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Personality and oral health

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Abstract

We investigated age-26 personality characteristics and age-32 oral health in a prospective study of a complete birth cohort born in Dunedin, New Zealand. Personality was measured using the Multidimensional Personality Questionnaire (MPQ). Oral health was measured using the short-form Oral Health Impact Profile (OHIP-14), a global measure, and dental examinations. Personality profiles were constructed for 916 individuals (50.8% men) using standardized MPQ scores, and multivariate analyses examined their association with oral health. Those reporting 1+ OHIP-14 impacts had higher Negative Emotionality scores (and lower Constraint and Positive Emotionality MPQ superfactor scores) than those who did not. After controlling for gender, clinical status, and the other two MPQ superfactors, those scoring higher on Negative Emotionality had a greater risk of reporting 1+ OHIP-14 impacts, as well as 3+ OHIP-14 impacts and worse-than-average oral health. They also had a greater risk of having lost at least one tooth from caries and of having 3+ decayed surfaces. Personality characteristics appear to shape self-reports of oral health. Personality is also a risk factor for clinical disease status, at least with respect to dental caries and its sequelae. Because the attitudes and values tapped into by personality tests can be altered by brief cognitive interventions, those might be useful in preventive dentistry.

Keywords

cohort studies; oral health; personality; psychology; social

Recent decades have seen a burgeoning in the use of self-report measures in oral epidemiological and health services research (1). This has been sparked by not only the development of such measures, but also by an increasing awareness of their utility in such research and the recognition that health is a subjective state (2). Self-reported oral health can be determined using either single- item or multi-item measures; the former require the respondent to rate a single statement or answer a single question, while the latter may comprise either a battery of psychometrically unrelated items or a scale consisting of a

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number of items that have been shown psychometrically to represent an underlying construct. Self-report scales used in oral health research include the short-form Oral Health Impact Profile (OHIP-14) (3), the Oral Impacts on Daily Performances (OIDP) scale (4), and the Geriatric (now 'General') Oral Health Assessment Index (GOHAI) (5). These have been shown to be valid and to have useful discriminative and evaluative properties, each showing strong associations with clinical oral disease status. Such scales are known as oral-health-related quality-of-life (OHRQoL) scales, although it has been suggested that they are correctly described as self-report oral health scales (6).

An important consideration with self-report health measures is that the rating for each item is provided solely by the respondent; as such, it is entirely subjective and represents the individual's interpretation of his or her current health state. People may interpret similar symptoms differently. A seminal study by Watson & Pennebaker (7) investigated general health complaints, stress, and distress among a number of population samples, and found negative affectivity to be consistently associated with subjective health measurements. There is already some evidence for such a phenomenon in oral health research. Kressin *et al.* (8) reported that older adults (aged ≥ 65 yr) from the USA with more depressive symptoms had a poorer OHRQoL. A New Zealand study of the impact of xerostomia on OHRQoL found that particular personality characteristics confounded the association (9). Thus, an important caveat when interpreting self-report oral health data is that the observer should be aware of interpersonal differences in the interpretation of health states: to put it crudely, informants who tend to 'view the glass as half-full' will tend to report better oral health, while those who see it as 'half-empty' will tend to lean the other way. This realization should come as no surprise. Recent years have seen the systematization of personality measurement and the emergence of a consensus on the structure of adult personality and its most salient traits (10).

Research into the association between personality and health has shown at least three processes to be involved (10). First, particular personality traits may predispose to poor oral health; an example of this might be a predisposition to bruxing (and subsequent temporomandibular joint dysfunction) among individuals who score more highly on the trait of aggressiveness. Second, personality traits may predispose to poor oral health because they are associated with health-damaging behaviours; for example, individuals who are low on constraint might be more likely to smoke and be, in turn, more likely to suffer periodontitis. Third, personality characteristics may shape the way in which individuals react to (interpret) symptoms and thus construct their illness state. For example, those scoring highly on stress reaction might tend to interpret oral symptoms as being more catastrophic than would their low-scoring counterparts.

Of the three possible mechanisms described above, the first and second are germane to the issue of the influence of personality on clinical disease status, and the third has the greatest immediate relevance to the issue of the influence of personality differences on oral health measurements using self-report global items and OHRQoL scales. An empirical examination of the nature and extent of any such associations would be timely. Accordingly, the aim of this study was to characterize the nature of the association between personality characteristics, clinical disease status and self-reported oral health in a longstanding cohort study. Specifically, we aimed to determine: (i) whether personality was associated with self-reported oral health, (ii) whether personality was associated with clinical disease status, and (iii) whether personality was associated with self-reported oral health, even after controlling for clinical disease status.

Material and methods

The Dunedin Multidisciplinary Health and Development Study (hereafter referred to as the 'Dunedin Study') is a longitudinal study of a birth cohort born in Dunedin (New Zealand) between 1 April 1972 and 31 March 1973 (11). The sample that formed the basis for the longitudinal study was 1,037 children assessed within 1 month of their third birthday and is considered to be broadly representative of its age group in the South Island population. Periodic collections of health and developmental data have since been undertaken, and this study uses data collected from assessments conducted at ages 15, 18, 26, and 32. Over 90% of the cohort self-identified as European. Ethical approval for the study was obtained from the Otago Ethics Committee, and informed consent was obtained from each participant (and also from parents at the assessments conducted during adolescence).

The OHIP-14 (3) was completed by participants at 32 yr of age. For each of the 14 items, participants were asked how often they had experienced the problem in the previous 4 wk. Responses were coded as 'very often' (scoring 4), 'fairly often' (scoring 3), 'occasionally' (scoring 2), 'hardly ever' (scoring 1), or 'never' (scoring 0). The prevalence of one or more OHIP-14 impacts was computed by identifying those who responded 'very often' or 'fairly often' for at least one of the 14 items.

A global self-rated oral-health measure asked participants to rate their oral health in comparison with other persons of their age (with response options: 'among the nicest', 'better than average', 'worse than average', or 'among the worst').

At 26 yr of age, participants completed a 177-item modified version ('Form NZ') of the Multidimensional Personality Questionnaire (MPQ), a self-report personality instrument examining a broad range of individual differences in emotional and behavioural style (12, 13). It has 10 independent subscales which, in turn, define the three superfactors of 'constraint', 'negative emotionality', and 'positive emotionality' (Table 1). The *constraint* factor comprises the traditionalism, harm avoidance, and control subscales. Individuals scoring highly on those traits tend to be restrained, cautious, and conventional, while low scorers are impulsive, fearless, and sensation-seeking, and reject conventional strictures on their behaviour. The *positive emotionality* factor comprises the wellbeing, social potency, achievement, and social closeness subscales: individuals scoring highly on those traits tend to interact positively with their environment, and are ready to experience the positive emotions which arise from those interactions. Low scorers report fear of these pleasurable transactions, a low degree of self-efficacy (the belief that they can influence their environment), and are less likely to be happy. The *negative emotionality* factor comprises the aggression, alienation, and stress reaction subscales: high scorers tend to be easily stressed and harassed, and are prone to experiencing strong negative emotions (such as anxiety or anger).

At 32 yr of age, examinations for dental caries (collected as tooth surface-level data using World Health Organization criteria), periodontal status, and missing teeth were conducted by two calibrated dental examiners. An estimate of accumulated tooth loss as a result of caries was obtained by observing the presence or absence of each tooth, and ascertaining the reason for its absence.

The periodontal measurements were made in all four quadrants. Three sites (mesiobuccal, buccal, and distolingual) per tooth were examined for probing depth (PD; the distance from the tip of the probe to the gingival margin) and gingival recession (GR; the distance from the gingival margin to the cemento–enamel junction) recorded using a National Institute for Dental Research (NIDR) probe. Clinical periodontal attachment loss (CAL) for each site was calculated by summing GR and PD values. Midbuccal measurements for molars were

made at the midpoint of the mesial root. All measurements were rounded down to the nearest whole millimeter at the time of recording. Third molars were not included in the analysis of the periodontal data. In this study, we defined a ‘case’ of periodontal disease as an individual with two or more sites with a CAL of ≥ 5 mm.

We constructed personality profiles by standardizing the MPQ superfactor and scale scores (which are continuous variables) into *Z* scores so that the mean and SD for each scale were 0 and 1, respectively; these were then plotted as line graphs. This enabled comparison of differences between groups with different self-reported health as effect size estimates in SD units, as reported by Slutske *et al.* (14).

In the multivariate analyses, the GLM command in Stata was used with a modified Poisson approach (15) to estimate the relative risk and CIs by using robust error variances. This was used to examine the association between self-reported oral health and MPQ superfactor scores, while controlling for gender, the number of untreated carious surfaces, the number of teeth missing as a result of caries, and periodontitis case status (at least one site with attachment loss of ≥ 5 mm) by 32 yr of age.

Results

Participation rates in the Dunedin Study are high, with 972 (96%) of the surviving participants taking part in the age-32 assessment; 932 (96%) of those were dentally examined, and MPQ data were available for all. Complete data on personality and oral health were available for 916 individuals (50.8% were men); the current analyses are restricted to those 916 (90.2% of the surviving cohort).

At 32 yr of age, one or more OHIP-14 impacts were reported by 214 (23.4%) individuals, and three or more OHIP-14 impacts were reported by 63 (6.9%) individuals. The distribution of responses to the global self-rated oral health measure was as follows: ‘among the nicest’, 32 (3.5%) individuals; ‘better than average’, 442 (48.3%) individuals; ‘worse than average’, 441 (44.9%) individuals; and ‘among the worst’, 31 (3.4%) individuals. For the purposes of this analysis, this variable was dichotomized to identify those rating their oral health as above or below average (51.7% and 48.3%, respectively).

Some 167 (18.2%) participants had one or more teeth missing as a result of caries, with the number of teeth missing ranging from 0 to 17 (mean ± SD: 0.6 ± 1.6). One or more untreated decayed surfaces were observed in 482 (52.6%) participants, with a mean ± SD of 2.3 ± 4.7 (range, 0–42) surfaces affected. One or more sites with a CAL of ≥ 5 mm were observed in 108 (11.2%) individuals.

A comparison of the personality profiles of those reporting 1+ OHIP-14 impacts and those reporting none is presented in Fig. 1. At the MPQ superfactor level, those reporting 1+ impacts had considerably higher scores on Negative Emotionality than those who did not, and they had significantly lower scores on Constraint and Positive Emotionality. At the MPQ scale level, they scored lower on self-control (part of the Constraint superfactor) and on wellbeing, social potency, and social closeness (part of the Positive Emotionality superfactor), and they had higher scores on all three of the scales that comprise the Negative Emotionality superfactor, with the greatest difference observed for the alienation scale score.

A comparison of the personality profiles of those reporting 3+ OHIP-14 impacts and those reporting none is presented in Fig. 2. A similar pattern to that of Fig. 1 is seen, but with considerably greater differences (and there was no significant difference on the social potency scale).

A comparison of the personality profiles of those reporting better-than-average oral health and those with worse-than-average oral health is presented in Fig. 3. At the MPQ superfactor level, the latter scored significantly lower on Constraint and Positive Emotionality, and significantly higher on Negative Emotionality. At the MPQ scale level, significantly lower scores were seen among those with worse-than-average oral health for the self-control, wellbeing, and social closeness scales. Significantly higher scale scores were seen among those with worse-than-average oral health for all three scales in the Negative Emotionality superfactor, with the greatest difference observed for the alienation scale score.

The outcomes of the multivariate models are presented in Table 2. After controlling for gender, clinical status, and the other two MPQ superfactors, individuals scoring higher on Negative Emotionality had a greater risk of reporting 1+ OHIP-14 impacts, as well as 3+ OHIP-14 impacts and worse-than-average oral health.

A comparison of the personality profiles of those who had lost teeth as a result of caries and those having lost none is presented in Fig. 4. At the MPQ superfactor level, those who had lost teeth scored significantly lower on Constraint and Positive Emotionality, and significantly higher on Negative Emotionality. At the MPQ scale level, significant differences in scores were seen for all except the traditionalism, social potency, and achievement scales. In Fig. 5, those with 3+ decayed surfaces scored significantly lower on Constraint and Positive Emotionality, and significantly higher on Negative Emotionality. At the MPQ scale level, significant differences in scores were seen for all except the social potency and achievement scales. For periodontitis (Fig. 6), those with at least one site with CAL ≥ 5 mm scored significantly lower on Constraint and higher on Negative Emotionality. At the MPQ scale level for those two superfactors, significant differences in scores were seen for all except the harm avoidance and stress reaction scales.

The outcomes of the multivariate models are presented in Table 3. Individuals scoring higher on Negative Emotionality had a greater risk of having lost at least one tooth because of caries, after controlling for gender, the other two MPQ superfactors, periodontal case status, and the number of decayed surfaces at 32 yr of age. They also had a greater risk of having 3+ decayed surfaces, after controlling for gender, the other two MPQ superfactors, periodontal case status, and the number of teeth lost as a result of caries.

Discussion

This study aimed to describe the association between personality characteristics and self-reported oral health in a longstanding cohort study. It has found a consistent association between negative emotionality and poorer self-reported oral health, whether measured using a sophisticated scale or a single-item global measure. The association persisted after controlling for gender, current clinical oral status, and other personality characteristics. There was also a strong association between negative emotionality and caries-associated tooth loss, as well as with higher numbers of untreated, decayed surfaces. Thus, personality shapes not only self-reported oral health but also clinical disease status, at least with respect to dental caries and its sequelae.

The past two decades have seen great conceptual and practical strides made in the development and increasingly widespread use of self-report measures of oral health. This has occurred in response to important early work by a number of authors, most notably Cohen & Jago (16), Reisine (17), and Locker (18). A range of OHRQoL scales has resulted; these have all been shown to be valid, and some have proven to be useful, not only in epidemiological and health services research but also in clinical research and practice. It is

surely only a matter of time before they are routinely used in day-to-day clinical practice. However, the findings of the current study suggest that responses to self-report items (and therefore scores on multi-item OHRQoL scales and global measures) can be influenced by particular personality traits, most notably the range of characteristics which fall within the Negative Emotionality domain.

In considering how this might work, it is informative to examine the constituents of the Negative Emotionality superfactor: aggression, alienation, and stress reaction. A high scorer on the aggression subscale is willing to hurt others for his/her own advantage, and will tend to intimidate others and cause them discomfort. A high scorer on the alienation subscale tends to feel mistreated, victimized, betrayed, and the target of false rumours. A high scorer on the stress reaction subscale tends to be nervous and sensitive, and feel vulnerable and prone to worry. To the casual dental observer, it is perhaps most obvious that an individual scoring highly on stress reaction would indeed tend to be more affected psychosocially by a particular oral disease state, other factors being equal, but the links with alienation and aggression require more scrutiny. Greater understanding of exactly how such a link comes about would require more in-depth study, probably using qualitative and/or mixed-methods approaches.

Another consideration is whether such differences would be apparent with other OHRQoL measures, or whether the personality effect is limited to the OHIP-14. Further research is necessary to investigate this.

What are the practical implications of the current study's findings? Essentially, a caveat is necessary: those employing these very useful measures of OHRQoL (and any global measure of oral health) need to be aware that people with particular personality characteristics do, in fact, interpret their oral health state differently from others; self-report measures of oral health suffer from a degree of 'contamination' by personality. In epidemiological research, this would mean that the use of self-report measures might somewhat overestimate the prevalence of poor oral health, and that researchers should therefore regard such reports with a degree of suspicion. In health services research, the benefits of a particular intervention that is being evaluated might be underestimated because of lower effect sizes resulting from the tendency (assumed here, it must be conceded) for more negatively emotional participants to score more highly on those measures. An important consideration with both of these examples is that the degree of contamination would depend partly upon the prevalence of negative emotionality traits in the population under study: if it was relatively small, the effect would be correspondingly minor; if it was relatively high, there might be a problem. Unfortunately, prevalence estimates for negative emotionality are not available because it is measured, used, and reported as a continuous variable; there are no accepted cut-off points for defining cases.

In practical terms, the findings mean that the concurrent use of a short measure of negative emotionality would enable adjustment of the self-report oral health data to allow for that trait. Does such a short measure exist? Watson *et al.* (19) published the Positive And Negative Affect Schedule (PANAS) scales over two decades ago. These comprise two 10-item scales representing positive emotionality and negative emotionality, respectively. The referent period for the response options can range from the current moment through the past few weeks or to the past year to 'in general'. The 10-item negative-emotionality scale could be used concurrently with a self-report oral health instrument (each using the same referent period) and then be used at the analysis stage to adjust scores on the latter. This is speculation at present, and there is a need for further research on the utility of the PANAS in such studies of self-reported oral health.

A noteworthy implication of the study findings is their underlining of the potential utility of dental clinical and self-report measures in wider psychological research, particularly in testing psychosomatic hypotheses. The most common clinical oral conditions (dental caries and periodontal disease, along with tooth loss, their clinical end point) are chronic conditions that are largely irreversible and cumulative in nature, with the evidence of an individual's past and present disease experience readily revealed by systematic dental examination. This provides an objective clinical yardstick against which to investigate interpersonal differences in self-reported oral health and their mediation or modification by a range of psychological traits.

We also note a potential implication from the finding that negative emotionality predicted clinically determined dental caries and tooth loss. Although it was long assumed that personality traits remain stable and unchanging, longitudinal research has documented that personality can and does change markedly, probably because of life experiences and lessons encountered in young adulthood (20). Moreover, brief cognitive interventions have been shown to successfully alter patients' negative emotional attitudes in relation to depression and cardiovascular disease, resulting in health-enhancing effects (21). As such, our findings suggest that negative attitudes and beliefs about oral care might pose an opportunity for the use of brief cognitive interventions in preventive dentistry.

In conclusion, the current study has demonstrated that personality characteristics appear to shape self-reports of oral health, suggesting that dentists should consider the source when using patients' reports. Personality is also a risk factor for clinical disease status, at least with respect to dental caries and its sequelae. Where practicable, investigations of self-reported oral health should include a measure of negative emotionality.

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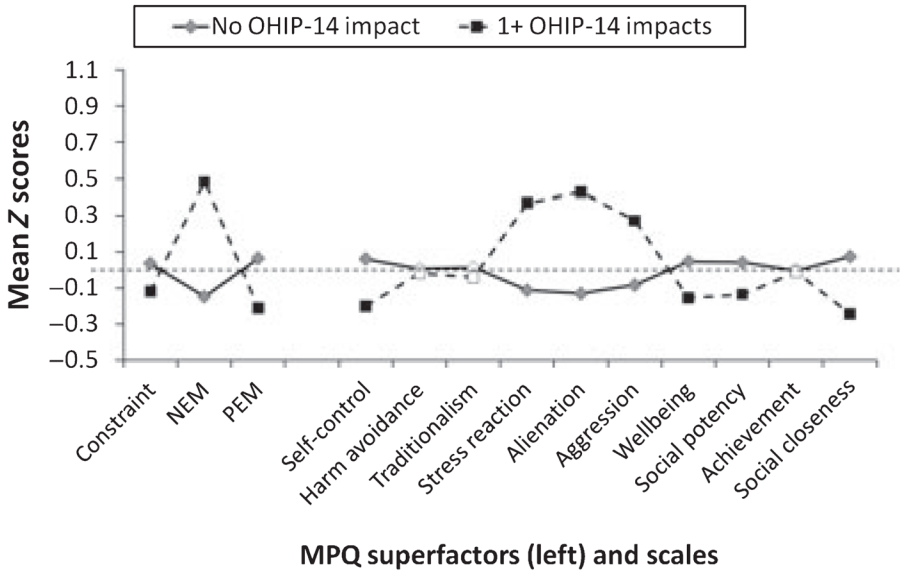

Fig. 1.

Multidimensional Personality Questionnaire (MPQ) profiles of those reporting one or more short-form Oral Health Impact Profile (OHIP-14) impacts and those reporting none. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

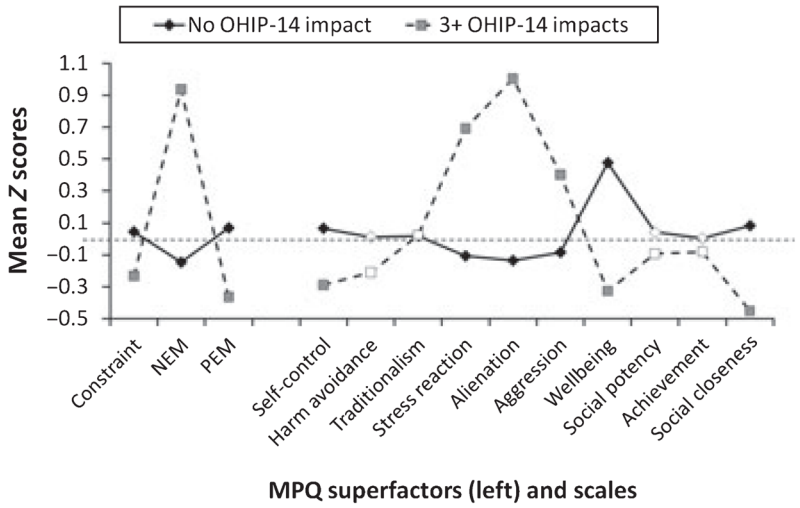

Fig. 2.

Multidimensional Personality Questionnaire (MPQ) profiles of those reporting three or more short-form Oral Health Impact Profile (OHIP-14) impacts and those reporting none. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

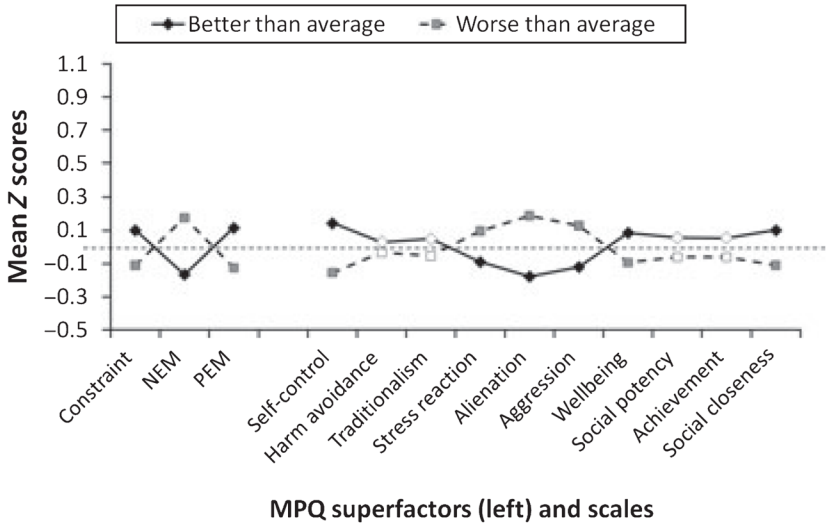

Fig. 3.

Multidimensional Personality Questionnaire (MPQ) profiles of those reporting better-than-average oral health and those reporting worse-than-average oral health. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

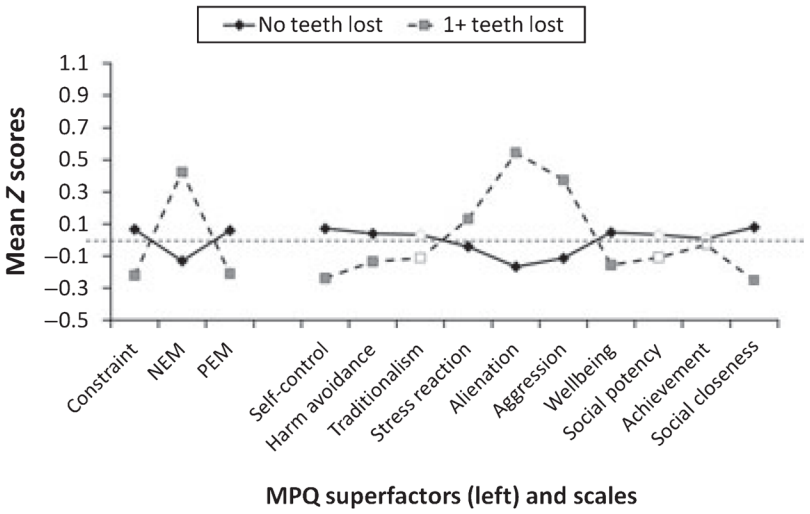

Fig. 4.

Multidimensional Personality Questionnaire (MPQ) profiles of those having lost one or more teeth from caries and those having lost none. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

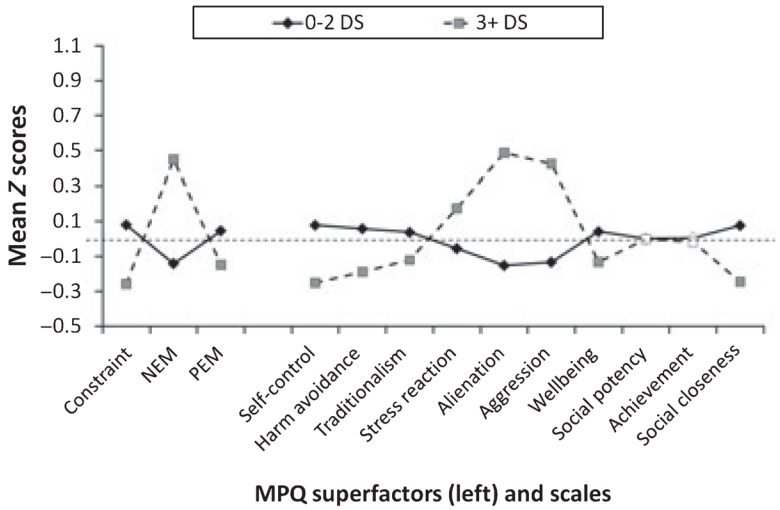

Fig. 5.

Multidimensional Personality Questionnaire (MPQ) profiles of those with three or more untreated decayed surfaces (DS) and those with fewer. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

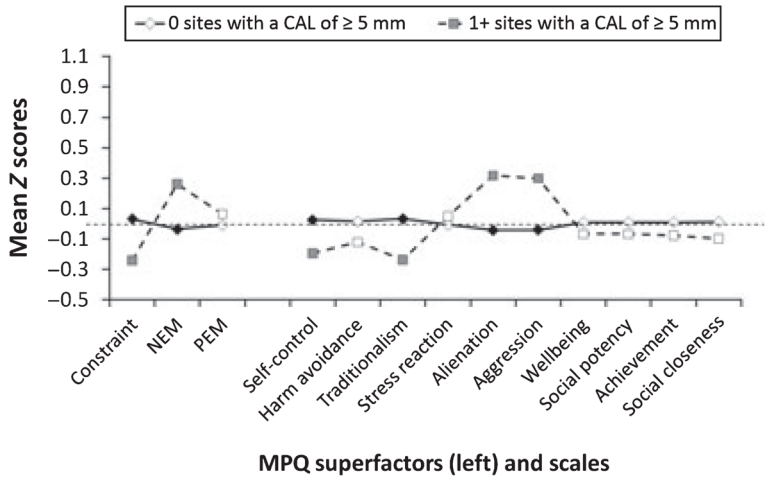

Fig. 6.

Multidimensional Personality Questionnaire (MPQ) profiles of those with one or more periodontal sites with a clinical periodontal attachment loss (CAL) of ≥ 5 mm and those with none. Closed symbols indicate $P < 0.05$. NEM, Negative Emotionality; PEM, Positive Emotionality.

Table 1

Overview of the Multidimensional Personality Questionnaire (MPQ) scale [adapted from Krueger *et al.* (22)]

MPQ superfactor	MPQ scale	No. of items	Description of a high scorer
Constraint	Control	20	Reflective, cautious, careful, rational, planful
	Traditionalism	22	Desires a conservative social environment; endorses high moral standards
	Harm avoidance	21	Avoids excitement and danger; prefers safe activities (even if tedious)
Negative emotionality	Stress reaction	14	Nervous, vulnerable, sensitive, prone to worry
	Aggression	18	Hurts others for own advantage; will frighten and cause others discomfort
	Alienation	17	Feels mistreated, victimized, betrayed, and the target of false rumours
Positive emotionality	Wellbeing	11	Happy, cheerful disposition; feels good about self and sees a bright future
	Social potency	18	Forceful and decisive; fond of leadership roles and influencing others
	Achievement	17	Works hard; enjoys demanding projects and working long hours
	Social closeness	19	Sociable; likes people and turns to others for comfort

Table 2

Outcomes of multivariate models for self-reported oral health by personality characteristics

	Relative risks (95% CI)*		
Characteristic	**1+ OHIP-14 impacts**	**3+ OHIP-14 impacts**	**Worse-than-average self-rated oral health**
MPQ superfactor (at 26 yr of age)			
Constraint	0.99 (0.87, 1.12)	0.96 (0.84, 1.10)	0.98 (0.96, 1.00)
Positive emotionality	0.93 (0.83, 1.03)	0.92 (0.82, 1.02)	0.98 (0.96, 1.00)
Negative emotionality	1.39 (1.26, 1.54)	1.47 (1.32, 1.64)	1.03 (1.00. 1.05)
Female gender	1.20 (0.94, 1.54)	1.31 (1.01, 1.70)	1.03 (0.98, 1.07)
Number of decayed surfaces at 32 yr of age	1.03 (1.02, 1.05)	1.04 (1.02, 1.05)	1.01 (1.01, 1.01)
Number of missing teeth by 32 yr of age	1.06 (1.01, 1.11)	1.07 (1.02, 1.13)	1.02 (1.01, 1.03)
Periodontitis by 32 yr of age	1.21 (0.90, 1.64)	1.25 (0.91, 1.71)	1.13 (1.07, 1.20)

*In interpreting the relative risks here, it should be borne in mind that the Multidimensional Personality Questionnaire (MPQ) scores have undergone *Z*-transformation; for example, the relative risk of 1.47 for 3+ short-form Oral Health Impact Profile (OHIP-14) impacts indicates that an individual scoring 1 SD higher on Negative Emotionality would have 1.47 times the risk of having 3+ OHIP-14 impacts, and someone scoring 2 SD higher would have 2.16 times the risk.

Table 3

Outcomes of multivariate models for clinical oral disease by personality characteristics

Characteristic	Relative risks (95% CI)*		
	1+ teeth lost as a result of caries	3+ untreated decayed surfaces	1+ sites with a CAL of ≥ 5 mm
MPQ superfactor (at 26 yr of age)			
Constraint	0.96 (0.83. 1.11)	0.96 (0.86, 1.08)	0.86 (0.72, 1.04)
Positive emotionality	0.90 (0.79, 1.02)	0.96 (0.87, 1.07)	1.00 (0.84, 1.19)
Negative emotionality	1.22 (1.06, 1.39)	1.31 (1.19, 1.43)	1.13 (0.96, 1.35)
Female	0.88 (0.66, 1.19)	0.59 (0.46, 0.77)	0.93 (0.63, 1.37)
Number of decayed surfaces at 32 yr of age	1.06 (1.05, 1.08)	–	1.04 (1.01, 1.06)
Number of missing teeth by 32 yr of age	–	1.16 (1.11, 1.21)	1.09 (0.99, 1.15)
Periodontitis by 32 yr of age	1.58 (1.13, 2.21)	1.46 (1.12, 1.91)	–

* The Multidimensional Personality Questionnaire (MPQ) scores have undergone *Z*-transformation; for example, the relative risk of 1.31 for 3+ untreated decayed surfaces indicates that an individual scoring 1 SD higher on Negative Emotionality would have 1.31 times the risk of having untreated decayed surfaces, and someone scoring 2 SD higher would have 1.72 times the risk.