Original Article

Personality traits as a potential predictor of willingness to undergo various orthodontic treatments

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ABSTRACT

Objective: To establish an association between patient personality traits and potential willingness to undergo various orthodontic treatments.

Materials and Methods: One hundred adolescent individuals aged 12–16 years completed an anonymous electronic questionnaire via Survey Monkey. The 24-item questionnaire contained three major sections: patient demographics, a modified Big Five Inventory (BFI)-10 personality index, and a willingness to undergo treatment assessment. Multiple-variable linear regression analyses were used to determine the associations among age, gender, ethnicity, and the five personality traits simultaneously with willingness to undergo treatment. Statistical significance was set at $P \leq .05$.

Results: Ninety-six of the 100 individuals were included in the statistical analysis. Age, ethnicity, and gender failed to correlate with potential willingness to undergo orthodontic treatment. Several personality dimensions within the modified BFI-10 (agreeableness, conscientiousness, and neuroticism) were significantly associated with willingness to undergo various orthodontic treatments ($P \leq .05$). Agreeableness demonstrated positive correlations with five treatment modalities, while both conscientiousness and neuroticism exhibited negative associations with a single treatment modality. Openness and extraversion were the only personality dimensions that failed to associate with any of the treatment modalities. Four of the nine treatment modalities had no association with patient demographics or a patient's personality dimensions.

Conclusions: Personality traits are useful in predicting a patient's potential willingness to participate in various orthodontic treatments. The agreeableness dimension provided the most utility in predicting patient willingness. Age, ethnicity, and gender were not significant in predicting patient willingness. (*Angle Orthod.* 2013;83:899–905.)

KEY WORDS: Personality index; Patient compliance; Orthodontic treatment

INTRODUCTION

Orthodontic cooperation, compliance, and motivation play a major role in the final outcome of orthodontic treatment. Lack of any of these characteristics can compromise treatment, extend treatment times, and lead to frustration on the part of the orthodontist and patient. Patient willingness to undergo various treatment procedures can be thought of as the first step in predicting motivation and adherence to further treatment. Sergl et al.[1] found that overall treatment compliance and the ability to deal with discomfort of orthodontic appliances correlated with a patient's attitude at the onset of treatment. Mehra et al.[2] also found that patient compliance was strongly correlated with the desire for orthodontic treatment. In regard to specific orthodontic procedures, Daniels et al.[3] found a positive correlation between patient pretreatment motivation and general cooperation, as

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well as their willingness to wear rubber bands and retainers. Identifying a patient's locus of motivation could be helpful but is often difficult to achieve. A more feasible method for orthodontists to predict patient willingness to undergo certain orthodontic procedures involves personality indexing.

A patient's personality consists of numerous traits that influence the decisions he makes on a daily basis. By assessing these personality traits, an orthodontist may be able to correlate how a patient would respond when asked to adhere to various treatments. The Big Five personality dimensions comprise one of the most commonly used personality taxonomies. The five identified dimensions are openness, conscientiousness, neuroticism, extraversion, and agreeableness. The specific domains can be described as follows: "openness" indicates willingness to experience new things, imaginative; "neuroticism" indicates emotional instability; "conscientiousness" indicates that the individual evaluates consequences prior to acting; "agreeableness" indicates ability to get along well with others and to be trustworthy; and "extraversion" indicates that the individual thrives in social situations.[4,5] The Big Five Inventory[6] (BFI) is a self-assessment instrument that aims to evaluate these five personality dimensions. The BFI contains 44 short-phrase items and has been shown[6] to be a quick and valid method of assessing the five dimensions. In an attempt to further expedite the process of assessing the five dimensions, the BFI-10[4] was created. The BFI-10 contains 10 total items and uses two phrase-items to assess each dimension. Rammstedt and John[4] reported that the BFI-10 can be completed in a minute or less and possesses acceptable psychometric properties compared to the original BFI-44 (overall mean correlation of .83). They did note that the agreeableness dimension demonstrated slightly reduced performance in the abbreviated model and recommended the addition of a third question, "Is considerate and kind to almost everyone," to improve its performance, thus generating the modified BFI-10 instrument. This 11-item instrument would be a useful personality trait assessment tool for orthodontists because it (1) is succinct in nature,[4] (2) has been previously validated,[4] (3) is applicable in preadolescent populations,[7] and (4) has been used in the medical[7–10] and dental[8,11,12] literature.

Few studies have investigated the relationship between a patient's personality characteristics and his potential adherence to certain treatment in orthodontics. El-Mangoury[13] demonstrated that psychological testing was useful in determining future orthodontic cooperation. He found that oral hygiene was better in orthodontic patients who exhibited a high need for achievement. Furthermore, he observed better compliance with wearing removable appliances and maintaining appliances among individuals with a high need for affiliation. Allan and Hodgson[14] correlated personality characteristics with patient cooperation during orthodontic treatment. They found that younger patients who were extraverted, trustworthy, motivated, and agreeable were more likely to cooperate. Furthermore, using the Brief Symptom Inventory, Cooper-Kazaz et al.[15] observed that anxious individuals preferred lingual and clear aligner appliances over buccal appliances. To date, however, no studies have linked an individual's personality type with his probable willingness to undergo specific orthodontic treatment modalities. Therefore, the aim of this study was to evaluate the association between patient personality and potential willingness to undergo various orthodontic procedures.

MATERIALS AND METHODS

Approval from the Indiana University Institutional Review Board was obtained prior to initiating this study. Survey Monkey (SurveyMonkey.com LLC), an online surveying software, was used to collect data in this study. This electronic surveying tool was configured to collect subject survey responses anonymously.

The questionnaire was composed of three sections and contained a total of 24 items. The first section included four basic demographic questions: patient age, gender, ethnicity, and grade level. The second section included the modified BFI-10 instrument (Appendix A). For each question, participants chose answers from a five-point Likert scale. The five possible responses were (1) strongly disagree; (2) disagree a little; (3) neither agree nor disagree; (4) agree a little; and (5) strongly agree. The final section of the questionnaire addressed the participant's proposed willingness to undergo different orthodontic procedures (Appendix B). Various contemporary orthodontic treatment procedures were included in this section, ranging from noninvasive procedures such as wearing orthodontic elastics to more invasive procedures such as dental extractions. Participants were asked to identify how willing they were to potentially undergo these procedures by using another five-point Likert scale. The answer choices for this section were (1) very unwilling, (2) unwilling; (3) neither willing nor unwilling; (4) willing; and (5) very willing.

Instrument Validation

While the modified BFI-10 has been previously validated, the 'willingness to undergo different orthodontic procedures' component of the instrument was designed by the investigators to evaluate what contemporary orthodontic treatment modalities participants might be willing to undertake during their treatment and required validation. The investigators

Table 1. Weighted Kappa Statistics for Test-Retest Reliability Questionnaire Assessment

Questionnaire Items	Weighted Kappa
Stop eating hard and sticky foods	.4
Brush and floss every day	.36
Wear a retainer	.35
Wear clear aligners	.51
Wear orthodontic rubber bands	.47
Wear headgear at home	.78
Wear a Herbst appliance	.57
Have a miniscrew implant placed	.46
Have teeth removed	.79

compiled a list of contemporary treatment modalities that an individual could potentially experience during orthodontic treatment. A total of nine treatment modalities were selected to be included in the final instrument. Pictures and descriptions for each orthodontic treatment were used to illustrate the purpose of each procedure. Prior to the study, the survey was reviewed by an expert panel composed of seven orthodontists, a pediatric dentist, a psychologist, and an expert in survey research. Feedback obtained from this group was used to modify the survey for content and face validity.

A pilot study was also conducted, prior to the main study, to establish test-retest reliability and to assess the participants' general understanding of the survey. In order to reduce bias, participants were asked to complete the electronic survey without assistance. A single investigator then conducted a face-to-face interview with each participant to assess his understanding of the survey.

After the interview, participants were given an identical paper copy of the survey with a unique identification number. After 1 week, the pilot participants were asked to complete and return the print survey to the orthodontic department. Data from the initial and returned surveys were used to establish test-retest reliability for the 'willingness to undergo treatment' section of the questionnaire.

Twenty-three individuals were recruited for the pilot study. Of those, 16 returned the secondary survey; thus, the test-retest reliability evaluation was complete on a sample size of 16. Two-way contingency tables and weighted kappa statistics were used to assess for test-retest reliability.

Landis and Koch[16] devised a scale with which to interpret kappa values; according to this scale, <0 = poor; 0–.20 = slight; .21–.40 = fair; .41–.60 = moderate; .61–.80 = substantial; and .81–1.0 = almost perfect (Table 1). According to this scale, all kappa values for the "willingness to undergo treatment" items fell into the fair to substantial range. Feedback from the face-to-face interviews revealed that pilot participants had a clear understanding of what was being asked in the survey. When all of the data from the pilot study were evaluated, it was determined that no modifications of the instrument were necessary.

Table 2. Descriptive Statistics by Gender, Age, and Ethnicity

Variable	N (%)
All	96 (100)
Gender	
Male	39 (41)
Female	57 (59)
Age	
12	33 (34)
13	14 (15)
14	16 (17)
15	24 (25)
16	9 (9)
Ethnicity	
American Indian or Alaskan Native	1 (1)
Asian	2 (2)
Black or African American	12 (13)
Hispanic or Latino	14 (15)
Native Hawaiian or Other Pacific Islander	1 (1)
White	59 (61)
Other	7 (7)

Main Study

Participant recruitment. Individuals were eligible to participate in this study if they met the following inclusion criteria: (1) they were between 12 and 16 years of age, (2) they presented to the university orthodontic clinic for evaluation of orthodontic need, and (3) they had no previous history of orthodontic treatment. Individuals were excluded from the study if (1) they had any self-reported cognitive impairments, which made the survey difficult for them to comprehend; (2) they had undergone previous orthodontic treatment; (3) they were younger than 12 or older than 16 years of age; (4) they or their parents/guardians were unwilling to participate; and/or (5) English was their second language.

A total of 101 adolescent individuals were recruited to participate in the main study when they presented to the orthodontic clinic for patient screening and/or initial records appointments. Only one individual declined participation in the study. The data from four subjects were eliminated from statistical analysis as a result of partial completion of the survey (n = 96). The distribution of female to male participants was relatively balanced: females represented 59% and males 41% of the sample population (Table 2). The majority of the participants in this study were non-Hispanic whites (n = 61%), with all other ethnic groups accounting for only 39% of our sampling population. The sample population had a mean age of 13.6 ($\pm$1.4) years, with an age range of 12–16 years.

Statistical Analysis

A power analysis indicated that 100 subjects would yield 86% power to detect a correlation of .3 at 5% significance. Descriptive statistics were generated to summarize the findings of the sample population. Multiple-variable linear regression analyses were used to determine the associations among age, gender, ethnicity, and the five personality traits simultaneously with willingness to undergo treatment. Statistical significance was set at $P \leq .05$.

RESULTS

Table 3 shows that agreeableness (mean = 4.2; standard deviation [SD] = 0.6) was the highest self-reported personality dimension within the sample population, while neuroticism (mean = 2.6; SD = 0.9) was the lowest self-reported personality dimension. No significant association was found between patient age, gender, or ethnicity and willingness to undergo various orthodontic treatments, and therefore these variables were excluded from the multiple-variable linear regression analyses. The agreeableness dimension was significant in predicting potential willingness to participate in five of the nine orthodontic treatments (Table 4): stop eating hard and sticky foods ($\beta = .39$, $P = .0360$), wear a retainer ($\beta = .66$, $P = .0029$), wear clear aligners ($\beta = .56$, $P = .0020$), rubber bands ($\beta = .41$, $P = .0226$), and Herbst appliance ($\beta = .48$, $P = .0170$). A significant negative association was found between neuroticism and eating hard and sticky foods ($\beta = -.34$, $P = .0051$). Conscientiousness was negatively associated with willingness to wear a Herbst appliance ($\beta = -.28$, $P = .05$). Openness and extraversion were the only personality dimensions that did not display a significant association with willingness to undergo these orthodontic procedures.

While significant associations were observed in this study, four of the nine willingness to undergo orthodontic treatment items were not associated with a patient's personality traits. Willingness to brush and floss, wear headgear, have a miniscrew implant placed, and have a tooth extracted all failed to establish a significant association with the modified BFI-10 personality dimensions.

An individual's personality traits were found to explain varying degrees of his willingness to undergo the treatments discussed (Table 5). Agreeableness and neuroticism accounted for 28% of the variability for willingness to stop eating hard and sticky foods. Agreeableness and conscientiousness explained 14% of the variability for willingness to wear a Herbst appliance. The agreeableness dimension alone accounted for 16%, 19%, and 14% of the variability for willingness to wear retainers, clear aligners, and orthodontic rubber bands, respectively.

Table 3. Sample Population Personality Type Distribution[a]

	N	Minimum	Maximum	Mean (SD)
Extraversion	96	1.5	5	3.5 (0.7)
Agreeableness	96	1.7	5	4.2 (0.6)
Conscientiousness	96	2	5	3.6 (0.8)
Neuroticism	96	1	5	2.6 (0.9)
Openness	96	1	5	3.5 (0.8)

[a] SD indicates standard deviation.

DISCUSSION

The obtained results indicate that an association exists between an individual's personality and his willingness to undergo certain orthodontic treatments. Interestingly, agreeableness proved to be the trait most often associated with willingness to undergo different orthodontic treatments. This is a logical connection, since trust is a trait in the agreeableness dimension. Those high in agreeableness were found to be more willing to cooperate with a larger number of orthodontic procedures presented in the survey. These results support the findings of Allan and Hodgson,[14] who determined the best cooperators during orthodontic treatment were trustworthy. These results also coincide with the findings of Cohen et al.,[9] who noted that patients high in modesty, another trait found within the agreeableness dimension of the modified BFI-10, displayed a positive correlation with patient adherence. Furthermore, they proposed that individuals scoring high in the agreeableness dimension may demonstrate more reverence to individuals of authority and be more likely to follow recommended medical instructions.

Conscientiousness was negatively associated with willingness to wear a Herbst appliance. This is intuitive, as these individuals tend to be more controlling and cognizant of their actions. During treatment, individuals low in the conscientiousness dimension may be more inclined to potentially accept the Herbst appliance; the opposite would be true for those scoring high in the conscientiousness dimension. Christensen and Smith[10] observed a similar negative association when they examined patient personality and adherence to a medication regimen. They showed that the conscientiousness dimension played a large role in adherence. This contradicts the findings of Umaki et al.,[17] who found people low in conscientiousness to be noncompliant.

Neuroticism was negatively associated with willingness to stop eating hard and sticky foods. This supports the observations by Umaki et al.,[17] who found that those who scored high in neuroticism were more likely to demonstrate poor compliance.

Table 4. Multiple-Variable Linear Regression Analysis for Willingness to Undergo Treatment Items and Modified Big Five Index (BFI)-10 Personality Dimensions[a]

	Beta	SE	*P* Value
How willing to stop eating hard or sticky foods?			
Intercept	4.10	1.48	NS
Extraversion	−.25	.15	NS
Agreeableness	.39	.18	.0360
Conscientiousness	.21	.13	NS
Neuroticism	−.34	.12	.0051
Openness	.01	.12	NS
How willing to brush and floss every day?			
Intercept	2.34	1.63	NS
Extraversion	−.18	.16	NS
Agreeableness	.31	.20	NS
Conscientiousness	.17	.14	NS
Neuroticism	−.01	.13	NS
Openness	.06	.13	NS
How willing to wear a retainer?			
Intercept	2.64	1.73	NS
Extraversion	−.29	.17	NS
Agreeableness	.66	.22	.0029
Conscientiousness	−.24	.15	NS
Neuroticism	−.05	.14	NS
Openness	−.14	.14	NS
How willing to wear clear aligners?			
Intercept	2.70	1.39	NS
Extraversion	.10	.14	NS
Agreeableness	.56	.17	.0020
Conscientiousness	−.09	.12	NS
Neuroticism	−.12	.11	NS
Openness	−.11	.12	NS
How willing to wear orthodontic rubber bands?			
Intercept	.97	1.42	NS
Extraversion	.19	.14	NS
Agreeableness	.41	.18	.0226
Conscientiousness	−.01	.13	NS
Neuroticism	−.09	.11	NS
Openness	−.06	.12	NS
How willing to wear headgear at home?			
Intercept	1.03	2.04	NS
Extraversion	.11	.21	NS
Agreeableness	.37	.26	NS
Conscientiousness	−.12	.18	NS
Neuroticism	−.04	.16	NS
Openness	−.01	.17	NS
How willing to wear a Herbst appliance?			
Intercept	1.07	1.58	NS
Extraversion	.21	.16	NS
Agreeableness	.48	.20	.0170
Conscientiousness	−.28	.14	.05
Neuroticism	−.07	.13	NS
Openness	−.18	.13	NS
How willing to have a miniscrew placed?			
Intercept	−.17	1.74	NS
Extraversion	.12	.17	NS
Agreeableness	.35	.22	NS
Conscientiousness	−.13	.15	NS
Neuroticism	−.11	.14	NS
Openness	−.06	.14	NS
How willing to have teeth removed?			
Intercept	2.39	.87	NS
Extraversion	.03	.19	NS
Agreeableness	.03	.23	NS
Conscientiousness	−.09	.17	NS
Neuroticism	−.10	.15	NS
Openness	−.07	.15	NS

[a] SE indicates standard error.

Openness and extraversion were the only personality dimensions that were not significantly correlated with willingness to perform orthodontic procedures. A possible explanation for this observation is that during the modification of the BFI into a 10-item inventory, the openness dimension became more predictive of the imaginative subtrait and less capable of predicting openness to new actions.[4] The extraversion dimension pertains to an individual's sociability or activity. The BFI personality dimensions assess a wide range of potential personality traits. It could be possible that extraversion is a personality aspect that doesn't relate to an individual's potential acceptance or compliance with a specified orthodontic treatment modality.

One surprising observation was that none of the BFI personality dimensions were found to have a significant association with willingness to brush and floss daily, wear headgear, have miniscrews placed, or have teeth removed. These orthodontic treatment modalities cover a wide range of potential invasiveness and level of required patient compliance. No clear explanation can be presented to account for these findings. However, the authors hypothesize that an individual's willingness or unwillingness to undergo these specific

Table 5. Multiple-Variable Linear Regression Model Analyses: Impact of Personality Dimensions on Explaining Subject Willingness to Undergo Orthodontic Treatments[a]

Questionnaire Items	Big Five Personality Dimension	R^{2b}
Stop eating hard and sticky foods	Agreeableness Neuroticism	.28
Brush and floss every day	–	–
Wear a retainer	Agreeableness	.16
Wear clear aligners	Agreeableness	.19
Wear orthodontic rubber bands	Agreeableness	.14
Wear headgear at home	–	–
Wear a Herbst appliance	Agreeableness Conscientiousness	.14
Have a miniscrew implant placed	–	–
Have teeth removed	–	–

[a] En dash (–) indicates that the regression model was unable to explain any of the variability associated with the criterion variables.

[b] R^2 indicates the proportion of the variance in the criterion variable that is explained by the regression model.

treatments may be primarily based on factors other than personality type, such as fear.

Age did not seem to be correlated with willingness to undergo various procedures, which coincides with the findings of Southard et al.[18] They found age not to be useful in determining future patient compliance. Gender also seemed to play no role in patient willingness to undergo orthodontic procedures. This refutes the findings of Southard et al.,[18] who found females to be more compliant.

While several significant associations were identified in this study, there were a few limitations that must be considered. First, the cross-sectional study design only allowed for the assessment of the participants' presumptive future behavior and not their actual adherence to specific orthodontic treatment modalities. Another study limitation was the relatively small sample size. Even with 96 participants, the observed associations, though significant, were mild. Association values of this magnitude are not uncommon in this type of research; however, with larger numbers of participants more substantial association values could be obtained. This will help to further determine the utility of a personality inventory for predicting adherent behavior.

To further strengthen the knowledge between an individual's personality and his willingness to adhere to orthodontic treatment more information is needed. Longitudinal studies with higher participant enrollment are needed to assess the connection between personality type and actual patient compliance during orthodontic treatment.

CONCLUSIONS

- Personality traits showed modest but significant correlations to potential willingness to undergo various orthodontic treatments.
- Agreeableness was positively associated with patient willingness to undergo various orthodontic procedures.
- Conscientiousness and neuroticism were negatively associated with willingness to participate in a few of the identified orthodontic procedures.
- Agreeableness proved to be the personality trait most useful in predicting willingness to undergo treatments.
- Age, ethnicity, and gender played no significant role in predicting a patient's willingness to undergo various orthodontic treatments.

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REFERENCES

1. Sergl HG, Klages U, Zentner A. Functional and social discomfort during orthodontic treatment—effects on compliance and prediction of patients' adaptation by personality variables. *Eur J Orthod*. 2000;22:307–315.
2. Mehra T, Nanda RS, Sinha PK. Orthodontists' assessment and management of patient compliance. *Angle Orthod*. 1998;68:115–122.
3. Daniels AS, Seacat JD, Inglehart MR. Orthodontic treatment motivation and cooperation: a cross-sectional analysis of adolescent patients' and parents' responses. *Am J Orthod Dentofacial Orthop*. 2009;136:780–787.
4. Rammstedt B, John OP. Measuring personality in one minute or less: a 10-item short version of the Big Five Inventory in English and German. *J Res Pers*. 2007;41: 203–212.
5. John OP, Naumann LP, Soto CJ. *Handbook of Personality: Theory and Research*. New York, NY: Guilford Press; 2008.
6. John OP, Donahue EM, Kentle RL. *The Big Five Inventory,* Versions 4a and 54. Berkeley, Calif: University of California, Berkeley; 1991.
7. Markey PM, Markey CN, Tinsley BJ, Ericksen AJ. A preliminary validation of preadolescents' self-reports using the Five-Factor Model of personality. *J Res Pers*. 2002;36: 173–181.
8. Helle L, Nivala M, Kronqvist P, Ericsson KA, Lehtinen E. Do prior knowledge, personality and visual perceptual ability predict student performance in microscopic pathology? *Med Educ*. 2010;44:621–629.
9. Cohen NL, Ross EC, Bagby RM, Farvolden P, Kennedy SH. The 5-factor model of personality and antidepressant medication compliance. *Can J Psychiatr*. 2004;49:106–113.
10. Christensen AJ, Smith TW. Personality and patient adherence: correlates of the five-factor model in renal dialysis. *J Behav Med*. 1995;18:305–313.
11. Vassend O, Willumsen T, Hoffart A. Effects of dental fear treatment on general distress—the role of personality variables and treatment method. *Behav Modif*. 2000;24: 580–599.
12. Smithers S, Catano VM, Cunningham DP. What predicts performance in Canadian dental schools? *J Dent Educ*. 2004;68:598–613.
13. El-Mangoury NH. Orthodontic cooperation. *Am J Orthod*. 1981;80:604–622.
14. Allan TK, Hodgson EW. The use of personality measurements as a determinant of patient cooperation in an orthodontic practice. *Am J Orthod*. 1968;54:433–440.
15. Cooper-Kazaz R, Ivgi I, Canetti L, et al. The impact of personality on adult patients' adjustability to orthodontic appliances. *Angle Orthod*. 2013;83:76–82.
16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33: 159–174.
17. Umaki TM, Umaki MR, Cobb CM. The psychology of patient compliance: a focused review of the literature. *J Periodontol*. 2012;83:395–400.
18. Southard KA, Tolley EA, Arheart KL, Hackett-Renner CA, Southard TE. Application of the Millon Adolescent Personality Inventory in evaluating orthodontic compliance. *Am J Orthod Dentofacial Orthop*. 1991;100:553–561.

Appendix A. Modified Big Five Inventory-10 (BFI-10)

Instruction: How well do the following statements describe your personality?

I see myself as someone who...	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
... is reserved	[1]	[2]	[3]	[4]	[5]
... is generally trusting	[1]	[2]	[3]	[4]	[5]
... tends to be lazy	[1]	[2]	[3]	[4]	[5]
... is relaxed, handles stress well	[1]	[2]	[3]	[4]	[5]
... has a few artistic interests	[1]	[2]	[3]	[4]	[5]
... is outgoing, sociable	[1]	[2]	[3]	[4]	[5]
... tends to find fault with others	[1]	[2]	[3]	[4]	[5]
... does a thorough job	[1]	[2]	[3]	[4]	[5]
... gets nervous easily	[1]	[2]	[3]	[4]	[5]
... has an active imagination	[1]	[2]	[3]	[4]	[5]
... is considerate and kind to almost everyone*	[1]	[2]	[3]	[4]	[5]

(*) Recommended11th question to improve the Agreeableness personality dimension.

Appendix B. Willingness to Undergo Orthodontic Treatment Instrument Items

Instructions: To get your teeth straight and keep them healthy, orthodontists may ask you to participate in a number of treatment procedures. Some of these procedures may cause temporary discomfort and/or impact your appearance, speech, and daily activities. Understanding this potential impact, please read the following questions and indicate your level of willingness to participate in the following treatment procedures.

How willing would you be to...	Very Unwilling	Unwilling	Neither Willing nor Unwilling	Willing	Very Willing
... stop eating hard and sticky foods?	[1]	[2]	[3]	[4]	[5]
... brush and floss daily?	[1]	[2]	[3]	[4]	[5]
... wear a retainer?	[1]	[2]	[3]	[4]	[5]
... wear clear aligners?	[1]	[2]	[3]	[4]	[5]
... wear orthodontic rubberbands?	[1]	[2]	[3]	[4]	[5]
... wear headgear at home?	[1]	[2]	[3]	[4]	[5]
... wear a Herbst appliance?	[1]	[2]	[3]	[4]	[5]
... have a miniscrew implant placed?	[1]	[2]	[3]	[4]	[5]
... have teeth removed?	[1]	[2]	[3]	[4]	[5]