study is slightly higher (57.60%) compared to men (42.40%). Among the participants, 39.50% had smoked in the past, 19.70% were current smokers, and 27.10 % did not practice any physical activity. According to Pearson correlations, age was positively associated with all variables that describe CVRFs, whereas female gender associated negatively with the same variables (except HDL-cholesterol). SES was negatively related to BMI, hip circumference, SBP, and fasting glucose. However, personality was linked only moderately to CVRFs.

Table 2 shows two factors labeled “obesity markers” and “metabolic components” according to EFA. Obesity markers encompassed the variables BMI, waist and hip circumferences. Metabolic components included SBP, HDL-cholesterol, triglycerides, and fasting glucose as manifest variables. The two factors strongly interrelated (r =.59, p <.001). Since both tobacco consumption and physical

inactivity are not significantly correlated with any of the two factors, we decided to analyze them separately.

Table 3 presents the main effects of socio-demographic factors, tobacco consumption, physical inactivity, and personality on obesity and metabolic indicators as CVRFs in sequentially adjusted multiple regression models. Increasing age, male gender, and decreasing SES were positively associated with obesity markers, explaining 14% of the total variance (Model 1). In Model 2, current tobacco consumption was negatively, while physical inactivity and past smoking were positively associated with obesity and adds 3% to the variance. However, the conscientiousness was only modestly (1%) associated with obesity markers (Model 3). Regarding metabolic component, results showed that demographic variables explained 18%, whereas current tobacco consumption and physical inactivity an additional 2% of the total variance. However, none of the personality traits was associated with this latent factor.

Discussion

This study assessed the relationship between personality, health behaviors, and obesity markers as well as metabolic component-related to CVRFs. As expected, obesity and metabolic indicators were strongly and positively interrelated. This confirms the medical thought that these factors correspond to the symptoms that characterize CVD (Finegold et al., 2012).

Consistent with previous literature, men are more affected than women (Vartiainen & Puska, 1999) and individuals with low SES and increasing age are more likely to develop CVRFs (Matthews & Gallo, 2011). Unhealthy behaviors were associated with both obesity and metabolic markers. Thus, current tobacco consumption was related to lower weight, compared with past smoking. One explanation lies in that tobacco consumption can have an inhibitory effect on appetite (Jo et al., 2002). If smokers stop their consumption, increase of weight will be a consequence (Chiolero et al., 2008). This could also be explained by a coping strategy used to reduce feelings of negative affect related to stress (Kassel et al., 2003). As expected, physical inactivity was related to high obesity and

metabolic markers. In contrast, it is well known that physical activity helps in losing weight, with a cardiovascular benefit as a consequence (Shiroma & Lee, 2010).

Regarding personality, only conscientiousness was negatively related to obesity (Sutin et al., 2011). This can be explained by that conscientiousness may help people to use their coping mechanisms more effectively by being more organized and having a high self-control (Jokela et al., 2014). Therefore, the health may be improved in conscientious individuals because they are more likely to adopt optimal lifestyle (Hagger-Johnson & Whiteman, 2007), which in turn can act against the obesity markers (Sutin et al., 2011).

Limitations. Despite the prospective design, these results are based on cross-sectional data, and therefore we were unable to take dynamic factors into account.

Conclusion. Our results show that personality played only a modest role on CVD via conscientiousness related to obesity. However, tobacco consumption and physical inactivity have more effect on CVFRs and, therefore, should be the focus of clinical interventions.

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Table 1. Demographics and Descriptive Statistics and Zero-order correlations among sample characteristics and key study variables (N = 2,543)

Variables	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**
1. Age																		
2. Female gender	.02																	
3. SES[1]	-.12**	-.16**																
4. Past tobacco consumption	.11**	-.11**	.05															
5. Current tobacco consumption	-.11**	-.01	-.02	-.40**														
6. Physical inactivity	-.03	-.07*	-.09*	-.01	.12**													
7. BMI [kg/m^2]	.14**	-.15**	-.12**	.10**	-.07*	.18**												
8. Hip circumference [cm]	.22**	-.09*	-.06*	.10**	-.09*	.14**	.86***											
9. Waist circumference [cm]	.22**	-.36**	-.03	.14**	-.04*	.18**	.86***	.85***										
10. SBP [mmHg]	.45**	-.26**	-.10**	.13**	-.12**	.08**	.29**	.27**	.35**									
11. HDL-cholesterol [mmol/L]	.07*	.41**	-.01	-.02	-.09*	-.14**	-.38**	-.31**	-.44**	-.13**								
12. Triglycerides [mmol/L]	.05*	-.22**	-.03	.02	.07*	.12**	.27**	.21**	.31**	.18**	-.46**							
13. Fasting glucose [mmol/L]	.22**	-.25**	-.07*	.10**	.01	.11**	.39**	.34**	.43**	.28**	-.25**	.27**						
14. Neuroticism	-.07*	.14**	-.09*	-.01	.03	.11**	-.01	-.03	-.05*	-.10**	.01	.01	-.03					
15. Extraversion	-.06*	.02	.09*	-.02	.04*	-.10**	-.02	-.03	-.04*	-.03	.04*	-.05*	-.03	-.43**				
16. Openness	-.06*	.06*	.28**	.02	.03	-.08*	.06*	-.04*	-.08*	-.10**	.04*	-.04*	-.07*	-.05*	.25**			
17. Agreeableness	.03	.24**	-.04*	-.08*	-.02	-.01	.05*	-.03	-.09**	-.04*	.12**	-.10**	-.08*	-.22**	.18**	.14**		
18. Conscientiousness	-.03	.01	.01	-.04*	-.02	-.09*	-.09*	-.07*	-.11**	.03	-.05*	-.06*	-.04*	-.40**	.41**	.11**	.27**	
Mean (or %)	59.69	57.6%	3.50	39.5%	19.7%	27.1%	25.92	100.00	91.45	128.55	1.67	1.33	5.86	18.17	27.78	29.54	33.45	35.00
Standard deviation (SD)	10.22	-	1.19	-	-	-	4.50	10.30	13.07	19.65	.46	.88	1.06	7.62	6.16	6.00	5.19	5.74

Note: [1]A value of 3 represents a socio-economic status of III (middle class) on the Hollingshead Scale; BMI = body mass index; SBP = systolic blood pressure; SD = standard deviation; SES = socio-economic status.

Table 2. Exploratory Factor Analysis to Identify Two Factors: Obesity Markers and Metabolic Components as Latent Traits

Loadings	Factor 1	Factor 2
BMI	**.92**	.07
Hip circumference	**1.00**	.13
Waist circumference	**.84**	.15
Systolic blood pressure	.20	**.23**
HDL-cholesterol	.09	**.69**
Triglycerides	.15	**.73**
Fasting glucose	.22	**.33**
SS loadings	2.68	1.18
Proportion	.38	.17
Cumulative	.38	.55
Correlations		
Factor 1	1.00	.59
Factor 2	.59	1.00

Note: SS loadings = Sum of Squared loadings; Proportion of the explained variance by factor was calculated; χ^2 (8) = 163.16, $p < .001$; (N = 2,118).
BMI: body mass index

Table 3. Association Between Personality Traits and Obesity Markers as well as Metabolic Components as CVRFs in All Participants

	Obesity markers CVRFs			Metabolic components CVRFs		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age	.26***	.25***	.25***	.07***	.08***	.08***
Gender (ref. Men)	-.53***	-.49***	-.47***	-.85***	-.82***	-.81***
Socio-economic status	-.10***	-.09***	-.08***	-.09***	-.08***	-.08***
Past tobacco consumption		.13**	.12**		.08	.07
Current tobacco consumption		-.14**	-.14**		.21***	.21***
Physical inactivity		.37***	.37***		.28***	.27***
Neuroticism			-.04			.00
Extraversion			.03			-.01
Openness to experiences			-.02			.00
Agreeableness			-.02			-.03
Conscientiousness			-.06**			-.04
R^2	.14	.17	.18	.18	.20	.20
ΔR^2		.03	.01		.02	.00
F	137.46***	88.65***	49.76***	182.40***	105.70***	58.67***

Note: For each step, standardized β are presented. *$p < .05$; **$p < .01$; ***$p < .001$; df= 11, n=2543 CVRFs: cardio-vascular risk factors