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Temperament and character predict body-mass index: A population-based prospective cohort study

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ABSTRACT

Objective: Personality is a potential factor determining individual differences in body-weight change. The current study examines associations between personality traits and change in body-mass index (BMI) over six years.

Method: The participants were 762 women and 648 men aged 24–39 years at the base-line. Personality was assessed with the Temperament and Character Inventory (TCI). For calculating BMI, height and weight were assessed at a clinic.

Results: Longitudinal analyses conducted with linear regressions showed that in men and women, higher Novelty seeking predicted higher BMI ($p<.05$), whereas lower Reward dependence predicted higher BMI in women ($p<.05$) when baseline BMI was taken into account. In addition, cross-sectional associations for several TCI traits were found in age and education adjusted analyses. In women, higher Self transcendence ($p<.05$) was associated with higher BMI. In men, higher Novelty seeking ($p<.001$) and Self transcendence ($p<.01$) and lower Self directedness ($p<.01$) and Cooperativeness ($p<.05$) were associated with higher BMI. In addition, analyses of variance were conducted for multidimensional trait profiles (trait combinations). Significant temperament profile related differences in BMI were found in all analyses in women. Associations with character profiles and in men were less consistent.

Conclusion: The results give support for personality playing a role in weight gain. Knowledge on personality may be used for motivating weight loss and designing weight management interventions.

Introduction

The development of obesity involves several psychological, biological and social factors. The concept of personality refers to relatively stable individual differences in individual's tendency to think, act, and feel in a certain way. Personality is a potential factor determining individual differences in body-weight change. Personality is related to unhealthy behaviors [1,2] responsible for weight gain, e.g. sedentary life style and high calorie diet [3]. Personality may also affect weight gain via psychological mechanisms, such as the ability to cope with stress [4] and its effect on weight gain.

A number of studies have shown associations between personality traits and body weight [5–11], but most of this evidence comes from cross-sectional studies and from clinical populations in selected settings. Thus very little is known about the associations between personality and weight over time in the general population.

Longitudinal studies on personality and weight gain are few and the findings are somewhat conflicting. In a two-year longitudinal study of Australian adults high extroversion predicted weight gain [12], but in another study of Finnish adults with a 15-year follow-up time higher weight gain was predicted by low rather than high extroversion in men and by high neuroticism over a six-year follow-up in women [13]. A 14-year follow-up study of American university alumni reported low conscientiousness to predict increases in body-mass index (BMI) [14] and another American study showed that low agreeableness was related to faster weight gain over the adult life, whereas low conscientiousness and high neuroticism were related to weight

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fluctuations [15]. Furthermore, a variety of more specific facets of the Five Factor Model personality traits (e.g. impulsiveness) have been found to predict higher BMI over three years [16].

The mixed findings call for more longitudinal research. In the current study, we examine whether personality assessed with the Psychobiological Model of Temperament and Character [17,18] predicts changes in BMI over six-year follow-up in a population-based sample. The Psychobiological Model includes four temperament traits and three character traits. The temperament traits are Novelty seeking (NS), Harm avoidance (HA), Reward dependence (RD) and Persistence (PS). The character traits are Self-directedness (SD), Cooperativeness (CO) and Self-transcendence (ST). The temperament traits are suggested to be related to brain systems associated with different neurotransmitters (NS with dopamine, HA with serotonin, RD with noradrenalin), appear early in life, and to reflect biases toward automatic reactions to behavioral stimuli [17]. Character traits on the other hand are theorized to develop later and to reflect maturity and the level of integration of personality [18–20].

In addition to examining separate traits, there is a need to examine combinations of multiple traits (multidimensional trait profiles) because the effect of a trait may vary depending on the levels of the other traits of the individual [17]. Although multidimensional trait profiles have seldom been investigated, the relevance of trait combinations in psychosomatic medicine has been demonstrated in recent research and the significance of multidimensional personality profiles is increasingly acknowledged [19,21–24]. Thus, in addition to examining whether individual personality traits are associated with weight change, we examine whether more specific associations can be observed with the aid of multidimensional trait profiles assessed according to the Psychobiological Model of Temperament and Character [17,18] which is a widely used theory in clinical practice. Temperament and character traits included in this theory have been found to be associated with various forms of eating disorders [7,8,25–27] and overweight [6,8]. The cross-sectional studies have reported associations for higher NS, higher HA, lower PS, lower CO, and lower SD with indicators of higher weight, although not all of these relations have been systematically found in all studies [5–8,28,29]. To our knowledge, there are no previous studies reporting longitudinal associations between the temperament and character traits and changes in BMI. Furthermore, there are no previous studies on associations between multidimensional trait profiles and BMI. We hypothesize that the cross-sectional associations that are found in the current study will follow the directions of the previously found associations but all traits may not be predictive of weight gain in the longitudinal analyses. Based on previous research, persons having a "mature" personality, consisting of high SD, and of high CO have better mental and subjective health [19,30]. Therefore, we hypothesize that high SD and CO would be associated with favourable BMI outcomes. Because of the lack of previous research on personality profiles and weight, more specific hypotheses for trait profiles are not set.

Materials and methods

Participants

The participants were derived from the ongoing prospective Young Finns study, which began in 1980. The subjects for the original sample in 1980 (n = 3596) were selected randomly from six age cohorts (aged 3, 6, 9, 12, 15, and 18 years) in the population register of the Social Insurance Institution, a database that covers the whole population of Finland. The design of the study and the selection of the sample have been described in detail by Raitakari et al. [31]. The assessments of the present study were carried out in 2001 when the participants were aged 24, 27, 30, 33, 36, and 39 years (temperament, character, BMI, and educational level) and in 2007 (BMI). The eligible sample of the present study included 2170 participants for whom BMI was measured in 2007. Those pregnant in either measurement time were excluded after which 1906 participants remained. Of these, 1763 had information on education, and of them 1410 had necessary information on all temperament and character traits. Full data on all study variables in 2001 and in 2007 was received from 1410 participants (762, 54.0%, women and 648, 46.0%, men). All the analyses were conducted on these participants. Participants gave written informed consent, and the study was approved by Local Ethics Committees.

Measures

Temperament and character

Temperament and character traits were assessed in 2001 with the ninth version of the Temperament and Character Inventory [32]. High NS is characterized for instance by impulsivity and exploratory excitability and high HA by cautiousness, inhibition, and proneness to anxiety [17,18]. High RD can be described as being empathic, sentimental, and sensitive to social cues. PS is a tendency to act persistently in spite of weariness or frustration. SD reflects ability to direct behaviors towards goals following one's own values, whereas CO reflects tendency to engage in collaboration and to feel connected with others. ST is related to spirituality and reflects a tendency to experience oneself as a part of the unity of all that exists [17,18]. Temperament traits NS (Cronbach's reliability $\alpha = 0.85$), HA ($\alpha = 0.92$), RD ($\alpha = 0.79$), and PS ($\alpha = 0.65$) were assessed with 40, 35, 24, and 8 items, respectively. Character traits SD ($\alpha = 0.90$), CO ($\alpha = 0.90$), ST ($\alpha = 0.91$) were assessed with 44, 42, and 33 items, respectively. We used the original TCI measure, but instead of the original true–false response format, items were rated on a five-point scale, ranging from 1 (not true for me at all) to 5 (true for me). Mean scores for the temperament and character traits in 2001 were calculated (Table 1).

To examine the effects of combinations of several traits, we followed the procedure used in previous studies [19,22] and divided NS, HA, and RD to high and low groups by median split. All combinations of high or low NS, HA, and RD were formed resulting in eight different temperament profiles. The trait combinations are indicated by combination of letters where letter 'n' corresponds to novelty seeking, letter 'h' to harm avoidance and letter 'r' to reward dependence and capital letters refer to high value and small letters to low value on the trait in question. Temperament profiles were labeled as Sensitive (NHR), Explosive (NHr), Passionate (NhR), Adventurous (Nhr), Cautious (nHR), Methodical (nHr), Reliable (nhR), and Independent (nhr). Additionally, those who were in the middle tertile in all three temperament traits formed a group of their own (called Middle) and were

Table 1
Descriptive statistics of the study sample

Variable (range)	Women (n = 762)		Men (n = 648)		p
	Mean	SD	Mean	SD	
Age at baseline (24–39)	32.0	5.0	31.7	5.0	ns
Education (1–3)	2.23	.55	2.21	.54	ns
Novelty seeking (1.5–4.6)	3.03	.41	2.92	.40	<.001
Harm avoidance (1.2–4.9)	2.72	.53	2.50	.52	<.001
Reward dependence (1.7–4.5)	3.52	.39	3.17	.39	<.001
Persistence (1.6–4.8)	3.22	.57	3.22	.53	ns
Self-directedness (1.9–4.8)	3.69	.46	3.75	.42	.009
Cooperativeness (2.0–4.8)	3.83	.38	3.68	.39	<.001
Self-transcendence (1.2–4.3)	2.59	.55	2.30	.51	<.001
Body-mass index in 2001 (15.7–47.8)[a]	24.3	4.4	25.5	3.9	<.001
Body-mass index in 2007 (16.6–58.8)[b]	25.3	4.9	26.6	4.0	<.001

[a] Range for women: 15.7–46.1. range for men: 15.7–47.8.
[b] Range for women: 16.6–58.8. range for men: 17.5–45.9.