

ORIGINAL ARTICLE



Satisfaction with smile appearance mediates oral health-related quality of life in adolescents regardless of orthodontic treatment need – a cross-sectional study

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ABSTRACT

Objectives: To explore the relationship between adolescents' oral health-related quality of life (OHRQoL), satisfaction with smile appearance, treatment need and treatment demand through direct and serial mediation models.

Materials and methods: This cross-sectional study included 215 11–14-year-olds and their parents. The instruments included the Child Perceptions Questionnaire and the Index of Orthodontic Treatment Need. Satisfaction with smile appearance, orthodontic treatment demand and parental perception of their child's orthodontic treatment need was recorded on a Likert scale (0 = not at all to 4 = very much). Serial mediation models were used to assess the effects of malocclusion on the OHRQoL.

Results: Objective treatment need explained less than 5% of the adolescents' OHRQoL. Serial mediation models through satisfaction with smile appearance, parental perception of their child's orthodontic treatment need, and patients' orthodontic treatment demand explained 23–25% of the variance.

Conclusions: Satisfaction with smile appearance mediates the OHRQoL in adolescents. Parents have no direct influence, but their perception of the need to correct their child's teeth might amplify adolescents' orthodontic treatment demand, leading to lower OHRQoL.

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Introduction

The World Health Organization defines quality of life as individuals' perceptions of their position in life in the context of their culture, value systems goals, expectations, standards and concerns [1]. Oral health-related quality of life (OHRQoL) is specifically associated with the impact of oral health on a person's everyday life and activities. It is a highly individual, multidimensional concept that arises from the combination of one's experiences and expectations and is equally influenced by clinical, individual and contextual characteristics [1].

The negative impact of malocclusion on young adolescents' OHRQoL has been proven by numerous studies [2,3]. Research has shown that about 50% of adolescents 11–14 years of age worldwide report impaired OHRQoL, independent of the presence of malocclusion [4,5]. Adolescents who perceive their appearance to be significantly impaired due to malocclusion report greater disruption of OHRQoL regardless of their age, sex and objective malocclusion severity [3]. Furthermore, malocclusion severity does not correspond to the parental perception about their child's orthodontic treatment need, nor can parents approximately assess the orthodontic treatment demand of their

children [6]. Parents of adolescents with anterior segment malocclusion tend to recognize the greater impact of malocclusion on their child's OHRQoL [7]. In addition to the direct impact of malocclusion on adolescents' OHRQoL, the indirect impact through parental influence should be noted.

Orthodontic treatment demand is a self-assessment measure describing one's desire for orthodontic treatment, and similar to the OHRQoL and parental perception of their child's treatment need, it does not correspond to malocclusion severity [8,9]. The most significant predictor of both OHRQoL and orthodontic treatment demand is dissatisfaction with smile appearance, often related to a malocclusion in the anterior segment [5,8].

The indirect effects of malocclusion on adolescents' OHRQoL have not yet been sufficiently investigated since they have only been conceptualized as per the biopsychosocial model and are, theoretically, a function of various experiences [10]. In psychology, a mediator is a characteristic of an individual or group (such as personality, cohesiveness, norms, etc.) that somehow changes the predictor variable, thereby influencing the outcome [11]. Conversely, a moderator is an independent variable that influences the direction and/or strength of the relationship between a predictor and criterion [12].

It has been observed that socioeconomic position acts both as a mediator and a moderator of the association between malocclusion and OHRQoL. The association between malocclusion and OHRQoL is weaker among adolescents from disadvantaged families, perhaps due to lower health literacy and a smaller number of dental visits [13]. Social reinforcement of dental aesthetics from parents, peers and mass media predicts the psychosocial dimension of OHRQoL and is partially mediated through social comparisons of one's dental appearance [14]. To date, no study has investigated the simultaneous contribution of both parents' and adolescents' self-assessments to adolescents' perceptions of OHRQoL. Therefore, this study aimed to investigate whether the relationship between adolescents' malocclusion and OHRQoL is mediated by satisfaction with their smile appearance, parental perception of their child's orthodontic treatment need, and/or adolescents' orthodontic treatment demand. We hypothesized that malocclusion causes dissatisfaction with smile appearance in adolescents and influences parental attitudes towards their child's orthodontic treatment need. Furthermore, we hypothesized that both adolescents' subjective dissatisfaction with smile aesthetics and parental attitude increase the adolescents' desire for orthodontic treatment and consequently contributes to poorer OHRQoL among adolescents.

Methods

Design and participants

This cross-sectional analytic study was conducted from 2016 to 2018 at the Department of Orthodontics, University Dental Clinic. A convenience sample of 237 young adolescents 11–14 years of age and their parents was recruited, of which 215 were analysed (53% females). Adolescents were consecutive patients referred by their dentists for orthodontic consultation or treatment. The inclusion criteria were adolescents without chronic diseases or conditions and with Croatian as their native language. As this was a cross-sectional study of a specific and not a general population, a control group of younger adolescents who did not seek orthodontic treatment was not used. Both sexes and all four age categories were equally distributed in the sample. More than 85% of adolescents were accompanied by their mothers.

The sample size required to test the indirect effects of malocclusion on OHRQoL was determined assuming a minimum correlation coefficient of 0.20, $\alpha < 0.01$, and power $> 90\%$ [15]. A minimum sample size of 211 was obtained. Oversampling was performed to compensate for any incomplete questionnaires and ratings.

Written consent was obtained from each parent before inclusion in the study. Parental consent was superseded by the child's consent. Adolescents aged 12 years and older also provided written consent. This study was approved by the local ethics committee (No. 2170-24-01-15-2).

Measures

OHRQoL in adolescents was measured by eight-item short forms of the Child Perceptions Questionnaire: Regression Short Form (RSF:8) and Item Short Form (ISF:8) [16,17]. Both the RSF:8 and ISF:8 measure the negative effects that orofacial conditions may have on a child's well-being, everyday life, and activities. The questionnaire consists of eight Likert-scale items that are close-ended, with higher scores indicating poorer OHRQoL. Responses are rated from 0 (never) to 4 (every day/almost every day), with a summary score ranging from 0 to 32. The eight-item CPQ is unidimensional, unlike the longer versions (16 and 37 items), with excellent validity and efficient administration [18].

Adolescents were asked to rate their satisfaction with smile appearance ('Are you satisfied with the look of your smile?') and orthodontic treatment demand ('Do you want treatment to correct your teeth position or appearance?') on a Likert scale, ranging from 0 (not at all) to 4 (very much). Parental perception of their child's orthodontic treatment needs was also recorded ('Do you think your child needs treatment to correct his/her teeth position or appearance?') on a Likert scale, ranging from 0 (not at all) to 4 (very much).

Malocclusion severity was assessed using the Index of Orthodontic Treatment Need – Dental Health Component (IOTN DHC) by two calibrated orthodontic specialists (SS being one) [19]. The weighted Cohen's kappa for intra-rater reliability was 0.838 – 0.958 for inter-rater 0.671 (95% confidence interval 0.469 – 0.873; $p < .005$) [16]. Malocclusion severity was later re-coded as a dichotomous variable in objective treatment need, as per previous research, with a cut-off point of 4, where IOTN DHC grades of 4 and 5 indicate a great objective need for orthodontic treatment [9].

Procedure

The questionnaires were self-administered before clinical examination and included demographic data (age and sex), self-perceived orthodontic treatment demand and satisfaction with smile appearance, RSF:8, and ISF:8. Adolescents were instructed to provide one answer for each item. After the adolescents completed the questionnaire, parents' perception of their child's orthodontic treatment need was noted. During the clinical examination, two orthodontists (SS being one) independently determined the malocclusion severity according to the IOTN DHC.

Data analysis

Spearman's correlation coefficients and multiple linear regression were used to test the mediation models. Mediation analysis was conducted as previously described in the literature [11,12,20]. The effects of the models are presented using their unstandardized values (B), standard errors (SE) and bias-corrected confidence intervals (CIs). Indirect effects were analysed in two serial mediation models: objective treatment need $\rightarrow$ satisfaction with smile appearance $\rightarrow$

parental perception of the child's orthodontic treatment need → adolescent's orthodontic treatment demand → OHRQoL assessed first by ISF:8 and then by RSF:8 (Figure 1). In addition to the total indirect effect (unstandardized regression coefficient B), the mediation effect size was reported by mediation index and calculated as the product of the total indirect effect and the standard deviation ratio of predictors and outcomes: Mediation index = $B_{MX} * B_{YM} * SD_X / SD_Y$, where B_{MX} is regression coefficient of predictor (X) → mediator (M) path, and B_{YM} is regression coefficient of mediator (M) → outcome (Y) path. Values of the mediation index from 0.01 (0.02 if the predictor is a dichotomous variable) to 0.09 indicate a small mediation effect, from 0.09 to 0.25 a moderate mediation effect, and for ≥ 0.25 a large mediation effect [20].

Statistical analysis was performed using the commercial statistical software IBM SPSS Statistics for Windows version 22.0 (IBM Corp, Armonk, NY). Serial mediation models were analysed using SPSS macro Process (Model 6).

Results

Internal consistency of the unidimensional eight-item CPQ was acceptable, though somewhat higher for the ISF:8 version with Cronbach's alpha = 0.81, compared to $\alpha = 0.76$ for the RSF:8 version. The prevalence of objective treatment need was 70% ($n = 151$), while 42% of the participants did not want orthodontic treatment or wanted it to a very small extent. The average values of the collected data are presented in Table 1. The highest correlations were observed between satisfaction with smile appearance and RSF:8 ($r = -0.473$), ISF:8 ($r = -0.450$), treatment demand ($r = -0.416$)

and objective treatment need ($r = -0.408$; all $p < .001$). The associations among the observed variables are presented in Table 2.

No significant difference was noted between males and females; they had similar levels of participation in the study (47% and 53%, respectively), malocclusion severity (69% and 72%, respectively) and treatment demand (54% and 62%, respectively). Somewhat higher correlations were noted between satisfaction with smile appearance and objective treatment need, treatment demand and OHRQoL for males when compared to females.

In the linear regression analysis, objective treatment need explained 4.3% of the ISF:8 variance and 3.4% of the RSF:8 variance ($\beta = 0.218$ and 0.197 , respectively; both $p < .005$). In the mediation models, objective treatment need was a significant predictor of all three mediators (a lines), but only satisfaction with smile appearance and treatment demand (b1 and b3 lines) contributed to OHRQoL, whereas parental attitude (b2 line) was insignificant. In both the RSF:8 and ISF:8 models, the contribution of objective treatment needs to OHRQoL in the presence of mediators (c' line) was insignificant, affirming a complete mediation (Figures 2 and 3). Serial mediation models significantly increased the proportion of OHRQoL variance explained: 23.1% in the ISF:8 and 25.1% in the RSF:8 model.

The total effect of the predictor and mediators was 2.501 ($p = .001$) for ISF:8 and 1.849 ($p = .003$) for RSF:8. The ratio of the total indirect effect (all three mediators) to the total effect in the RSF:8 model was 1.049. Hence, the mediation was so strong in the RSF:8 model that the direct effect was not only diminished, but changed its direction (negative regression coefficient of c' line) in the presence of mediators.

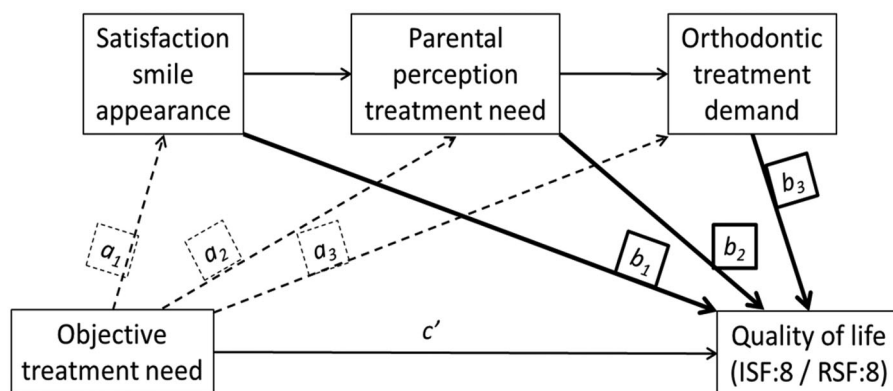


Figure 1. Serial mediation models: a lines represent the contribution of objective treatment need on three possible mediators, b lines represent the contribution of each mediator to OHRQoL and c' line is the effect of the predictor (objective treatment need) on the outcome (OHRQoL) when mediators are accounted for. The assumptions were that objective treatment need contributes to all three mediators (a lines), there is a serial relationship between mediators, all mediators contribute significantly to OHRQoL (b lines), and the direct effect of objective treatment need will become insignificant in the presence of mediators (c' line).

Table 1. Objective treatment need, satisfaction with smile appearance, orthodontic treatment demand, parental perception of their child's orthodontic treatment need and self-perceived OHRQoL assessed by ISF:8 and RSF:8 for the entire sample.

Variable	Statistics
Objective treatment need (IOTN DHC 4 and 5), <i>N</i> (%)	151 (70)
Satisfaction smile appearance (0–4), median (interquartile range, IQR)	2 (2–3)
Orthodontic treatment demand (0–4), median (IQR)	3 (2–4)
Parental perception treatment need (0–4), median (IQR)	3 (2–4)
RSF:8, mean (standard deviation SD)	4.8 (4.3)
ISF:8, mean (SD)	7.2 (5.3)

Table 2. Associations among observed variables assessed by Spearman correlation coefficient.

	Gender (male = 0)	Objective treatment need (IOTN DHC 4, 5)	Satisfaction smile appearance (0–4)	Orthodontic treatment demand (0–4)	Parental perception treatment need (0–4)	ISF:8	RSF:8
Age (11–14 years)	0.040	–0.022	–0.121	0.006	–0.115	–0.025	0.044
Gender (male=0)		0.033	–0.069	0.044	–0.233**	0.083	0.009
Objective treatment need (IOTN DHC 4, 5)			–0.408**	0.284**	0.148*	0.265**	0.249**
Satisfaction smile appearance (0–4)				–0.416**	–0.341**	–0.450**	–0.473**
Orthodontic treatment demand (0–4)					0.316**	0.316**	0.358**
Parental perception treatment need (0–4)						0.226**	0.211*

** $p \leq .001$; * $.001 < p \leq .01$.

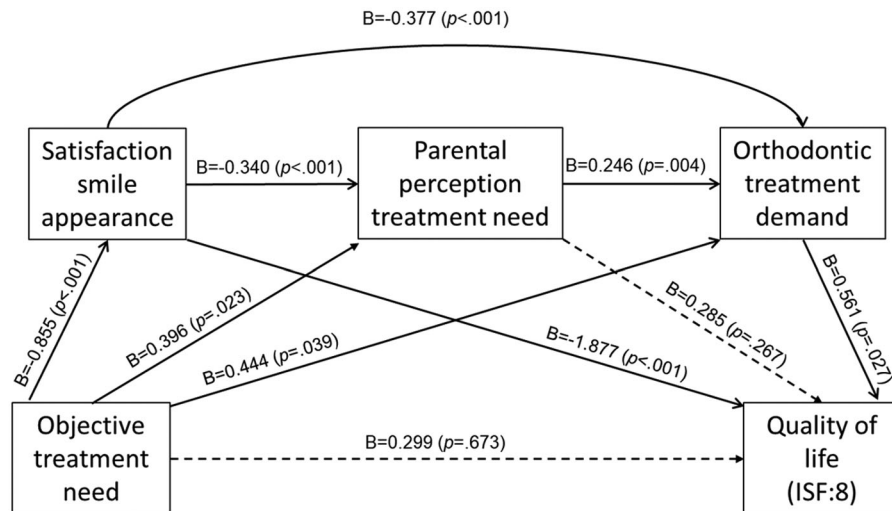


Figure 2. Serial mediation of adolescents' satisfaction with smile appearance (0–4), parental perception of treatment need (0–4) and adolescent's orthodontic treatment demand (0–4) on the relationship between objective treatment need (IOTN DHC 4 and 5) and OHRQoL as assessed by ISF:8 (full lines demonstrate a statistically significant influence or contribution while interrupted lines demonstrate an insignificant contribution). Higher unstandardized B coefficients represent a higher contribution while a negative sign indicates an inversely proportional relationship.

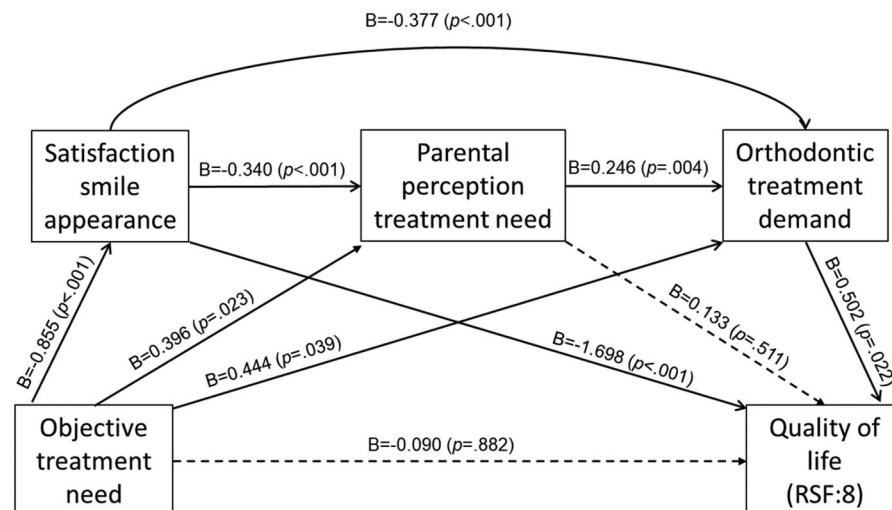


Figure 3. Serial mediation of satisfaction (0–4), parental perception (0–4) and treatment demand (0–4) on the relationship between objective treatment need (IOTN DHC 4 and 5) and OHRQoL as assessed by RSF:8 (full lines demonstrate a statistically significant influence or contribution while interrupted lines demonstrate an insignificant contribution). Higher unstandardized B coefficients represent a higher contribution while a negative sign indicates an inversely proportional relationship.

Table 3. Effects of the serial mediation model for the relationship of objective treatment need and OHRQoL assessed by ISF:8 and RSF:8.

	ISF:8			RSF:8		
	Effect (standard error)	Bias-corrected confidence interval	R ²	Effect (standard error)	Bias-corrected confidence interval	R ²
Total effect	2.501 (0.736)	1.050 – 3.952	0.231	1.849 (0.617)	0.632 – 3.065	0.251
Direct effect	0.299 (0.708)	–1.096 – 1.694	0.047	–0.090 (0.615)	–1.281 – 1.101	0.039
Total indirect effect	2.202 (0.462)	1.411 – 3.245	0.184	1.939 (0.395)	1.262 – 2.826	0.212
Moderation effect size		0.192 (0.128 – 0.263)			0.207 (0.139 – 0.285)	

Moderation effect size presented as mediation index = $B_{MX} * B_{YM} * SD_X / SD_Y$.

Table 4. Contribution of each mediator in a serial mediation model of objective treatment need and OHRQoL assessed by ISF:8 and RSF:8.

	ISF:8			RSF:8		
	Effect (bias-corrected confidence interval)	Ratio to total indirect effect	Ratio to total effect	Effect (bias-corrected confidence interval)	Ratio to total indirect effect	Ratio to total effect
M1	1.605 (0.903 – 2.552)	0.729	0.642	1.453 (0.845 – 2.273)	0.764	0.786
M2	0.030 (–0.042 – 0.279)	0.014	0.012	0.014 (–0.036 – 0.194)	0.007	0.008
M3	0.249 (0.014 – 0.743)	0.113	0.099	0.222 (0.023 – 0.638)	0.115	0.120
M1→M3	0.181 (0.041 – 0.452)	0.082	0.072	0.162 (0.040 – 0.389)	0.084	0.088

M1 Satisfaction smile appearance, M2 Parental perception treatment need, M3 Orthodontic treatment demand.

In addition to significant indirect and non-significant direct effects, the SE values of the direct effect and the total effect were almost twice those of the mediation effect in both the ISF:8 and RSF:8 models, confirming the significance of the mediators. The mediation effect sizes were moderate to high and somewhat greater in the RSF:8 model (Table 3).

The indirect effect was strongest through satisfaction with smile appearance mediation: 1.605 for ISF:8 and 1.453 for RSF:8. Serial mediation through satisfaction with smile appearance and treatment demand had the strongest effect on OHRQoL: the ratio to total effect was 0.814 for ISF:8 and 0.994 for RSF:8. By adding parental perception of their child's treatment need in the serial mediation models, the total effect and total variance explained remained the same for both ISF:8 and RSF:8 (Table 4).

In boys, objective treatment need explained 8.4% of ISF:8 variance and 6.9% of RSF:8 variance ($\beta = 0.305$ and 0.279 ; $p = 0.002$ and 0.004 , respectively). In girls, objective treatment need explained 1.8% of both ISF:8 and RSF:8 variances ($\beta = 0.164$ and 0.165 ; $p = 0.082$ and 0.081 , respectively). No mediation analysis was performed because there was no indication of significant differences in adolescents' perception of treatment demand or OHRQoL or in the parental influence on their opinion and desire. Furthermore, our sample size was too small to test the mediation effect on each gender separately (minimum sample size was determined to be 211, assuming a minimum correlation coefficient of 0.20, $\alpha < 0.01$, and power $> 90\%$).

Discussion

Serial mediation models through satisfaction with smile appearance, parental perception of their child's orthodontic treatment need, and orthodontic treatment demand explained a proportion of variance that was over five times greater than the proportion accounted for by objective orthodontic treatment need. In addition, in serial mediation models, the contribution of malocclusion severity was not significant, suggesting a complete mediation of moderate to high effect size. A ratio of indirect to total effect greater than

one might be observed for (strong) competitive mediation models, where the direction of mediation is opposite to the direction of the direct effect. In this study, objective treatment need increased the summary score of the OHRQoL instruments however, this effect was indirect, through a decrease in satisfaction with smile appearance when using the RSF:8 model. Hence, the impact of malocclusion on adolescents' OHRQoL is a consequence of their satisfaction with their smile appearance. Aesthetic appearance plays an important role in the self-concept and development of self-esteem in young adolescents [21]. Upon entering puberty, in early adolescence, children become more attentive to differences, primarily physical, between themselves and the group of peers they are surrounded by, resulting in feelings of superiority or inferiority [18]. Adaptation to the environment and social interactions are very important in adolescence. Impaired facial aesthetics due to malocclusion can lead to feelings of shame, discomfort, and concern; diminished social activities; and generally impair adolescents' self-esteem. Dissatisfaction with smile appearance has proven to be the most significant predictor of low self-esteem among young adolescents 11–14 years of age [22,23]. At the same time, low self-esteem had a 2.5 times greater impact on OHRQoL than did malocclusion severity. Adolescents who feel more comfortable in their own skin and have more self-esteem and better psycho-emotional well-being report a better OHRQoL regardless of the malocclusion severity [24]. Accordingly, self-esteem and satisfaction with smile appearance could be considered major determinants of the OHRQoL in young adolescents. However, it may be difficult to assess young adolescents' self-esteem. Adolescents might describe their self-esteem as very high to avoid coping with feelings of shame or discomfort and to feel more confident and empowered in their own eyes. In addition, self-esteem is highly prone to fluctuations and dependent on self-worth conditions and the perceived relevance of events [25]. Although the impact of malocclusion on adolescents' OHRQoL is related to self-esteem and given the previously mentioned factors that make it difficult to assess adolescents' self-esteem in everyday clinical orthodontic practice, using

self-reported satisfaction with a smile appearance may be the best option. Previous research, similar to our results, suggests that although malocclusion severity does not have a direct impact on OHRQoL, it often proportionally corresponds to self-reported satisfaction with smile appearance; the more severe the malocclusion, the lower the satisfaction with smile appearance [26].

Parental attitudes about their child's orthodontic treatment need did not affect adolescents' perception of OHRQoL. In general, the association between parents and adolescents' self-reports of malocclusion and its impact have rarely been studied [27]. Significant psychological and emotional development and changes during puberty are often accompanied with a challenging parent-child relationship. Parental perception may correspond more closely to adolescents' perceptions at a later stage of life or post-puberty, when children are more inclined to express their thoughts and feelings. Considering that significant parent-child matching has been observed in assessing OHRQoL in chronically ill children [28], a more significant influence of parental attitude might be expected in adolescents who are more attached to their parents. Although mothers often spend more time with their children and children might be more willing to share their experiences and feelings with their mothers, both mothers and fathers were equally (un)aware of the impact of malocclusion on their child's OHRQoL [29]. However, some authors emphasize the importance of assessing parental perception when investigating young adolescents' OHRQoL for two reasons. First, adolescents may have difficulty understanding emotions that require a higher degree of cognitive development and, therefore, may be unreliable in reporting the impact of malocclusion on their OHRQoL [30]. Parents are involved to some extent in their children's lives, so they can notice the difficulties their children may encounter in everyday life and activities due to malocclusion. Second, parents decide to seek orthodontic treatment and approve the proposed treatment plan. Hence, their attitudes towards orthodontic treatment may influence their child's motivation. Our study demonstrated that even though parental perception of their child's treatment needs did not necessarily worsen the child's perception of OHRQoL, it did still significantly amplify the child's desire for treatment and indirectly lead to reporting lower OHRQoL.

Few studies have investigated the contribution of parental attitude about their child's orthodontic treatment need on the adolescents' treatment demand, and parental perception was revealed as the most significant predictor for the development of desire for orthodontic treatment in young adolescents [31,32]. Parents usually have a higher motivation and desire for their child's orthodontic treatment than the adolescents themselves [33,34]; however, the self-assessed orthodontic treatment need of parents and adolescents were found to be congruent [35]. Parental approval was found to be important for the development of self-esteem, and a sense of importance in the family was the most significant predictor of adolescents' psychological well-being [36]. The importance of parental attitudes in adolescents' orthodontic treatment demands was a crucial finding of this study.

Adolescents who had a greater desire for treatment were more satisfied with the treatment itself and their appearance upon completion of treatment [37,38]. A higher treatment demand might lead to greater motivation and cooperation during treatment, assuming greater patient satisfaction with the treatment results. Therefore, the findings from this research are valuable for a better understanding of orthodontic problems, as perceived by patients and their parents.

The unidimensional eight-item Child Perceptions Questionnaire for assessing young adolescents' OHRQoL has not been previously used in our country. Reliability in terms of internal consistency was similar to the originals, with the short form being somewhat more reliable [16,17]. Besides the obvious advantage of taking less time to complete the short forms and therefore, their easier implementation in clinical practice, the current literature points to greater structural validity when compared to the longer versions [16,17]. An international study conducted on more than six thousand adolescents revealed that by removing only two items from the 16-item Child Perceptions Questionnaire, a one-factor structure was gained, and unidimensionality of the concept of OHRQoL was accomplished [39].

Limitations and implications

A limitation of this study was that we did not measure the contribution of socioeconomic status to adolescents' perception of their OHRQoL. Previous research reported contradictory findings regarding the socioeconomic status of participants [32,40]. In addition, we did not assess the participants' dental health status (such as caries experience) or self-esteem.

In addition, the long-term impact of orthodontic treatment on the OHRQoL of young adolescents has not been sufficiently investigated. Self-esteem and psychological well-being (considered the primary reasons for seeking treatment and the main indicators of treatment success in adolescents) did not differ between people with untreated malocclusion and those who completed treatment 20 years ago [41]. Another cohort study found poorer psychosocial outcomes among orthodontically treated participants than among untreated participants after 17 years [42]. Orthodontic treatment improves appearance, which in some cases could result in an improvement in OHRQoL, but does not necessarily imply an improvement in overall quality of life, psychological well-being and self-esteem [43]. These results confirm the assumption that self-assessment measures (OHRQoL, satisfaction with smile appearance, orthodontic treatment demand and attitude about the need for treatment) are complex, multidimensional and dynamic constructs, which further emphasizes the need for serial mediation models in research.

This is the first study to investigate the indirect effects of malocclusion on adolescents' perception of their OHRQoL using a serial mediation model with both parents' and adolescents' self-assessments. Approximately 90% of the total malocclusion effect on OHRQoL was mediated by satisfaction with smile appearance. A malocclusion need to be severe to significantly diminish a young adolescent's satisfaction with

smile appearance, leading to the development of negative emotions, such as shame, irritation, frustration, a sense of social exclusion and rejection, ultimately disturbing adolescents' OHRQoL to a significant extent. The patient's perspective is important in orthodontic treatment planning, cooperation during treatment, and satisfaction with treatment outcome, as it helps clinicians better understand patients' needs and improve patients' OHRQoL, not only correct their malocclusion. Further research into the complex world of patients' and parents' perspectives is necessary in the future.

Conclusion

Satisfaction with smile appearance predominantly mediates OHRQoL in adolescents. Parents have no direct influence on their child's perception of OHRQoL, but their positive perception of orthodontic treatment and the need to correct their child's malocclusion might amplify the adolescent's desire for orthodontic treatment, all leading to a lower OHRQoL.

Disclosure statement

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