








Self-perceived oral health and happiness - a cross-sectional study in a cohort of university students

Mariana Gonzalez Cademartori^{1*} , Sarah Arangurem Karam¹ , Luiz Alexandre Chisini¹ , Kauê Farias Collares¹ , Marina Sousa Azevedo¹ , Flávio Fernando Demarco¹ , Marcos Britto Correa¹ 

¹ Graduate Program in Dentistry, School of Dentistry, Federal University of Pelotas, Pelotas, RS, Brazil.

Corresponding author:

Mariana Gonzalez Cademartori.
Graduate Program in Dentistry,
School of Dentistry, Federal
University of Pelotas, Pelotas,
RS, Brazil.
E-mail: marianacademartori@gmail.com

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In recent years, studies investigating psychological states such as happiness in individuals' health have increased.

Aim: This study investigated a possible association between self-perceived oral health and happiness in university students. **Methods:** This cross-sectional study was performed in a cohort of university students who entered in the 2016 academic year at the Federal University of Pelotas, located in southern Brazil. Data were collected using a self-administered questionnaire, including demographic and socioeconomic characteristics, psychosocial traits, and oral health-related questions. Happiness was measured through a question accompanied by the Faces Scale of Andrews and Whitey. Poisson regression models with robust variance were used to assess the association between the exposure variables (oral health measures) and the outcome (happiness). **Results:** The prevalence of happiness was 48.6%. A significant association between happiness and oral health, including satisfaction with dental appearance (PR 1.86; 95% CI 1.73-2.01), oral health-related to quality of life (PR 1.19; 95% CI 1.09-1.31), and halitosis (PR 1.10; 95% CI 1.01-1.20), was found.

Conclusion: Individuals who reported dissatisfaction with dental appearance, an impact on oral health-related to quality of life, and halitosis perceived themselves as unhappy.

Keywords: Oral health. Happiness. Self concept. Quality of life.



Introduction

Traditional assessments of health have historically focused on the negative aspects, such as the risk and impact of diseases¹⁻³. However, recent studies have prompted a paradigm shift in the conception of health, expanding the scope of oral health to include subjective elements like overall well-being and social dynamics in individuals' daily lives⁴⁻⁸. According to the World Health Organization, health is a state of complete physical, mental, and social well-being, not merely the absence of disease⁹. In this context, there is a growing emphasis on exploring psychological characteristics, such as happiness, in the literature related to individual health⁴⁻⁸.

Happiness is a subjective construct closely linked to well-being¹⁰. It can be defined as the degree to which individuals positively evaluate the overall quality of their lives¹⁰. Happiness is generally considered an intrinsic characteristic rather than a transient state of contentment¹¹. Moreover, this individual emotional state can be shaped by personal experiences, values, and priorities^{10,11}. In the context of oral health, the influence of oral health outcomes can impact individual happiness⁴⁻¹⁶. Medical students who receive regular dental care reported higher levels of happiness¹². On the other hand, adolescents with malocclusion were associated with less happiness and demonstrated a negative impact on the oral health-related quality of life¹³.

In recent years, there has been a growing interest in studying the psychological aspects of individual health, with a specific focus on happiness⁴⁻⁸. Most of these studies are conducted with samples of children/adolescents¹⁴⁻¹⁶ or older individuals^{17,18}. Therefore, the available literature lacks a comprehensive exploration of the relationship between self-perceived oral health and happiness, particularly in populations susceptible to high levels of stress and anxiety, such as university students⁸. University students are a vulnerable group, especially for mental health issues such as depression, anxiety, and stress⁸, which, in turn, could be significant predictors of students' happiness¹⁹.

While studies have started to address psychological well-being concerning oral health, there remains a significant gap in understanding how aspects like satisfaction with dental appearance, oral health-related quality of life, and oral health outcomes influence happiness levels among this specific group. Addressing these gaps is crucial for a more nuanced understanding of the relationship between oral health perceptions and overall happiness, particularly within the context of university life. Thus, the present study aimed to investigate a possible association between self-perceived oral health and happiness in university students. We hypothesized that happiness would also be associated with oral health outcomes and could impact students' oral health-related quality of life.

Materials and methods

The Strengthening the Reporting of Observational Studies in Epidemiology Strobe guidelines (STROBE) was adopted to report this study²⁰.

Study design and participants

This cross-sectional study was performed in a cohort of university students who entered in the 2016 academic year at the Federal University of Pelotas (UFPeL), located in Southern Brazil. Prior to data collection, all academic units were informed about the study and authorized its implementation. All entrants of the 2016 year were invited to participate and signed a consent form. Individuals who did not were able to self-answer the questionnaire or that did not ingress at the university in 2016 were not included in the final sample. Considering the estimated number of entrants in the first half of 2015 (3,000 students) and an unknown prevalence of 50% for the variables of interest, an accuracy in frequency estimation of 1.8 percentage points was achieved within a 95% confidence interval.

Data were collected using a self-administered questionnaire including demographic and socioeconomic characteristics, general habits and behaviors, and oral health questions. Trained postgraduate and undergraduate students applied the questionnaires in the classrooms before the beginning of lessons. Additional details about methodological issues are presented in previous studies²¹⁻²³.

Regarding the training process of interviewers, four hours of theoretical training was conducted, and the questionnaire's questions were discussed. A pilot study was carried out with 100 university students of second semester of graduate school, not eligible for the study, from five different academic units randomly selected. This study was approved by the Ethics Committee of the Faculty of Medicine (Protocol number 49449415.2.0000.5317).

Covariates included demographic and socioeconomic characteristics. Age of participants was collected in years. Skin color was self-reported by participants (categorized into White and Non-white). Family income was collected in Brazilian real (BRL) and classified in: a) \leq R\$1000; b) R\$1001 to R\$5000; and c) \geq R\$5001.

Signs and symptoms of depression were assessed using the Patient Health Questionnaire-2 (PHQ-2), an abbreviated version of the Patient Health Questionnaire Depression (PHQ-9). The PHQ-2 is composed of two questions about frequency of depressed mood over the past two weeks. A PHQ-2 score ranges from zero to six points. A cutoff score of three was adopted²⁴.

Self-perception about oral health, satisfaction with both dental appearance and dental color, oral health-related quality of life, oral health status (dental caries experience and gingival bleeding), halitosis, dysfunction temporomandibular and frequency of dental visits were the variables considered as exposure. Self-perception of oral health was collected by the question: "Comparing with people of your age, how do you see the health of your teeth, mouth and gums?" with the following response alternatives: a) good (very good /good) and b) Bad (regular/bad/very bad). To assess satisfaction with dental appearance, an affirmation was presented: "I do not like to see my teeth when I see myself in mirror, in photographs or in videos. Faced with this declaration, which alternative best fits your answer?" The response alternatives were dichotomized in yes (not agree) or no (I agree a little/I agree more, or less/I agree very much/I totally agree). Satisfaction with dental color was measured using the question: "Are you satisfied with the color of your teeth?" The

response alternatives were categorized in yes (very satisfied/satisfied) or no (very dissatisfied/dissatisfied).

Oral health-related quality of life (OHRQoL) was measured using the Brazilian version of Oral Impact on Daily Performance (OIDP), which is comprised by nine questions over physical, psychological, and social domains. All questions have a Likert scale of six points as following: a) never; b) less than once a month; c) once or twice a month; d) once or twice a week; e) 3-4 times per week; and f) all or almost every day. In order to verify presence of impact on OHRQoL, a cut-off point from overall score was adopted using mean score²⁵.

Oral health status was assessed using self-reported measures of dental caries experience and gingival bleeding. For dental caries experience, it was asked if the student had at least one decayed, filled or extracted teeth due to dental caries. Gingival bleeding was measured through the question: "Do your gum bleed when do you brush your teeth?" Answers were categorized as yes, or no. Self-reported halitosis was measured using a visual analogue scale. Participants were asked: "In a scale from zero to 10, being zero for no odor and 10 for extremely foul odor, mark how you feel your breath". Variable was dichotomized in no bad breath (from 0 to 2 scores) and bad breath (score 3 or more). Temporomandibular dysfunction (TMD) was measured using the Fonseca's anamnestic index (FAI), an instrument indicated to detect signs and symptoms of TMD in epidemiological surveys. It consists of 10 questions ranked in never (0 points), sometimes (5 points) and always (10 points). Final score is categorized according to TMD severity as no dysfunction, mild dysfunction, moderate dysfunction, or severe dysfunction²⁶. For the proposed analysis, response alternatives were dichotomized into no (no dysfunction category/ 0–15 points) or yes (mild dysfunction [20–40 points], moderate dysfunction [45–65 points], and severe dysfunction categories [70–100 points])²⁶.

Perception of happiness was measured using a question accompanied by the Faces' Scale of Andrews and Whitey. Participants were asked to point out the face that best expressed the way they felt about life. The Faces' Scale presents seven faces from happier to unhappier. Response alternatives were dichotomized into happiness (faces one and two – happiest faces) and unhappiness (faces from three to seven)²⁷.

Statistical analyses were performed using Stata 17.0 (Stata Corporation, College Station, TX, USA). For descriptive analysis, relatives and absolute frequencies were estimated with their respective confidence intervals. Crude and adjusted Poisson regression models with robust variance were used to assess the association between exposure variables (oral health measures) and the outcome (perception of happiness). Regarding the outcome, happiness was considered the reference category. This strategy allowed the estimation of Prevalence Ratios (PR) and 95% confidence intervals (CI). Exposure variables with P values of $\leq .20$ in the crude analyses were included in the model fitting. Sex, age, skin color, and family income were retained in the model fitting irrespective of p-value. A backward stepwise procedure was used to exclude explanatory variables in the model fitting. For the final model, the variables were considered significant if they had a p-value of ≤ 0.05 after adjustments.

Results

Of total eligible students identified (n=3,237), 2,089 students signed the consent term and participated of this study. Recuses represented only 1.4% of total students invited to participate. Students that did not found in the respective classes were considered as losses (34.6%). About 522 participants presented missing in variables of interest. For that reason, 1,567 students composed sample final of complete cases of this study. The participants were predominately females (52.1%), between 16 to 24 years (81.2%), white skin color (74.8%) and had family income ranging from 1,001 to 5,000 reais per month (61.5%). The prevalence of unhappiness was 51.4% (Table 1).

Table 1. Description of the sample according to included variables. Pelotas, Brazil. (complete cases n=1,567)

Variables/Categories	Total n (%)	Perception of Happiness		P-value
		Happiness	Unhappiness	
		n (%)	n (%)	
Gender				0.689
Male	728 (46.7)	367 (50.4)	361 (49.6)	
Female	830 (53.3)	410 (49.4)	420 (50.6)	
Age				0.027
16-24 years	1,239 (79.5)	598 (48.3)	641 (51.7)	
25-34 years	179 (11.5)	96 (53.6)	83 (46.4)	
35 years more	140 (9)	83 (59.3)	57 (40.7)	
Skin color				0.131
White	1,161 (74.5)	592 (51)	569 (49)	
Non-white	397 (25.5)	185 (46.6)	212 (53.4)	
Familiar income				0.249
≤1,000	248 (16)	116 (46.8)	132 (53.2)	
1,001-5,000	952 (61.1)	470 (49.4)	482 (50.6)	
>5,000	358 (22.9)	191 (53.4)	167 (46.6)	
Self-perception of oral health				<0.001
Good	1,109 (71.2)	594 (53.6)	515 (46.4)	
Poor	449 (28.8)	183 (40.8)	266 (59.2)	
Satisfaction with dental appearance	2,036			<0.001
Yes	792 (50.8)	446 (56.3)	346 (43.7)	
No	766 (49.2)	331 (43.2)	435 (56.8)	
Satisfaction with dental color				<0.001
Yes	929 (59.6)	521 (56.1)	408 (43.9)	
No	629 (40.4)	256 (40.7)	373 (59.3)	
Oral health-related to quality of life				<0.001
Without impact	366 (23.5)	226 (61.7)	140 (38.3)	
With impact	1,192 (76.5)	551 (46.2)	641 (53.8)	

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Signs and symptoms of depression			<0.001
No	1,310 (84.1)	747 (57)	563 (43)
Yes	148 (15.9)	30 (12.1)	218 (87.9)
Gingival bleeding			0.004
No	765 (49.1)	410 (53.6)	355 (46.4)
Yes	793 (50.9)	367 (46.3)	426 (53.7)
Halitosis self-reported			<0.001
No bad breath	893 (57.3)	490 (54.9)	403 (45.1)
Bad breath	665 (42.7)	287 (43.2)	378 (56.8)
Temporomandibular dysfunction			<0.001
No	981 (63)	523 (53.3)	458 (46.7)
Yes	577 (37)	254 (44)	323 (56)

More than half of students reported a positive perception related to their oral health (71.4%) and to their dental color (59.8%). In addition, the prevalence of impact of oral health-related quality of life was 41.8 percent. The prevalence of dental caries experience, gingival bleeding, and some degree of TMD were 68.2%, 50.8% and 50.2%, respectively. In addition, most of the students reported not present halitosis (58.1%). More details are described in Table 1.

Table 2 shows crude and adjusted analyses for independent variables and the perception of happiness. After adjustments for demographic, socioeconomic characteristics and depression, the association between oral health and the outcome remained. University students with impact on oral health-related quality of life (PR 1.24; 95%CI 1.08-1.42) reported a negative perception in relation to happiness. Moreover, unhappiness could be attributed to students with bad satisfaction about their dental appearance (PR 1.12; 95%CI 1.01-1.24) and about their dental color (PR 1.14; 95%CI 1.02-1.26), and those that reported have bad breath (PR 1.13; 1.02-1.23). Although a high prevalence of signs and symptoms of temporomandibular dysfunction has been observed, an association between this disorder and unhappiness has not been identified after adjustments (Table 2).

Table 2. Crude (°) and adjusted (ª) analyzes for independent variables and the perception of happiness of university students at UFPel, Pelotas, Brazil. Poisson regression model (analytical sample of complete cases n=1,558 individuals).

Variables/Categories	Perception of Happiness (Ref. Happiness)			
	PR ° (95% CI)	P value	PR ª (95% CI)	P value
Sex		0.585		0.471
Female	1.02 (0.94-1.11)		0.97 (0.88-1.06)	

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Continuation			
Age		0.008	0.070
25-34 years	0.91 (0.78-1.05)		0.93 (0.80-1.09)
35 years more	0.80 (0.67-0.95)		0.84 (0.69-1.03)
Skin color		0.051	0.218
Non-white	1.09 (0.99-1.20)		1.07 (0.97-1.18)
Familiar income		0.063	0.493
1,001-5,000	0.95 (0.84-1.07)		1.02 (0.90-1.16)
>5,000	0.86 (0.74-1.01)		0.96 (0.82-1.11)
Signs and symptoms of depression		<0.001	<0.001
Yes	2.03 (1.90-2.17)		1.88 (1.73-2.04)
Self-perception of oral health		<0.001	--
Poor	1.28 (1.17-1.39)		--
Satisfaction with dental appearance		<0.001	0.027
Poor	1.33 (1.22-1.45)		1.12 (1.01-1.24)
Satisfaction with dental color		<0.001	0.013
No	1.34 (1.23-1.45)		1.14 (1.02-1.26)
Oral health-related to quality of life		<0.001	0.002
With impact	1.38 (1.26-1.50)		1.24 (1.08-1.42)
Halitosis self-reported		<0.001	0.014
Bad breath	1.26 (1.16-1.37)		1.13 (1.02-1.23)
Temporomandibular dysfunction		<0.001	--
Yes	1.22 (1.12-1.33)		--
Gingival bleeding		0.093	--
Yes	1.16 (0.97-1.37)		--

PR: Prevalence Ratio. * Categories of Reference: Sex: Male; Age: 16-24 years; Skin color: White; Family income: ≤1,000 Brazilian Real; Perception of oral health=Yes; Satisfaction with dental appearance=Yes; Satisfaction with dental color=Yes; Depression=No; Oral health-related to quality of life=Without impact; Dental caries experience=No; Halitosis self-reported=No bad breath; Temporomandibular dysfunction=No; Gingival bleeding=No. -- Variables not included in the final model after adjustments.

Discussion

This study explored the potential relationship between oral health and perception of happiness in a community-based sample of university students in Brazil. Our

findings showed that a poor self-perception of dental appearance, impact on oral health-related quality of life and report of halitosis are associated with unhappiness.

In last years, psychological characteristics have been investigated as possible behavioral risk factor for oral health. University students are a vulnerable group for mental diseases, especially those in the health area who must cope with not only stressors common in higher education institutions but also anxiety towards clinical placements²⁸. Besides that, female gender, baseline depression and stress coping are among the predictors of depressive symptoms among college students⁸.

Mental health problems cause lack of motivation, emotional support, and academic overload²⁹. It is possible that these mental problems have a cumulative effect during school, since the levels of stress, anxiety and depression are lower in individuals in the initial semesters when compared to those in the more advanced semesters of the university¹⁹. Besides that, these mental health problems mentioned above are important predictors for students' happiness¹⁹.

Happiness has been associated with life satisfaction, positive affect and with health-related quality of life among university students, suggesting that is an important facet of the global well-being construct of the individual¹⁰. Happy people tend to have a healthy lifestyle. That is, higher levels of happiness have been associated with not smoking or drinking, healthy eating, daily physical activity, and hours of sleep³⁰. As well as physical health, oral health has also been linked to happiness. Happy individuals rate their gingival status as better than those do unhappy and tend to visit their clinician for check-perform³¹.

Subjective oral health indicators have being demonstrated as better predictors of happiness compared with objective ones³². Dental appearance can influence the judgment of other people in relation to personal individual characteristics. People with less dental disease tend to self-consider as more socially competent, to show higher intellectual achievement, and to have better psychologic adjustments³³. In this way, oral health would be considered as an important indicator of subjective happiness, i.e., those people who have a bad perception related their oral health, tend to feel less happy¹⁶. This fact is demonstrated by our finding, which showed that those university students that reported a poor perception of their dental appearance and who reported impact on their oral health-related quality of life feel unhappy, reinforcing the important role of oral health self-perceived measures as a feature of well-being.

Esthetic is a very important concept for general population, and it has been considered a key component of social interaction, especially in young individuals who want to be accepted into their social group. In dentistry, younger people are concerned about the alignment and color of the teeth³⁴. A positive self-perceived satisfaction of dental appearance has positive impact on person's social and psychological behavior and dental self-confidence among university students³⁴. On the other hand, poor dental aesthetics led to lower self-esteem, which reflects negatively in their social interactions³⁵. Moreover, social anxiety and need for social approval stand as obstacles to happiness³⁶, having an important impact on their academic performance³⁷.

Our study also observed that subjects who reported bad breath felt unhappy. Subjects who reported halitosis tend to present a decrease of interpersonal contact affecting their feeling of happiness³⁸. Unhappy people tend to report a lower frequency both of toothbrushing and dental check-ups frequency³². Poor oral hygiene is one of the main causes of halitosis, a malodor caused mainly by volatile sulfur compounds produced by bacterial degradation of mouth presenting a high prevalence worldwide³¹. This study showed that happiness may be affected by presence of halitosis, displaying a high ability of oral health outcomes influence the individual's happiness.

Our results however should be considered in the context of some limitations. First, the cross-sectional design hides causal inferences about the associations tested. In addition, a reverse association between happiness and self-perceived oral health is plausible, i.e. unhappy people may perceive themselves worse even if they do not have oral problems. This is another limitation of cross-sectional study. Although the instrument used to measure happiness has been a single question, it is known its validity and reliability, being indicated for population epidemiologic surveys³⁸.

Regardless of the limitations, it is important pointing out some strengths of our study. As aforementioned, this is the first study exploring a potential relationship between happiness and oral health in a community-based sample of university students on southern Brazil. This large and representative sample with a small number of refusals allows our results can be extrapolated for populations with similar characteristics. Yet, we opted for subjective health measure since it was considered as good indicators to predict perception of happiness, as has been demonstrated in previous studies¹⁶. Feeling happy itself does not depend exclusively of clinical measures of disease, once it has been observed that medical conditions affect happiness only for a relatively short period of time after diagnosis³⁹. For that, the way the individual perceives himself / herself should be considered as an indicator of risk for psychosocial problems.

In conclusion, this study showed an association between self-perceived oral health and happiness among university students. Individuals that reported a dissatisfaction with dental appearance, impact on oral health-related to quality of life, and reported halitosis perceived themselves as unhappy. In view of the importance of this psychosocial component on live of university students, this study encourages the implementation of easily accessible health services for university students, including the dental service, to minimize their impact on quality of life and self-perception of physical and mental health.

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Conflict of Interest

The authors have no conflict of interest to disclose.

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Author Contribution

All authors conceived the ideas. **Mariana Gonzalez Cademartori**: collected the data, analyzed the data, wrote de draft and the final version of the manuscript. **Sarah Arangurem Karam**: collected the data, wrote de draft and the final version of the manuscript. **Luiz Alexandre Chisini**: collected the data, wrote de draft and the final version of the manuscript. **Kauê Farias Collares**: collected the data, wrote de draft and the final version of the manuscript. **Marina Sousa Azevedo**: managed the fieldwork and analyzed the data. **Flávio Fernando Demarco**: managed the fieldwork. **Marcos Britto Corrêa**: managed the fieldwork and analyzed the data. All authors reviewed and approved the final version of the manuscript.

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