Relationship between Personality Traits and Eating speed - Results from a large cross-sectional study among Iranian adults

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Abstract

The eating speed has been hypothesized to be associated with energy intake and weight control. Recently, the effects of some factors on eating rate were investigated, however; studies about the impacts of psychological factors in this field are rare. One of these possible factors is personality traits. This study aimed to assess the relationship between personality traits and eating speed. This cross-sectional study was performed among 4763 adults in 2011. Personality trait was assessed by using the Big Five Personality Inventory Short Form. The eating speed was evaluated using a pretested questionnaire and latent class analysis (LCA) was applied to categorize participants according to the eating speed. Multiple binary logistic regression analysis was used for data analyses. We found that the higher levels of neuroticism (quartile 4) were associated significantly with lower odds of normal eating speed (OR: 0.43; 95% CI: 0.31, 0.60; P<0.001) but higher levels of other personality traits were statistically significantly associated with higher odds of normal eating speed. The current study showed significant associations between personality traits and eating speed; accordingly, it provides primary evidence about the potential value of personality traits for managing the eating rate. Further prospective observational and interventional studies are recommended.

1. Introduction

The behavioral factors related to eating, including the eating speed is one of the increasing concerns to restrict energy intake in which it became a hallmark of many weight control programs. The importance of altering eating behaviors in health promotion is broadly recognized. Eating behaviors have an imperative role in preventing diseases such as diabetes, obesity, and cardiovascular disease (Ferriday, Bosworth, et al. 2015). Some epidemiological surveys have indicated positive relations between eating rapidly and metabolic syndrome (Hsieh, Muto, et al. 2011) and obesity (Ohkuma, Fujii, et al. 2013). Studies showed that eating too speedy is associated with overeating (Zhu, Hsu, et al. 2013). There is a relationship between eating speed and satiety (Privitera, Cooper, et al. 2012, Ferriday, Bosworth, et al. 2015). The eating speed affects satiety and food intake so a slower eating speed is associated with increased satiety and decreased food intake. Two hypotheses are proposed: the first demonstrates that slower eating gives time to start the physiological satiety signals and the second hypothesis suggests that slower eating enhances and prolongs satisfying eating so declines feelings of hunger (Privitera, Cooper, et al. 2012). However, data to support these hypotheses have been inconsistent. A systematic review of controlled trial studies has revealed that quicker eating is associated with more energy intake (Robinson, Almiron-Roig, et al. 2014), and higher body mass index (BMI) (Almiron-Roig, Tsiountsioura, et al. 2015) is clinically important. Recently, the effects of some factors such as bite-size, food viscosity, food service form, and eating method on the eating speed have been investigated. In one study by E Almiron-Roig, it was reported that larger portion size leads to bigger bite-size and quicker eating speed (de Graaf 2011, E Almiron-Roig, Tsiountsioura, et al. 2015). In another study, Zhu found that the increased food viscosity resulted in a reduced eating speed, decreased postprandial appetite, and appetite to eat (Zhu, Hsu, et al. 2013). Suh in their study showed that the eating speed was decreased when the mixed form of a meal was served and in another study, Sun showed that the eating speed and chewing time changed with diverse feeding tools (chopsticks, fingers, and spoon) (Sun, Ranawana, et al. 2015, Suh and Jung 2016), However, studies about the impacts of psychological factors in this field are rare. One of these possible factors is personality traits.

Personality traits are described as individual patterns of feeling, thinking, and acting (Scoffier-Mériaux, Falzon, et al. 2015). The behaviors of persons are affected by their personality. The big five-model of traits is mostly used to determine personality traits. This model classifies personality traits into five categories i.e. conscientiousness, extraversion, neuroticism, agreeableness, and openness to experience (Feizi, Keshteli, et al. 2014). Conscientiousness (C) is an attempt to organize purpose and insistence to achieve goals. Extraversion (E) is the tendency toward vigorous and social activity. Neuroticism (N) is attending to experience negative actions. Agreeableness (A) is a tendency toward friendliness and sociability. Openness (O) is the liking in experiencing novel things, opinions, and individuals (Roohafza, Feizi, et al. 2016). Personality traits are associated with several health outcomes (Raynor and Levine 2009). Recent studies indicated that personality traits affect eating styles, food choices, and eating disorders (Mottus, Realo et al. 2012, Keller and Siegrist 2015). One study by Mottus et al. revealed a significant relationship between personality traits and eating habits (Mõttus, McNeill, et al. 2013).

The aforementioned evidence provides a good base for hypothesizing that the eating speed may also be related to people's personality traits, but to our knowledge, the relation between personality and eating speed is not investigated, so this study aimed to assess the relationship between personality traits and eating speed.

2. Methods

2.1. Participants

This cross-sectional study was performed within the framework of the Study on the Epidemiology of Psychological, Alimentary Health, and Nutrition (SEPAHAN) in Iran. This project was a community-based plan designed to investigate the epidemiological impressions of functional gastrointestinal disorders (FGIDs) and their association with mental and lifestyle determinants on non-academic members of Isfahan University of Medical Sciences. SEPAHAN was conducted in 2010 in two separate waves. Briefly, 10087 non-academic members of the staff of Isfahan University of Medical Sciences (IUMS), who were working in hospitals, university campus, and health centers affiliated with IUMS, were invited to participate in the first study. The first phase focused on evaluating the basic characteristics, lifestyle, and dietary habits, and intakes of participants. The response rate in this phase was 86.16%, and 8691 completed questionnaires were returned. At the second phase, other questionnaires, which were designed to collect information on gastrointestinal, psychological, and somatoform symptoms, were distributed and 6239 completed questionnaires were returned (response rate: 64.64%). After merging data from these two phases, complete information was available for 4763 people. The study protocol was approved by the Ethic Committee of Isfahan University of Medical Sciences (Project numbers: #189069, #189082, and #189086) and followed the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects. Written informed consent was obtained from all participants after clarifying the study protocol. The details about the design, conducting, instruments, and all aspects of study could be found elsewhere (Adibi, Keshteli, et al. 2012).

2.2. Measures

2.2.1. Assessment of eating speed

The eating speed was investigated by using a questionnaire that included the following questions: ‘how thoroughly do you chew foods? (Not very well, well, very well)’, ‘how long does it take you to eat lunch? (never eat lunch, < 10 min, 10–20 min, > 20 min)’, ‘how long does it take you to eat dinner? (never eat dinner, < 10 min, 10–20 min, > 20 min)’. We applied Latent class analysis to determine classes of people in terms of their eating speed (Hagenaars, Mccutcheon, 2002). All questions, provided in Table 1, were variables that entered into LCA. Eating speed was considered as a latent construct that could not be examined directly. Therefore, LCA as an advanced statistical method was used for the extracting of the eating speed habit indirectly based on the series of eating speed variables. Eating speed was assessed using LCA by examining the pattern of relations between observed eating speed variables and classifying individuals with similar profiles (i.e., latent classes). Therefore, each constructed class plays a role in a specific level of eating speed. In this analysis, different indicators of eating rate described in Table 1, were examined. During LCA fitting to the data, at first, a one-class model was applied. Then, we sequentially increased the number of latent classes to determine the most parsimonious and interpretable model. For example, since a high percentage of subjects responded that they would chew meals more than 20min, such a pattern of eating rate was considered as normal eating rate class and when the majority of people expressed their chewing duration of each meal as "lower than 10min" the related class was considered as speedy. Finally, based on the mentioned questions, using latent class analysis (LCA) eating speed was defined as three classes: ‘normal’, ‘relative speedy’ and ‘speedy (Saneei, P et al. 2016)

2.2.2. Assessment of personality traits

The big five personality inventory short form was used to evaluate personality traits. The five factors include Neuroticism (N): the tendency to experience affective instability (hostility, anxiety, depression, angry, vulnerability, and impulsivity) and negative affect; Extraversion (E): dispositions toward sociability and energetic activity (assertiveness, positive emotion, warmth, gregariousness, seeking, and excitement); Openness (O): reflects individual's like interest in novel people, and ideas, as well as esthetic and intellectual propensities (values, feelings, fantasy); Agreeableness (A): a propensity toward amiability, (modesty, trust, altruism, compliance, and straightforwardness); and Conscientiousness (C): qualities such as fastidiousness, goal-orientation, and dependability (order, self-discipline, competence, achievement striving, and deliberation) (Chapman B et al.2007). These factors include the principal axes of behavioral and psychological variations in people and each element is associated with several prominent health-related behaviors and outcomes, which contain higher levels of overall morbidity and self-rated health (Neeleman J et al. 2002). This 60-item scale consists of 12 items for each subscale. These items are scored from one to five. One is for strongly disagree, and five for strongly agree. Some items are reverse scored. Higher scores point to higher levels of that particular personality trait. The reliability of the entire scale ($\alpha = 0.70$) and subscales ($\alpha s > 0.68$), and the internal consistency of the subscales in Iranian have been established previously(Anisi, Majdiyan, et al. 2011).

2.2.3. Assessment of other variables

A self-administered questionnaire was used to gather information on age, sex, educational attainment (less than diploma (12-year formal education), diploma, and university graduate), smoking habits (current smoker, never smoking, ex-smoker), marital status (single, married), body weight and height of the participants and BMI (kg/m^2). The general physical activity questionnaire (GPAQ) was used to assess their physical activity(Physical activity levels of participants were categorized as never, less than 1 hour, 1–3 hour, and more than 3 hours per week) (Ahmad, Harris, et al. 2015). The reliability of this questionnaire was assessed using Cronbach's alpha coefficient ($\alpha = 0.84$). The functional gastrointestinal disorders (FGIDs) were defined as suffering from at least one of the following: irritable bowel syndrome (IBS), gastroesophageal reflux disorder (GERD), constipation, and dyspepsia. FGIDs were determined using a modified Persian version of the Rome III questionnaire (The split-half test reliability of whole items value was 0.72), as a section of the main comprehensive questionnaire and Talley Bowel Disease Questionnaire (TALLEY, PHILLIPS, et al. 1990, Toghiani et al.2016). Psychological distress was assessed by using the validated Iranian version of the General Health Questionnaire-12 (GHQ) and classified as no psychological distress and presence of psychological distress. Reliability analysis showed satisfactory results (Cronbach's alpha coefficient = 0.87) (Montazeri, Harirchi, et al. 2003).

2.2.4. Statistical analysis

Participants were categorized into three groups based on the eating speed behavior using latent class analysis (‘normal’, ‘relative speedy', and 'speedy’). To determine significant differences in demographic characteristics, personality traits, lifestyle variables, and gastrointestinal disorders, and psychological distress across categories of eating speed, we used analysis of variance (ANOVA) and chi-square test for continuous and categorical variables, respectively. Odds ratios (OR), and 95% confidence intervals (CIs) for eating speed as dependent variable across quartiles of different personality traits scores were calculated using logistic regression in crude and adjusted models. Model 1 was adjusted for age, sex, marital status, educational level. Additional adjustments for BMI, smoking, and physical activity were made in model 2. Model 3 was additionally adjusted for FGIDs and psychological distress. *P* for linear trend was determined by considering the frequency of eating speed as linear continuous variables in the logistic regression model. Holm-Bonferroni method (Hommel, G,1988) was used to adjust the type one error rate for multiple comparisons, and adjusted p-value thresholds for significance were reported in tables. $P < 0.05$ was considered as a statistical significance (2-sided) level.

3. Results

The mean age of participants was 36.58 years; 2657(55.6%) were female; 2650 (57.3%) were university graduates; 3776 (81.2%) were married, 171(3.6%) were smokers and 38.2% reported never physical activity per week. Patterns of diet-related practices regarding the eating speed identified by LCA are shown in Table 1. Latent class analysis resulted three distinct classes including ‘normal’ (n = 886,20 %), ‘relative speed’ (n = 3080, 69.5%), and ‘speedy’ eating (n = 467, 10.5%). The majority of people in the normal eating speed class had a long chewing duration, while in a speedy class, people had a short chewing duration (Table 1).

Table 1
The pattern of the eating speed identified by latent class analysis among Iranian adults

	Eating speed class		
	Normal	Relative speed	speedy
Class Size	0.20	0.695	0.105
How thoroughly do you chew food?			
Not very well	0.04	0.13	0.46
Well	0.69	0.76	0.53
Very well	0.27	0.11	0.01
How long does it take you to eat lunch?			
Never eat	0.03	0	0
< 10 min	0	0.07	0.99
10–20 min	0.21	0.92	0.01
> 20 min	0.76	0.0021	0
How long does it take you to eat dinner?			
Never eat	0.23	0.04	0
< 10 min	0.06	0.18	0.96
10–20 min	0.50	0.66	0.03
> 20 min	0.20	0.10	0.0001

Table 2 presents the characteristic of study participants across classes of eating speed identified by latent class analysis. Participants in the first class of the eating speed were older. The eating speed was significantly different between men and women so that 40.2 % of individuals in the second class of eating speed were female and 29.2 % were male ($P < 0.001$). Also, physical activity and educational level were significantly different ($P < 0.001$), but marital status and smoking were not different between the three classes of eating speed. Individuals with ‘faster eating’ had higher BMI, higher neuroticism scores, and had lower extraversion, openness, agreeableness, and conscientiousness scores. The prevalence of functional gastrointestinal disorders (FGIDs) was not significantly different between classes of eating speed. According to the General health questionnaire (GHQ), 76.9% of individuals had no psychological distress. The prevalence of psychological distress was significantly different across classes of eating speed ($P < 0.001$, Table 2).

Table 2
Basic characteristics of study participants across classes of the eating speed

Variable	Eating speed class			P-value*
	Normal	Relative speed	Speedy	
Age (year)	37.9 ± 8.62	36.14 ± 7.93	36.43 ± 7.83	< 0.001
Sex				< 0.001
Male	49.60	42.00	49.80	
Female	50.40	58.00	50.20	
Educational level				< 0.001
Under diploma	19.70	8.50	1.30	
Diploma	31.90	19.20	3.50	
University graduate	48.40	37.20	4.90	
Marital status				> 0.99
Married	82.90	81.2	81.80	
Single	19.10	18.8	18.20	
Physical activity (per week)				< 0.001
Never	32.80	39.30	41.00	
≤ 1 hour	27.10	27.20	27.30	
1–3 hour	22.60	22.30	21.30	
≥ 3 hour	17.50	11.20	10.40	
BMI (kg/m^2)	25.03 ± 4.50	24.95 ± 4.36	25.94 ± 5.48	< 0.001
Smoking				> 0.99
Nonsmoker	95.10	96.80	95.80	
Smoker	4.90	3.20	4.20	
Personality traits				
Neuroticism	17.80 ± 8.10	18.74 ± 7.72	20.70 ± 8.10	< 0.001
Extraversion	29.60 ± 7.45	29.10 ± 6.91	28.10 ± 7.12	0.001
Openness	24.15 ± 5.50	24.20 ± 5.14	23.23 ± 5.30	0.001
Agreeableness	31.02 ± 6.95	31.30 ± 6.91	29.10 ± 6.21	< 0.001
Conscientiousness	36.44 ± 7.90	36.5 ± 6.10	34.10 ± 6.10	< 0.001
FGIDs†				0.30
No	49.60	47.40	43.50	
yes	50.40	52.60	56.00	
psychological distress				< 0.001
No	80.50	76.90	69.60	
yes	19.50	23.10	30.40	

*Derived from one-factor ANOVA and chi-square test for continuous and categorical variables, respectively. † FGIDs: functional gastrointestinal disorders. ‡ Quantitative variables were reported as mean ± SD while qualitative variables as a percentage. All p-values were adjusted using the false discovery rate controlling procedure developed by the Holm-Bonferroni method.

Table 3 presents the distribution of eating speed classes and other characteristics of study participants across quartiles of personality traits' scores. The eating speed was significantly different across quartiles of five personality traits; in which people with higher neuroticism scores (fourth quartile) showed higher speeding of eating while people in the fourth quartile of other personality traits had lower speeding of eating. Genders were significantly distributed across quartiles of all personality traits (P < 0.001) except Conscientiousness (P = 0.27), while there was a significant educational distribution across quartiles of all personality traits (P < 0.001). BMI was not different across the quartile of neuroticism and extraversion but it was different across other personality traits. The prevalence of FGIDs was different across the quartile of some personality traits, and the prevalence of psychological distress was different across quartiles of all personality traits (Table 3).

Table 3
General characteristics of participants across quartile of personality traits

	Neuroticism			Extraversion			Openness			Agreeableness			Conscientiousness		
	Q4	P value[1]	Q4	P value[1]	Q4	P value[1]	Q4	P value[1]	Q4	P value					
Normal	25.80	20.80	< 0.001	24.10	30.70	< 0.001	25.00	25.50	0.001	25.40	26.80	< 0.001	32.50	25.40	< 0.001
Relative speed	26.40	22.80		23.40	26.70		25.20	23.40		29.50	23.40		30.00	23.80	
Speedy	29.10	31.20		19.20	22.40		20.90	21.10		22.60	18.80		27.20	17.40	
Age (y)	37.00 ± 8.20	35.33 ± 7.60	< 0.001	36.40 ± 8.14	36.25 ± .40	0.72	36.2 ± 8.12	35 ± 7.75	< 0.001	36.44 ± 8.20	36.11 ± 8.10	0.16	36.60 ± 8.11	36.70 ± 8.26	> 0.99
Sex			< 0.001			< 0.001			< 0.001			< 0.001			> 0.99
Male	44.80	33.20		48.80	51.60		46.00	37.70		46.30	33.50		44.80	41.70	
Female	55.20	66.80		51.20	48.40		54.00	62.30		53.70	66.50		55.20	58.30	
Educational level			< 0.001			< 0.001			< 0.001			< 0.001			< 0.001
Under diploma	16.60	16.40		11.60	11.40		1.01	4.80		11.30	10.50		13.10	10.20	
Diploma	31.70	29.50		27.80	31.40		29.30	23.70		31.30	23.80		27.50	32.90	
University graduate	51.70	54.10		60.70	57.30		60.60	71.40		57.40	65.70		59.40	57.00	
Marital status			0.06			> 0.99			< 0.001			0.16			0.64
Married	83.40	78.60		81.10	81.50		82.90	73.90		83.20	79.10		80.90	79.80	
Single	16.60	21.40		18.90	18.50		17.10	26.10		16.80	20.90		19.10	20.20	
Physical activity (MET))			< 0.001			< 0.001			< 0.001			0.10			< 0.001
Never	39.20	47.80		32.70	29.30		36.00	32.60		35.20	37.20		35.60	33.00	
≤1 hour	27.40	26.10		28.30	27.90		27.90	28.80		28.90	27.20		29.30	26.50	
1–3 hour	21.60	18.90		24.70	24.90		23.50	24.10		23.40	21.50		23.10	24.30	
≥3 hour	11.90	7.30		14.40	17.90		12.70	14.50		12.50	14.00		11.90	16.20	
BMI	25.32 ± 5	25 ± 4.83	0.51	25.22 ± 4.90	25 ± 4	> 0.99	25 ± 4.44	24.53 ± 4.2	< 0.001	25 ± 4.00	25 ± 5.00	0.002	24.96 ± 4.75	24.82 ± 4.15	0.002
Smoking			> 0.99			0.40			0.14			0.002			0.28
Smoker	3.70	4.10		3.20	3.50		3.40	2.50		3.00	2.30		96.80	97.00	
Nonsmoker	96.30	95.90		96.80	96.50		96.60	97.50		97.00	97.70		3.20	3.00	
FIGIDs			< 0.001			< 0.001			> 0.99			< 0.001			< 0.001

[1]Derived from one-factor ANOVA and chi-square test for continuous and categorical variables, respectively. ‡ Quantitative variables were reported as mean ± SD while qualitative variables as percentage. All p-values were adjusted using the false discovery rate controlling procedure developed by the Holm-Bonferroni method.

Crude and multivariable-adjusted ORs (95% CIs) for eating speed classes across quartiles of personality traits are presented in Table 4. In the crude model, higher levels of neuroticism (quartile 4) were associated with lower odds of normal eating (OR = 0.43; 95% CI: 0.31, 0.60; P < 0.001). Further adjustment for various confounders such as age, gender, marital status, and educational level, although weakened the associations but strongly remained practically significant. In the final model, we observed that higher scores of neuroticism were associated with a 50.0% decrease in the odds of being in the normal eating speed compared with the reference category (OR = 0.50; 95%CI:0.31,0.81; P = 0.01). But in the crude model, higher levels of extraversion (quartile 4) were associated with higher odds of being in normal eating class (OR = 1.89; 95% CI: 1.39, 2.57; P < 0. 001). Further adjustment for age, gender, marital status, educational level, physical activity, smoking, and BMI weakened the associations, and in the final model, the association was not remained statistically significant after adjusting the effect of FGIDs, and psychological distress. Also, in the crude model, higher levels of openness (quartile 4) were statistically significantly associated with higher odds of being in normal eating class (OR = 1.59; 95% CI: 1.17, 2.15; P < 0.001). Further adjustment for various confounders, weakened the associations. In the final model, we observed that the higher scores of openness were associated with a 70.0% increase in the odds of being in the normal eating class compared with the reference category (OR = 1.70; 95%CI:1.15,2.54; P = 0.004). In the crude model, higher levels of agreeableness (quartile 4) were associated with higher odds of normal eating (OR for the class of normal eating speed = 1.82; 95% CI: 1.33, 2.50; P < 0.001). Further adjustment for various confounders although attenuated the associations, it strongly remained significant. In the final model, we observed that the higher scores of agreeableness were associated with a 55.0% increase in the odds of being in the normal eating speed compared with the reference category (OR = 1.55; 95%CI: 1.03, 2.34; P = 0.002). Finally, in the crude model, higher levels of conscientiousness (quartile 4) were associated with higher odds of normal eating (OR for the class normal eating speed = 2.00; 95% CI: 1.45, 2.77; P < 0.001). Further adjustment for various confounders, weakened the associations. In the final model, we observed that higher scores of conscientiousness were associated with a 95.0% increase in the odds of being in the normal eating speed class compared with the reference category (OR = 1.95; 95%CI:1.26,3.03; P = 0.002).

	Neuroticism			Extraversion			Openness			Agreeableness			Conscientiousness		
	Q4	P value[1]	Q4	P value[1]	Q4	P value[1]	Q4	P value[1]	Q4	P value					
No	45.10	75.60		51.20	59.60		48.60	47.50		50.10	54.50		49.80	55.80	
Yes	54.90	24.40		48.80	40.40		51.40	52.50		49.90	45.50		50.20	44.20	
psychological distress			< 0.001			< 0.001			< 0.001			< 0.001			< 0.001
No	77.50	40.50		86.20	94.60		78.30	80.50		83.60	86.80		82.00	89.50	
Yes	22.50	59.50		13.80	5.40		21.70	19.50		16.40	13.20		18.00	10.50	

[1]Derived from one-factor ANOVA and chi-square test for continuous and categorical variables, respectively. ‡ Quantitative variables were reported as mean ± SD while qualitative variables as percentage. All p-values were adjusted using the false discovery rate controlling procedure developed by the Holm-Bonferroni method.

Crude and multivariable-adjusted ORs (95% CIs) for eating speed classes across quartiles of personality traits are presented in Table 4. In the crude model, higher levels of neuroticism (quartile 4) were associated with lower odds of normal eating (OR = 0.43; 95% CI: 0.31, 0.60; P < 0.001). Further adjustment for various confounders such as age, gender, marital status, and educational level, although weakened the associations but strongly remained practically significant. In the final model, we observed that higher scores of neuroticism were associated with a 50.0% decrease in the odds of being in the normal eating speed compared with the reference category (OR = 0.50; 95%CI:0.31,0.81; P = 0.01). But in the crude model, higher levels of extraversion (quartile 4) were associated with higher odds of being in normal eating class (OR = 1.89; 95% CI: 1.39, 2.57; P < 0. 001). Further adjustment for age, gender, marital status, educational level, physical activity, smoking, and BMI weakened the associations, and in the final model, the association was not remained statistically significant after adjusting the effect of FGIDs, and psychological distress. Also, in the crude model, higher levels of openness (quartile 4) were statistically significantly associated with higher odds of being in normal eating class (OR = 1.59; 95% CI: 1.17, 2.15; P < 0.001). Further adjustment for various confounders, weakened the associations. In the final model, we observed that the higher scores of openness were associated with a 70.0% increase in the odds of being in the normal eating class compared with the reference category (OR = 1.70; 95%CI:1.15,2.54; P = 0.004). In the crude model, higher levels of agreeableness (quartile 4) were associated with higher odds of normal eating (OR for the class of normal eating speed = 1.82; 95% CI: 1.33, 2.50; P < 0.001). Further adjustment for various confounders although attenuated the associations, it strongly remained significant. In the final model, we observed that the higher scores of agreeableness were associated with a 55.0% increase in the odds of being in the normal eating speed compared with the reference category (OR = 1.55; 95%CI: 1.03, 2.34; P = 0.002). Finally, in the crude model, higher levels of conscientiousness (quartile 4) were associated with higher odds of normal eating (OR for the class normal eating speed = 2.00; 95% CI: 1.45, 2.77; P < 0.001). Further adjustment for various confounders, weakened the associations. In the final model, we observed that higher scores of conscientiousness were associated with a 95.0% increase in the odds of being in the normal eating speed class compared with the reference category (OR = 1.95; 95%CI:1.26,3.03; P = 0.002).

Table 4
Crude and multivariable odds ratios (95% CI for OR) for the association of personality traits an

Q4	Q3	Q1	P-trend	Q4		Q3	Q1	P-trend	Q4		Q3	Q1	P-trend	Q4		Q2
Normal	Crude	0.43 (0.31–0.60)	0.76 (0.54–1.06)	1	< 0.001	1.89(1.39–2.57)		11.14(0.84–1.1.55)	1	< 0.001	1.59(1.17–2.15)		1.31(0.96–1.77)	1	< 0.001	1.82 2.50
	Model1	0.37 (0.25–0.37)	0.76(0.52–1.12)	1	< 0.001	2.10(1.48–2.98)		1.26(0.90–1.80)	1	0.002	2.00(1.41–2.83)		1.51(1.10–2.11)	1	< 0.001	2.03 2.90
	Model2	0.42(0.27–0.64)	0.96(0.63–1.48)	1	< 0.001	1.90(1.26–2.83)		1.30(0.88–1.92)	1	0.02	1.68(1.14–2.49)		1.49(1.01–2.20)	1	0.004	1.68 2.50
	Model3	0.50(0.31–0.81)	1.00(0.65–1.54)	1	0.01	1.70(1.10–2.64)		1.21(0.80–1.83)	1	0.15	1.70(1.15–2.54)		1.50(1-2.20)	1	0.004	1.55 2.34
Relative speed	Crude	0.53(0.40–0.71)	0.87 (0.64–1.17)	1	< 0.001	1.57(1.20–2.10)		1.28)0.99–1.65)	1	< 0.001	1.52(1.16–1.98)		1.54((1.19–1.99)	1	0.001	1.78 2.36
	Model1	0.49(0.36–0.67)	0.94(0.67–1.32)	1	< 0.001	1.67(1.24–2.29)		1.26(0.95–1.68)	1	0.002	1.51(1.12–2.04)		1.58(1.19–2.10)	1	< 0.001	1.63 2.22
	Model2	0.49(0.34–0.70)	1.09(0.74–1.61)	1	< 0.001	1.64(1.16–2.32)		1.36(0.98–1.90)	1	0.02	1.37(0.98–1.92)		1.61(1.16–2.23)	1	0.004	1.34 1.87
	Model3	0.55(0.40–0.83)	1.14(0.80–1.70)	1	0.01	1.42(1.00-2.10)		1.28(0.91–1.80)	1	0.15	1.31(0.93–1.84)		1.55(1.11–2.20)	1	0.004	1.20 1.70

*Values are OR (95% CI). Derived from a Mantel-Haenszel extension chi-square test. † Model 1: Adjusted for age, gender, marital status, and educational level, ‡ Model 2: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI. § Model 3: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI, FGIDs, and psychological distress.. All p-values were adjusted using the false discovery rate controlling procedure developed by the Holm-Bonferroni method.

4. Discussion

This study was conducted aimed at assessing the relationship between personality traits and eating speed in a large sample of the Iranian adult population. The findings of our study showed that the higher scores of neuroticism were associated with higher odds of faster eating rates whereas higher scores of other personality traits were associated with higher odds of normal/slower eating speed. To our knowledge, the current study is the first study to assess the relationship between personality traits and eating speed. In line with our results, some previous studies showed that neuroticism was associated with other

dietary habits such as pickiness, neophobia, breakfast skipping, and promotion of other unhealthy food choices (Keller C et al. 2015, Intiful, F.D et al. 2019). Another study reported that lower scores of neuroticism were associated with making healthy dietary choices (Kikuchi Y, 1999). Previous studies showed that conscientiousness is associated with a variety of healthy eating behaviors such as fat, sweets, and sugar moderation, regular eating time and avoidance of salty foods and people with high scores of conscientiousness are more talented to follow dietary advice and adoption healthful practices Bae SJ, 2004, Keller C et al. 2015, Intiful, F.D et al. 2019). The association of other personality traits i.e. extraversion and agreeableness with some eating behaviors such as try to know new foods, geophagia, variety seeking, and skipping of meals have been reported (Goldberg LR, 2002, Keller C et al. 2015, Intiful, F.D et al. 2019). Based on few studies on the association of the five factors inventory model among all personality traits openness has been shown is constantly associated with healthy dietary habits (Mottus, R,2012).

Studies in the field of effective factors on eating speed are rare and restricted to factors such as food service, and music, and there is no study about the predictive role of personality traits. Previous studies revealed music does not influence eating speed, energy intake, or appetite in volunteers (Péneau, Mekhmoukh, et al. 2009, Mamalaki, Zachari, et al. 2017). One study showed that the form of food is served has a significant effect on the eating speed and energy intake and individuals eat significantly faster and more when the meal is served up combination (Sun, Ranawana, et al. 2015). Also, a study suggested that eating with special tools changes the chewing times and the amount of food consumption and finally affects the eating speed (Scoffier-Mériaux, Falzon, et al. 2015). Some studies showed that increased the number of chewing reduced eating speed (Andrade, Greene et al. 2008, Zhu and Hollis 2014). One study suggested that increased viscosity of semisolid food reduced the eating speed(Zhu, Hsu, et al. 2013).

A possible explanation for our results might be that the emotions initiated from individual personality could

regulate eating behaviors, similarly eating may regulate an individual's emotions and some traits prevent individuals to adapt to those healthy eating behaviors. For example, individuals with neuroticism trait have less control over their eating behaviors and do not act in an organized and disciplined style (Zhu and Hollis 2014). Whereas more organized and self-disciplined individuals (i.e., those who are more conscientious) have better control over their eating behaviors and tend to maintain a healthy status by seeking healthy eating behaviors (Mõttus, McNeill, et al. 2013).

Finally, some important limitations of our study need to be mentioned. First, we used self-administered questionnaires for evaluating eating speed and personality, so due to the high volume of the sample in the first stage, we did not directly control them. Second, the cross-sectional plan of our study does not allow us to extract any causal conclusion. Third, our study was carried on IUMS personnel; therefore, the generalization of our findings may be limited. To date, there have been only a few studies concentrating on the association between personality traits and dietary habits, and our study as the first one contributed to the scarce research by evaluating its association with eating speed. The other major strengths of this study are high response rate, the application of validated tools, and a large sample size with various demographic data and detailed data on all five personality domains.

Conclusion

The association between eating speed and people's personality traits is supported by the current study findings. Our study provides primary evidence about the potential value of personality traits for managing the eating rate. Personality traits are in association with numerous diseases that this association is mediated by health behaviors particularly eating habits accordingly knowledge of the impacts of personality trait on dietary habit is of relevance for an effective behaviors' modification in eating habits through conducting health promotion and individualizing dietary health care programs. Further prospective observational and interventional studies are recommended.

Declarations

Ethics approval and consent to participate

Written informed consent was obtained from all study participants and the ethic committee of Isfahan University of Medical sciences approved the SEPAHAN study protocol.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no conflicts of interest.

Authors' contributions

E.A, K.AH, A.H, R.H and A.P designed the study and wrote the protocol. F.A conducted the statistical analysis and generated the idea of current secondary study. K.M wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript. A.P directed the SEPAHAN study as principle investigator.

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Data Availability: Data and materials supporting the results of this article are available from the corresponding author on reasonable request.

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