

## Relationship among oral habits, orofacial function and oral health-related quality of life in children

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**Abstract:** The objective was to evaluate the relationship among oral habits, oral function and oral health-related quality of life (OHRQoL) in children. Three hundred and twenty-eight subjects (8–14 years old) were assessed for orofacial function using the Brazilian version of the Nordic Orofacial Test-Screening (NOT-S). OHRQoL was assessed using the Child Perceptions Questionnaires (Brazilian versions) for the 8–10 (CPQ<sub>8-10</sub>) and 11–14 (CPQ<sub>11-14</sub>) year age groups. The subjects were distributed into a Habit group and a Habit-free group according to domain III (Habits) of the NOT-S. Oral habits were present in 71.3% of the sample ( $p = .0001$ ), with a higher prevalence in females (62.8%,  $p = .001$ ). The NOT-S, CPQ<sub>8-10</sub> and CPQ<sub>11-14</sub> scores were higher in the Habit group ( $P = .0001$ ,  $P = .009$  and  $p = .001$ , respectively). Domain I (Sensory Function) was significantly more affected in Habit group subjects ( $p = .001$ ). The NOT-S scores were positively correlated with the CPQ<sub>8-10</sub> and CPQ<sub>11-14</sub> scores only in the Habit group ( $r = .32$ ,  $p = .0003$  and  $r = .30$ ,  $p = .001$ , respectively). These results indicate that oral habits can impact OHRQoL. Moreover, orofacial dysfunctions were associated with worse OHRQoL in subjects with oral habits.

**Descriptors:** Disability Evaluation; Habits; Oral Health; Quality of Life.

### Introduction

The World Health Organization (WHO) defines health as a state of complete physical, social and mental well-being and defines quality of life (QoL) as the individual's perception of their position in life in the context of the culture and value system where they live and in relation to their goals, expectations, standards, and concerns.<sup>1</sup> Thus, health influences QoL. Oral health is an important part of general health and well-being and is more important for the general health of those with oral or craniofacial problems.<sup>2</sup> Over the past two decades, traditional methods of measuring oral health, which mainly use clinical dental indices and focus only on the absence or presence of oral diseases,<sup>3</sup> have been substituted for a multidimensional concept that includes the psychosocial aspects of oral health<sup>4</sup> and their influence on oral health-related quality of life (OHRQoL).

Instruments for OHRQoL measurement have been developed to assess the physical and psycho-social impact of oral health, to quantify the

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extent to which dental and oral disorders interfere with daily life and well-being<sup>5</sup> and to assess both the needs for and outcomes of clinical and psychosocial interventions from the perspective of the individual concerned.<sup>6</sup> These instruments have the potential to improve the quality of clinical and psychosocial care.<sup>7</sup>

Orofacial function includes vital actions (e.g., breathing, chewing and swallowing) and muscle posture (e.g., mouth and tongue posture)<sup>8</sup> and forms the basis for social interaction in terms of speech, emotional communication, facial expression and appearance.<sup>9</sup> Orofacial dysfunctions can compromise well-being and OHRQoL from childhood.<sup>10</sup> There is evidence of the importance of comprehending the individual and ambient factors that influence the relationship between orofacial function and health/QoL. Children are affected by numerous oral and orofacial disorders (e.g., dental caries, malocclusion, cleft lip and palate), all of which have the potential to compromise functioning, well-being and OHRQoL.<sup>10</sup>

Orofacial dysfunctions also include the presence of oral habits,<sup>10</sup> which are the main functional factors that influence the development of malocclusion. Sucking habits or nail biting, mouth breathing and alterations of swallowing are the most common.<sup>11</sup>

The present study aimed to evaluate the influence of oral habits on orofacial functions and OHRQoL in children. An additional aim was to verify if there were associations between orofacial dysfunctions and OHRQoL in groups with and without oral habits.

## Methodology

### Sample

This project was approved by the Ethics Committee in Research of Piracicaba Dental School, University of Campinas (CEP-FOP; protocol number 009/2008). Four public schools in Piracicaba, SP, Brazil, were selected by lottery. A meeting was scheduled with parents/guardians to explain the study aims and methods to be applied and to distribute consent forms. During this period, a total of 550 consent forms were distributed, and 333 were returned with the respective parent/guardian autho-

rizations. The exclusion criteria were as follows:

- presence of systemic and/or mental developmental disorders as reported by teachers and coordinators of school and
- non-collaboration with the examinations and fulfillment of the OHRQoL questionnaire, which is self-applied (Child Perceptions Questionnaires, CPQ).<sup>12,13</sup>

The final sample was composed of 328 children, 8 to 14 years old (mean age:  $1.5 \pm 1.7$  years), including 197 girls (60.1%) and 131 boys (39.9%). The age range was established according to the CPQ ages, 8–10 and 11–14 years old, as detailed below. Five children out of 333 were excluded because they did not complete the CPQ.

The assessments were carried out on two week days during the 2009 academic year. During the first assessment, orofacial function was evaluated, and during the second assessment, the questionnaires were applied.

### Orofacial functions

Orofacial functions were evaluated using the Nordic Orofacial Test-Screening (NOT-S) protocol,<sup>11</sup> translated and culturally adapted to Brazilian Portuguese.<sup>14</sup> This protocol consists of a structured interview and a clinical examination. Each part has six domains. In the interview, the following functions are assessed:

- (I) sensory function,
- (II) breathing,
- (III) habits,
- (IV) chewing and swallowing,
- (V) drooling and
- (IV) dryness of the mouth.

In the examination, the following functions are assessed:

- (1) face at rest,
- (2) nose breathing,
- (3) facial expression,
- (4) masticatory muscle and jaw function,
- (5) oral motor function and
- (6) speech.

Each domain contains one to five items, reflecting the complexity of the specific function.

NOT-S was applied individually (MSL). The NOT-S interview was performed by asking questions on the screening form, for example, in item I “Sensory function,” one question is “Does brushing your teeth elicit a gag reflex?” To assess orofacial dysfunctions in the clinical examination, the subjects were requested to conduct tasks related to items 1–6 and an illustrated manual, which contained pictures of the tasks, was used. An answer of “yes” or a task that met the criteria for impaired function resulted in a score of 1, indicating a dysfunction in the scored domain. An answer of “no” or a task that did not meet the criteria resulted in a score of zero. The total score was the sum of the score for each domain, ranging from 0 to 12. For more details, please consult <http://mun-h-center.se/en/Mun-H-Center/Mun-H-Center-E/NOT-S/>.

The subjects were included in the Habit group if they answered yes to at least one of the three questions in domain III of the NOT-S and in the Habit-free group if they answered no to all questions in this domain. The types of oral habits asked about and recorded were:

- nail biting,
- lip biting or sucking,
- thumb or finger sucking,
- pacifier sucking,
- bottle sucking,
- cheek biting,
- tooth grinding,
- tongue biting and
- pencil and pen biting.

### Oral health-related quality of life (OHRQoL)

The OHRQoL was evaluated using the CPQ,<sup>12,13</sup> validated for Brazilian children,<sup>15</sup> which takes into account the cognitive abilities and lifestyles in an age range from 8 to 10 years (CPQ<sub>8–10</sub>) and from 11 to 14 years (CPQ<sub>11–14</sub>). The instrument assesses the perceptions of the impact of oral disorders on physical and psychosocial functioning. The CPQ items are distributed into four domains:

- oral symptoms,

- functional limitations (e.g., difficulties with chewing),
- emotional well-being and
- social well-being.

A Likert-type scale was used with the response options of

- never = 0,
- once or twice = 1,
- sometimes = 2,
- often = 3, and
- very often = 4.

A high score indicated more negative impacts on OHRQoL. The CPQ<sub>8–10</sub> is composed of 29 questions and the CPQ<sub>11–14</sub> of 41. The minimum possible score is zero, and the maximum possible score is 116 for the CPQ<sub>8–10</sub> and 164 for the CPQ<sub>11–14</sub>.

All children completed the age-specific CPQ by themselves. First, the researchers read the instructions, and the children were requested to inquire if they had any questions.

### Statistical analysis

Data analysis was performed using SPSS 9.0 software (SPSS, Chicago, USA) with a 5% significance level. Normality was assessed using the Kolmogorov-Smirnov test. Because score distributions were asymmetrical, non-parametrical tests were used. Descriptive statistics were followed by bivariate analyses, chi-squared and Fisher’s exact tests for a comparison of proportions (number of individuals and gender) and the Mann-Whitney test for a comparison of the means of the continuous variables (age, NOT-S and CPQ scores). Differences in the means of the NOT-S and CPQ scores according to different types of oral habits were evaluated using the Kruskal-Wallis test. Spearman’s correlation test was used to evaluate the correlation between the NOT-S and both CPQ scores for each clinical group (Habit and Habit free).

### Results

The sample characteristics are shown in Table 1. The majority of the subjects (71.3%,  $p < .0001$ ) presented at least one oral habit and were included in the Habit group. Females were more frequent in the

**Table 1** - Descriptive data of the analyzed variables according to the clinical groups.

	Habit	Habit free	<i>p</i> <sup>c</sup>	
Number (%) <sup>a</sup>	234 (71.3)	94 (28.7)	< .001	
Mean age (SD) <sup>b</sup>	1.6 (1.7)	1.0 (1.7)	.19	
Gender [n (%)]				
Boy	87 (37.2)	44 (46.8)	-	
Girl	147 (62.8)	50 (53.2)	-	
	<i>p</i> <sup>d</sup> =.001	<i>p</i> <sup>d</sup> =.70		
NOT-S scores				
Mean (SD) <sup>b</sup>	3.0 (1.4)	2.0 (1.3)	< .001	
Median (IQR)	3 (2)	2 (2)		
Mean CPQ scores (SD) <sup>b</sup>				
8–10 (n = 173)	Mean (SD)	14.6 ± 12.9	1.1 ± 11.1	.009
	Median (IQR)	12 (13)	8 (10)	
11–14 (n = 155)	Mean (SD)	24.6 ± 17.8	15.7 ± 13.7	.001
	Median (IQR)	20 (23)	9 (12)	

SD, standard deviation; IQR, interquartile range; <sup>a</sup> chi-square test; <sup>b</sup> Mann-Whitney test; <sup>c</sup> *p*-value (differences between columns); <sup>d</sup> *p*-value (differences between lines).

**Table 2** - NOT-S and CPQ scores according to the oral habit type.

Type of oral habit		NOT-S scores	CPQ <sub>8-10</sub>	CPQ <sub>11-14</sub>
Thumb or finger sucking (n = 21)	Mean (SD)	3.2 ± 1.3	14.8 ± 13.4	36.7 ± 18.6
	Median (IQR)	3 (2)	9 (12.5)	36.5 (11.75)
Pacifier sucking (n = 2)	Mean (SD)	4.0 ± 4.2	15.0 ± 14.1	–
	Median (IQR)	4 (3)	15 (10)	
Bottle sucking (n = 2)	Mean (SD)	2.0 ± 1.4	–	–
	Median (IQR)	2 (1)		
Nail biting (n = 141)	Mean (SD)	3.0 ± 1.3	15.8 ± 12.4	24.8 ± 19.1
	Median (IQR)	3 (2)	13 (12)	19 (24.5)
Lip biting or sucking (n = 89)	Mean (SD)	3.0 ± 1.5	12.1 ± 1.9	24.0 ± 19.8
	Median (IQR)	3 (2)	9 (11.25)	19 (22)
Cheek biting (n = 52)	Mean (SD)	3.3 ± 1.5	14.8 ± 15.9	29.3 ± 16.2
	Median (IQR)	3 (2)	6 (14.25)	27 (25)
Grinding (n = 49)	Mean (SD)	3.5 ± 1.5	17.6 ± 16.5	25.6 ± 2.0
	Median (IQR)	3 (1)	9 (21.25)	21 (23)
Tongue biting (n = 20)	Mean (SD)	3.6 ± 1.6	17.2 ± 13.9	28.7 ± 18.8
	Median (IQR)	3 (5)	18 (15)	27 (22)
Pencil or pen biting (n = 4)	Mean (SD)	3.0 ± 2.0	–	27.3 ± 17.9
	Median (IQR)	2 (1)		27 (27.75)
<i>p</i> -value <sup>a</sup>		.29	.56	.22

<sup>a</sup> Kruskal-Wallis test (differences between lines).

**Table 3** - Distribution of the sample [n (%)] for each NOT-S domain.

NOT-S domains	Habit (n = 234)		Habit free (n = 94)		p-value <sup>a</sup>
	N	%	N	%	
<b>Interview</b>					
(I) Sensory function	41	18.0	2	2.1	.001
(II) Breathing	22	9.4	9	9.6	.87
(III) Habits	234	10.0	0	0	-
(IV) Chewing and swallowing	125	53.0	41	44.0	.41
(V) Drooling	29	12.0	13	14.0	.90
(VI) Dry mouth	64	27.0	16	17.0	.15
<b>Examination</b>					
(1) Face at rest	67	29.0	31	33.0	.66
(2) Nose breathing	9	3.8	5	5.3	.55
(3) Facial expression	64	27.0	28	3.0	.84
(4) Masticatory muscle and jaw function	25	11.0	14	15.0	.45
(5) Oral motor function	5	2.1	6	6.4	.09
(6) Speech	14	6.0	6	6.4	.10

<sup>a</sup> Comparisons with the Habit-free group (chi-square and Fisher's exact tests, where appropriate).

Habit group (62.8%,  $p = .001$ ). Children with oral habits had, on average, higher mean NOT-S (3.0 versus 2.0;  $p < .001$ ), CPQ<sub>8-10</sub> (14.6 versus 1.1;  $p = .009$ ) and CPQ<sub>11-14</sub> scores (24.6 versus 15.7;  $p = .001$ ) than subjects in the Habit-free group. When considering the types of oral habits, there were no differences in the means of the NOT-S and both CPQ scores ( $p > .05$ ) (Table 2).

Table 3 shows the sample distribution for each domain of the NOT-S. Children with oral habits had higher impairment of sensory function (Domain I) than the children in the Habit-free group ( $p = .001$ ).

For the Habit group, the NOT-S scores were positively correlated with the CPQ<sub>8-10</sub> and CPQ<sub>11-14</sub> scores. There were no correlations between the NOT-S and both CPQ scores in the Habit-free group (Table 4).

## Discussion

The NOT-S and CPQ were chosen because they

**Table 4** - Spearman's correlation between NOT-S and CPQ scores.

	Habit (n = 234)		Habit free (n = 94)	
	R	p-value	R	p-value
NOT-S and CPQ <sub>8-10</sub>	.32	< .001	.16	.24
NOT-S and CPQ <sub>11-14</sub>	.30	.001	.12	.45

are validated protocols available in many languages, including Brazilian Portuguese,<sup>12,15</sup> making possible the comparison of international data, assessing orofacial functions and OHRQoL.

A wide range of frequencies of oral habits has been reported, from 9.9% to 34.1% on international studies,<sup>16,17</sup> and from 70% to 83.1% in Brazilian studies,<sup>18,19</sup> corroborating our results. The most prevalent habit was nail biting. Pacifier and finger sucking were less prevalent, which agrees with the findings of Thomaz *et al.*<sup>20</sup> These results can be justified by the age sample because it has been observed that sucking habits during early ages may further change to nail biting or another oral habit<sup>20</sup> if psychological and/or emotional factors are involved.<sup>21</sup>

A higher prevalence of oral habits was found in girls than in boys. To date, there is no consensus regarding the prevalence of oral habits and their association with gender. The lack of consensus might be explained by the different dentition stages of the evaluated populations.<sup>11,19,22</sup>

The Habit group presented higher CPQ<sub>8-10</sub> and CPQ<sub>11-14</sub> scores than the Habit-free group, indicating that the consequences of oral habits on oral health could be considered as influential factors on quality of life, corroborating the findings of Sardenberg *et al.*<sup>23</sup> A possible explanation is that the maintenance of oral habits can be the etiological factor of malocclusion, and it is been suggested that malocclusion has a high impact on OHRQoL.<sup>2,23</sup> Another possibility is that individuals with a gag reflex felt that their oral condition had an impact on overall QoL.<sup>24</sup> This observation could justify the higher CPQ scores for the Habit group, which presented this sensory function on the NOT-S evaluation. Moreover, girls reported a higher impact on OHRQoL than boys,<sup>15,25</sup> and the Habit group was 62.8% girls. Teeth appearance was important for girls and had a

high impact on their appearance satisfaction.<sup>25</sup>

Subjects with oral habits also presented higher NOT-S scores than their counterparts. When considering the sample distribution according to each domain of NOT-S, there were significant differences between the Habit and Habit-free groups, with the former presenting higher impairment on sensory function (Domain I) than the latter. The sensory function in the NOT-S is evaluated by asking the individual if toothbrushing elicits a gag reflex and if having too much food in the mouth makes it difficult to chew. The sensory function in children in the Habit group was considered impaired due to the presence of gag reflexes when tooth brushing, indicating the influence of oral habits in this NOT-S domain. Deleterious oral habits may be related to emotional and/or psychological factors,<sup>21</sup> particularly nail biting,<sup>26</sup> which was the most prevalent habit in the present study. In addition, the gag reflex can be an expression of emotional distress,<sup>27</sup> and patients with a gag reflex have been found to be dentally anxious.<sup>28</sup> In this context, the observed relationship between the oral habits and gag reflex could be a manifestation of stress related to the oral cavity, although verifying this possibility requires further research. Nevertheless, a low number of children demonstrated impairment in some domains of clinical examination that can be considered limitations, such as nose breathing, oral motor function and speech.

Unexpectedly, the breathing domain results in the NOT-S interview were similar in the two groups, which is justified by the healthy sample, i.e., the participants were chosen randomly from a population, differing from the choice by Bakke *et al.*<sup>9</sup> Further-

more, the most prevalent oral habits could not influence morphological characteristics related to oral breathing onset. Chewing and swallowing were also the same for both groups, as observed in the NOT-S interview, indicating that the oral habits did not influence the respective functions. Both interview domains results were in line with the NOT-S clinical examination, indicating consistent results.

The NOT-S, CPQ<sub>8-10</sub> and CPQ<sub>11-14</sub> scores presented significant correlations in the Habit group, indicating the influence of orofacial dysfunctions on OHRQoL. This finding is in line with the literature because oral health is related to well-being and QoL, as measured along functional, psychosocial, and economic dimensions.<sup>9</sup> Child OHRQoL can be influenced by dental caries, fluorosis, malocclusion, gum problems, cleft lip and palate and/or craniofacial anomalies.<sup>15</sup> Moreover, oral and craniofacial diseases or disabilities contribute to the compromise of oral sensorimotor functions<sup>3</sup> and, consequently, negatively influence the OHRQoL.

## Conclusions

Children and adolescents of the Habit group presented more orofacial dysfunction and higher impacts on OHRQoL than the habit-free group. Moreover, the presence of orofacial dysfunctions was associated with worse OHRQoL in subjects with oral habits.

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