Item-level analysis of the relationship between orthodontic treatment need and oral health–related quality of life in Korean schoolchildren

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Introduction: This study aimed to evaluate the associations between normative orthodontic treatment need and oral health–related quality of life (OHRQoL) at an item level as well as subscale and total score levels among schoolchildren. **Methods:** A cross-sectional study was conducted on 2,010 randomly selected children aged approximately 8, 10, 12, and 15 years residing in the Gyeonggi province, Korea. Children were clinically examined with the Index of Orthodontic Treatment Need (IOTN). To measure OHRQoL, the Child Oral Health Impact Profile (COHIP) was used. **Results:** In the physical health domain of COHIP, crooked teeth, discoloration, "food sticking," and "difficulty keeping teeth clean" were significantly associated with IOTN levels ($P < 0.05$), whereas pain, sensitivity and bleeding, bad breath, mouth breathing, and dry mouth were not. In addition, present and future dental health were significantly associated with IOTN levels, although self-confidence, attractiveness, and future health were not. As expected, the 5 subscale scores and total score of COHIP were significantly associated with IOTN levels after adjustment for gender, age, socioeconomic level, and caries state. **Conclusions:** This study suggests the importance of in-depth investigation at the item level of OHRQoL assessment scales to better evaluate the impact of malocclusion that might be alleviated by orthodontic treatment. (Am J Orthod Dentofacial Orthop 2019;155:355-61)

The importance of a comprehensive assessment of orthodontic treatment need with the use of both objective and subjective measures has been acknowledged by researchers as being of value to patients, health care providers, and public health authorities.[1,2] Although the objective degree of orthodontic treatment need is most often measured by traditional clinical measurements, including occlusal indices and cephalometric radiographic findings, the health effect of malocclusion can be assessed by its impact on the individual patient's perceived physical health, psychologic well-being, and social well-being.[1] Oral health–related quality of life (OHRQoL) has been considered the best perceptive measure to subjectively assess the consequences of malocclusion conditions.[2] The relationship between normative orthodontic need and OHRQoL has been extensively studied.[2-4] A general association between these measures has been repeatedly confirmed, although the strength of evidence is relatively low.[3,4]

Physical appearance, and the impact of well aligned teeth on the concept of beauty and status within one's culture, is generally accepted as important for the adolescent seeking group approval at school or in society at large. The nature of the relationship between malocclusion and OHRQoL remains unsettled. Although most researchers have found significant associations between malocclusion status and psychologic and social well-being, inconsistent results have been reported, especially

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for the relationship of malocclusion to physical health.[4-6] Moreover, there is little or no strong evidence that the levels of self-concept, self-confidence, and social well-being improve after orthodontic treatment, although the primary reason for seeking orthodontic treatment is concern about esthetic impairment, which is closely related to psychologic and social well-being.[5] Therefore, there is a need for a more meticulous assessment of the impact of malocclusion on OHRQoL.[6]

Most previous studies have compared the total OHRQoL score and domain (or subscale) scores with objective malocclusion criteria, omitting item-level investigations.[5] Evaluation at the domain level may be insufficient, especially for assessing physical health consequences. The reason is that the physical health domain is composed of several distinct heterogeneous categories, for example, oral symptoms such as pain, dental abnormalities in color, shape, and arrangement, food caught between teeth, etc, whereas items in the psychologic and social well-being domains of OHRQoL may be more homogeneous in nature. Therefore a more detailed item-level investigation of OHRQoL questionnaires may be required to elucidate the true impact on the physical health domain. To the best of our knowledge, studies on the relationship between malocclusion and each item of OHRQoL assessment tools among schoolchildren are scarce.[1,7]

The Child Oral Health Impact Profile (COHIP) is a relatively new OHRQoL questionnaire developed for schoolchildren aged 8-15 years.[8] The Korean version of COHIP was validated in various aspects of reliability and validity standards.[9,10] Normative orthodontic treatment need has been frequently measured with the use of the Index of Orthodontic Treatment Need (IOTN).[4]

The purpose of the present study was to evaluate the associations between normative orthodontic treatment need and OHRQoL by appraising the relationship between the IOTN Dental Health Component (DHC) and COHIP among a representative sample of Korean schoolchildren aged 8-15 years. Assessment was performed at item level as well as with the use of subscale and total COHIP scores.

MATERIAL AND METHODS

A representative sample of 2,236 students aged 8-15 years residing in Gyeonggi province, Korea, were randomly selected from 60 schools (out of a total of 2,128 schools in Gyeonggi province). Within each of the 60 schools, 1 classroom of the 3rd, 5th, 7th, and 10th grades was selected, which correspond to ages 8, 10, 12, and 15 years, respectively. A total of 126 children (5.6%) were excluded from the analysis because they were undergoing active orthodontic treatment with ≥1 fixed appliance or did not finish the dental examination. This resulted in 2,010 students in the final sample. More detailed information about subject selection was reported in a previously published article.[9]

The purpose of the study was explained to the students, and their legal guardians signed written consents in advance. The study was approved by the Eulji University Institutional Review Board.

COHIP is a self-administered questionnaire consisting of 5 subscales with a total of 34 items.[8] The questionnaire contains 28 negative items about any discomfort during the past 3 months due to oral health problems and 6 positive items about feelings related to oral health. Negative items were scored with the use of a 5-point Likert-type scale of 0 = "never," 1 = "almost never," 2 = "sometimes," 3 = "fairly often," and 4 = "almost all the time." Positive items were scored 0 = "strongly disagree," 1 = "somewhat disagree," 2 = "don't agree or disagree," 3 = "somewhat agree," and 4 = "strongly agree." "High impact" was defined as a higher score in negative items with responses of "fairly often" and "almost all the time" and lower score in positive items with responses of "strongly disagree" and "somewhat disagree."

The subscales include oral health, functional, socioemotional, school environment, and self-image. The COHIP total score was obtained as a sum of the 34 items, and subscale scores were obtained by summing related item scores. The COHIP total score ranged from 0 to 136, with higher scores representing better OHRQoL. Children did not appear to have difficulty understanding the COHIP questionnaire, with almost all children (98.0%) replying that the COHIP questions were easy or very easy to answer. The Family Affluence Scale (FAS) was used to assess children's socioeconomic status indirectly by asking about possession of a family car, their own bedroom, computers, etc.[11]

A dental examination was conducted to evaluate IOTN-DHC[12] and the presence of active clinical caries by 1 calibrated dentist (H.-Y.K.). Five grades were applied for IOTN-DHC: grade 1 = no need; grade 2 = slight need; grade 3 = borderline need; grade 4 = great need; and grade 5 = very great need. The original grades were recategorized to a 3-level scale of no need (grade 1 or 2), borderline (grade 3), and need (grade 4 or 5). The presence of active caries was determined by having ≥1 or decayed deciduous or permanent teeth.

Overjet, defined as the distance parallel to the occlusal line between the tip of a central incisor and labial surface of the corresponding lower central incisor, was measured with the use of a specially designed ruler. The IOTN-DHC assessment was repeated among 252

children 7-15 days after the initial IOTN-DHC assessment was conducted. The kappa value for IOTN-DHC was 0.826 (SE 0.059) which means substantial test-retest agreement exceeding the standard of 0.6.[13]

Statistical analysis

Bivariate relationships of students' gender, age, and COHIP item scores to the IOTN were examined by means of chi-square test. The relationships of the COHIP scores to IOTN were assessed by means of the Kruskal-Wallis test with post hoc multiple comparisons owing to the negatively skewed distribution of COHIP scores. COHIP total and subscale scores were dichotomized by their median values and used for a multiple logistic regression model with adjustment for gender, age, socioeconomic level, and carries status. All analyses were performed with the use of IBM SPSS Statistics version 23.0 (IBM Corp, Armonk, NY). The type 1 error rate was set at an alpha level of 0.05.

RESULTS

Among the 2,010 students in the sample, boys (53.0%) were slightly more represented than girls. Age group was categorized based on school years. A total of 520 students (25.9%) categorized as in great need or very great need by IOTN were identified as subjects who needed orthodontic treatment. Among all of the students, 5.5% had a large overjet ranging from 7 to 12 mm and 2.1% showed crossbite with negative overjet (Table I). Boys had significantly ($P = 0.020$) more orthodontic treatment need (28.2%) compared with girls (23.2%; Table II). However, age ($P = 0.223$) and socioeconomic status ($P = 0.805$) groups were not associated with IOTN.

Frequencies and percentages of high impacts in negative items according to IOTN levels are presented in Table III. In the oral health subscale, only items with a direct impact of malocclusion, such as crooked teeth, discoloration, and food sticking were significantly associated with IOTN levels ($P < 0.05$). Remotely related possible consequences of malocclusion, such as pain and sensitivity, were not significantly associated with IOTN. In the functional subscale, only "difficulty keeping teeth clean" was significantly associated ($P < 0.001$), while "trouble chewing firm foods" and "difficulty being understood" were insignificant ($P < 0.1$). All of the items in the social/emotional subscale were significantly associated with IOTN levels, whereas all of the items in the school environment were insignificant.

For the self-image subscale, which is composed of positive impact items, disagreement with "have good teeth" and "will have good teeth when older" were associated with orthodontic need. However, self-confidence, attractiveness and future health were not associated with need (Table IV). COHIP total and all subscale scores were significantly different according to IOTN levels (Table V). Children with orthodontic treatment need showed consistently lower total COHIP and subscale scores, which means lower OHRQoL, compared with children who had no or slight need of orthodontic treatment ($P < 0.01$).

Table I. Distribution of subjects according to Index of Orthodontic Treatment Need Dental Health Component (IOTN-DHC) and amount of overjet

Characteristics	*Category (grade)*	n *(%)*
IOTN-DHC	No need (1)	849 (42.2%)
	Slight need (2)	330 (16.4%)
	Borderline need (3)	311 (15.5%)
	Great need (4)	398 (19.8%)
	Very great need (5)	122 (6.1%)
Overjet	0-3 mm	1352 (67.3%)
	4-6 mm	498 (24.8%)
	7-12 mm	110 (5.5%)
	−1 to −6 mm*	43 (2.1%)

*Cross-bite cases.

The results of multiple logistic regression showed that children without need had higher OHRQoL compared with those with treatment need after adjustment for gender, age, socioeconomic level, and caries state (Table VI). The corresponding odds ratios and 95% confidence intervals were 1.9 (1.5-2.4) for COHIP, 1.3 (1.1-1.7) for oral health, 1.5 (1.2-1.9) for functional subscale, 1.7 (1.3-2.1) for social/emotional subscale, 1.4 (1.1-1.7) for school environment, and 1.3 (1.1-1.6) for self-image subscale.

DISCUSSION

The relationship between orthodontic treatment need and the physical health domain of OHRQoL has appeared to be inconsistent in previous studies.[4-6] Because studies reporting item-wise comparisons between OHRQoL and malocclusion are scarce, which physical health items have stronger influence on orthodontic treatment need remains unclear, and generalizations can be made based only on limited studies.[1,7] Although malocclusion per se does not cause orofacial pain, indirect pathways between the two are plausible when including impact of malocclusion on temporomandibular disorders and creating dental, gingival, and mucosal trauma.[6] However, in the present study, pain was not associated with malocclusion. In contrast, 2 previous studies showed significant association of orthodontic treatment need and eating-related dental pain in Brazilian adolescents

Table II. Distribution of orthodontic need assessment levels as measured by the IOTN-DHC according to gender and age groups, n (%)

		*IOTN-DHC level**			
Group	*Total*	*No need*	*Borderline*	*Need*	P *value*†
Total	2010 (100.0%)	1179 (58.7%)	311 (15.5%)	520 (25.9%)	
Gender					0.020
Male	1066 (53.0%)	594 (55.7%)	171 (16.0%)	301 (28.2%)	
Female	944 (47.0%)	585 (62.0%)	140 (14.8%)	219 (23.2%)	
Age					0.223
8 y	384 (19.1%)	233 (60.7%)	76 (19.8%)	75 (19.5%)	
10 y	506 (25.2%)	285 (56.3%)	76 (15.0%)	145 (28.7%)	
12 y	644 (32.0%)	383 (59.5%)	88 (13.7%)	173 (26.9%)	
15 y	476 (23.7%)	278 (58.4%)	71 (14.9%)	127 (26.7%)	
Family affluence level					0.805
Low	544 (27.2%)	329 (60.5%)	77 (14.2%)	138 (25.4%)	
Middle	1060 (53.0%)	617 (58.2%)	163 (15.4%)	280 (26.4%)	
High	397 (19.8%)	230 (57.9%)	67 (16.9%)	100 (25.2%)	

*IOTN-DHC level of need was categorized as: No need = grade 1 or 2; Borderline = grade 3; Need = grade 4 or 5; †Chi-square test.

aged 15-16 years[1] and mouth aching in Saudi young adults aged 21-25 years.[7]

More direct functional impacts of malocclusion, such as crooked teeth, discoloration, and food sticking, were significantly associated in the present study with IOTN levels. According to Coyne et al (1999), among 555 respondents aged ≥18 years, correction of functional problems such as "difficulty chewing or speaking" was considered to be very important in correcting various dentofacial anomalies, regardless of age.[14] In addition, correction of "crooked or crowded front teeth" was important in seeking orthodontic treatment. In contrast, among children aged 8-15 years in the present study, questions with similar contents, such as "trouble chewing firm foods" and "difficulty being understood," obtained marginal significance. Previous studies have shown inconsistent results concerning the impact of malocclusion on creating problems in pronouncing words, which was found to be significant in Brazilian adolescents aged 15-16 years[1] and not significant in Saudi young adults aged 21-25 years.[7]

Age difference may partly explain these conflicting results in the relationship between parameters in the physical domain of OHRQoL and malocclusion. Age was reported as a major influencing factor on the association between malocclusion and HRQoL in a meta-analysis.[15] Studies of children younger than 14 years have been less likely to show association between malocclusion and OHRQoL, studies of children aged ~14 years have shown the biggest impact,[15] and the association tends to decrease as age increases from 15 to 25 years.[16]

All of the items in the social/emotional domain showed strong association with malocclusion, as expected. Being a target of bullying and teasing seems to be more prevalent among children with malocclusion, and strong emotional reactions, such as being upset or feeling unhappy or sad, were observed.[17] Also in the self-image domain, self-confidence and attractiveness were not significantly associated with orthodontic treatment need, and only present and future dental health, which may have more direct consequences, were significantly associated with treatment need.

The social/emotional impacts of malocclusion have been reported to be influenced by psychologic profile, such as self-esteem and psychologic well-being.[18,19] According to Aguo et al (2008), children aged 11-14 years in Toronto, Canada, with low self-esteem reported substantial impact of malocclusion on OHRQoL, and self-esteem was closely correlated to the child's emotional and social well-being.[18] Aguo et al (2011) subsequently postulated a mediator role of psychologic well-being on the social/emotional impact of malocclusion on OHRQoL and reported that children with lower psychologic well-being showed improved OHRQoL after receiving orthodontic treatment, whereas children with higher psychologic well-being had better OHRQoL regardless of their orthodontic treatment.[19] The results of the present study support the significant associations between IOTN level and COHIP total and 5 subscale scores. Most previous studies suggested a significant association of total OHRQoL score and social/emotional subscale scores with malocclusion status,[5,16,20-24] whereas inconsistent results were reported on the physical health subscale. Nonsignificant associations of oral health or functional well-being with malocclusion were reported by some researchers,[20,22,24-26] whereas others showed significant relationships.[7,16]

Table III. Distribution of high impacts* in negative COHIP items according to orthodontic treatment need levels as assessed by the IOTN-DHC, n (%)

	IOTN-DHC level†			
Item	*No need*	*Borderline*	*Need*	P *value*‡
Total	1179 (58.7%)	311 (15.4%)	520 (25.9%)	
Oral health				
Pain/toothache	29 (2.5%)	6 (1.9%)	16 (3.1%)	0.766
Breathing through mouth	159 (13.5%)	39 (12.5%)	72 (13.8%)	0.945
Discoloration of teeth	68 (5.8%)	11 (3.5%)	36 (6.9%)	0.047§
Crooked teeth or spaces	115 (9.8%)	44 (14.1%)	164 (31.5%)	<0.001
Sores or sore spots	79 (6.7%)	16 (5.1%)	49 (9.4%)	0.165
Bad breath	146 (12.4%)	42 (13.5%)	60 (11.5%)	0.652
Bleeding gums	46 (3.9%)	17 (5.5%)	33 (6.3%)	0.237
Food sticking	186 (15.8%)	42 (13.5%)	114 (21.9%)	0.005§
Sensitivity with hot/cold	131 (11.1%)	33 (10.6%)	80 (15.4%)	0.080
Dry mouth	60 (5.1%)	20 (6.4%)	32 (6.2%)	0.093
Functional				
Trouble chewing firm foods	30 (2.5%)	9 (2.9%)	23 (4.4%)	0.051
Difficulty eating	16 (1.4%)	5 (1.6%)	12 (2.3%)	0.304
Trouble sleeping due to teeth/face	4 (0.3%)	0 (0.0%)	6 (1.2%)	0.131‖
Difficulty pronouncing	6 (0.5%)	5 (1.6%)	7 (1.3%)	0.114‖
Difficulty being understood	7 (0.6%)	5 (1.6%)	10 (1.9%)	0.065
Difficulty keeping teeth clean	23 (2.0%)	8 (2.6%)	31 (6.0%)	<0.001§
Social/emotional				
Unhappy or sad due to teeth/face	24 (2.0%)	12 (3.9%)	30 (5.8%)	<0.001§
Felt worried or anxious due to teeth/face	34 (2.9%)	10 (3.2%)	33 (6.3%)	<0.001§
Avoided smiling	31 (2.6%)	3 (1.0%)	21 (4.0%)	<0.001§
Felt looked different	35 (1.5%)	6 (1.9%)	15 (2.9%)	<0.001§
Worried about others' thinking	43 (3.6%)	12 (3.9%)	44 (8.5%)	<0.001§
Felt shy or withdrawn due to teeth/face	27 (2.3%)	6 (1.9%)	21 (4.0%)	0.001§
Been teased due to teeth/face	11 (0.9%)	2 (0.6%)	8 (1.5%)	0.014§
Been upset by questions about teeth/face	20 (1.7%)	10 (3.2%)	13 (2.5%)	0.006§
School environment				
Missed school due to teeth/face	1 (0.1%)	0 (0.0%)	1 (0.2%)	0.292‖
Difficulty paying attention due to teeth/face	7 (0.6%)	1 (0.3%)	4 (0.8%)	0.632‖
Not wanted to speak due to teeth/face	10 (0.8%)	3 (1.0%)	3 (0.6%)	0.806‖
Not wanted to go to school due to teeth/face	6 (0.5%)	1 (0.3%)	3 (0.6%)	0.889‖

*High impact = responses of "fairly often" and "almost all the time" in negative items; †IOTN-DHC level of need was categorized as: No need = grade 1 or 2; Borderline = grade 3; Need = grade 4 or 5; ‡Chi-square test; §$P < 0.05$; ‖More than 20% of cells have expected number <5, therefore their chi-square test results can not be reliable.

The main strength of the present study is the meticulous investigation and analysis of the item level of an OHRQoL measure in terms of the relationship of the individual items with orthodontic treatment need as a marker of malocclusion. As mentioned earlier, some domains in OHRQoL measurement tools contain heterogeneous items and, therefore, simple summing up of item scores may have limitations. Some individual items in OHRQoL questionnaires convey critical importance related to malocclusion, for example, pain, self-confidence, attraction, etc. In addition, the present study used a large representative sample from a community population, whereas most studies in the orthodontic literature on OHRQoL used small convenience samples from orthodontic treatment clinics, which limits their generalizability to broader populations.[15]

IOTN is considered internationally to be a valid and reliable assessment tool[27]; it was originally developed and examined among 11–12-year-old schoolchildren by Brook and Shaw.[12] However, there has been controversy on the feasibility of applying it for mixed dentition.[28,29] Wakhloo proposed that the combined use of IOTN-DHC and the IOTN Aesthetic Component (AC) can be effective for prioritizing orthodontic treatment needs in the mixed dentition period.[29,30] Nearly one-half of subjects in the present study were in the 8- and 10-year-old groups and were likely to have had mixed dentition. Because the IOTN-AC was not used as an assessment tool in this study, this could present a limitation.

This population-based study has some other possible limitations. First, because children who had

Table IV. Distribution of high impacts* in positive COHIP items according to orthodontic treatment need levels as assessed by the IOTN-DHC, n (%)

	IOTN-DHC level†			
Item	*No need*	*Borderline*	*Need*	P *value*‡
Total	1179 (58.7%)	311 (15.4%)	520 (25.9%)	
Self-image				
Been confident due to teeth/face	906 (76.8%)	246 (79.1%)	405 (77.9%)	0.512
Felt was attractive due to teeth/face	1,039 (88.1%)	287 (92.3%)	478 (91.9%)	0.053
Have good teeth	384 (32.6%)	105 (33.8%)	227 (43.7%)	<0.001§
Feel good about myself	185 (15.7%)	51 (16.4%)	88 (16.9%)	0.667
Will have good teeth when older	402 (34.1%)	112 (36.0%)	224 (43.1%)	0.001§
Will have good health when older	257 (21.8%)	67 (21.5%)	106 (20.4%)	0.154

*High impact = responses of "fairly often" and "almost all the time" in negative items; †IOTN-DHC level of need was categorized as: No need = grade 1 or 2; Borderline = grade 3; Need = grade 4 or 5; ‡Chi-square test; §$P < 0.05$.

Table V. Comparative subscale scores of the Child Oral Health Impact Profile (COHIP) according to levels of orthodontic treatment need as assessed by the IOTN-DHC, mean ± SD

	IOTN-DHC level*			
Scale (possible range)	*No need*	*Borderline*	*Need*	P *value*†
IOTN-DHC	1179 ± 58.7	311 ± 15.5	520 ± 25.9	
COHIP (0-136)	105.1 ± 12.3[a]	104.2 ± 12.4[a]	100.4 ± 13.6[b]	<0.001
Oral health (0-40)	28.8 ± 5.4[a]	28.9 ± 5.4[a]	27.5 ± 5.8[b]	<0.001
Functional (0-24)	22.1 ± 2.4[a]	21.8 ± 2.6[ab]	21.4 ± 2.8[b]	<0.001
Social/emotional (0-32)	28.5 ± 4.2[a]	28.2 ± 4.4[a]	26.8 ± 5.2[b]	<0.001
School environment (0-16)	15.4 ± 1.2[a]	15.3 ± 1.2[ab]	15.2 ± 1.3[b]	0.006
Self-image (0-24)	10.3 ± 3.9[a]	9.9 ± 3.6[ab]	9.5 ± 3.5[b]	0.002

[a,b]Values with different superscript letters were significantly different in the item comparison according to mean post hoc multiple comparison procedure.
*IOTN-DHC level of need was categorized as: No need = grade 1 or 2; Borderline = grade 3; Need = grade 4 or 5; †Kruskal-Wallis test.

Table VI. Adjusted odds ratios and 95% CIs for having higher oral health–related quality of life according to IOTN-DHC level*

	Child oral health impact profile					
IOTN-DHC level	*Total*	*Oral health*	*Functional*	*Social/emotional*	*School environment*	*Self-image*
No need	1.9 (1.5-2.4)	1.3 (1.1-1.7)	1.5 (1.2-1.9)	1.7 (1.3-2.1)	1.4 (1.1-1.7)	1.3 (1.1-1.6)
Borderline	1.5 (1.1-2.1)	1.3 (0.9-1.8)	1.2 (0.9-1.7)	1.4 (1.0-1.8)	1.1 (0.8-1.5)	1.1 (0.8-1.4)
Need	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)

Results are adjusted for gender, age, socioeconomic level, and caries status.
*IOTN-DHC level of need was categorized as: No need = grade 1 or 2; Borderline = grade 3; Need = grade 4 or 5.

undergone orthodontic treatment were not excluded from this study, interpretation of results may be weakened by their inclusion. Most children who had completed orthodontic treatment were expected to have no or slight orthodontic treatment need. Second, this was a cross-sectional study, so relationships identified in the analysis can not be interpreted as causal. Third, in general few students reported high impacts of negative items in the school environment COHIP subscale, so this domain was not able to be robustly studied for its relationship to orthodontic treatment need in this population.

CONCLUSIONS

This study suggests the importance of analysis at the item level of OHRQoL measures to more thoroughly describe the impact of disease, such as malocclusion,

or treatment needs, such as orthodontic treatment need, on OHRQoL. This analysis demonstrated that, as expected, 5 subscale scores and the total score of COHIP were significantly associated with IOTN. Moreover, only OHRQoL items of direct consequence to malocclusion, such as crooked teeth or perception of dental health, were significantly associated with malocclusion, whereas more distant items, such as self-confidence and attractiveness, were not.

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