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Original articles

Taste perception in complete denture wearers

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ABSTRACT

Purpose: to assess the recognition of salty, sweet, and citrus tastes in complete denture wearers.

Methods: the study included toothless individuals (experimental group) who had been using, for at least 3 months and at the most 5 years, acrylic resin removable bimaxillary complete dentures in good condition and with adequate maxillo-mandibular relationship. The same assessment was performed in the control group, which had 26 toothed individuals. Volunteers had no difficulties ingesting any type of food. Salty, sweet, and citrus tastes were assessed with filter paper strips soaked in such solutions and placed on the tongue dorsum. Assessments were performed in duplicate and in random order.

Results: the percentage rate of errors was similar between the control (9.6±13.5%) and experimental groups (10.5±15.5%) (p=0.80). There was no difference in the frequency of correct perception of tastes between denture wearers and toothed individuals.

Conclusion: individuals who wore acrylic resin removable bimaxillary complete dentures perceived salty, sweet, and citrus tastes like toothed individuals did.

Keywords: Periodontal Prosthesis; Water Flavor; Deglutition; Taste Disorders; Taste Buds

Study conducted at the Medical School and Dental School of Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, São Paulo, Brazil.

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INTRODUCTION

Oral sensitivity is important to adapt swallowing-related events to the bolus characteristics[1,2]. This adaptation ensures effective and safe swallowing of boluses with different temperatures, volumes, consistencies, compositions, and tastes. The correct perception of liquid and solid boluses requires a complex and intense innervation of the organs involved in the process[3-5], which is necessary for an adequate motor response[5,6]. When sensitivity is blocked, swallowing may become difficult and the bolus may be aspired to the airways[7,8].

Tactile and pain sensitivity in toothless people's oral mucosa[9] and their taste recognition may be impaired. However, this verification in complete denture wearers is still controversial – some studies demonstrate the denture does not influence taste perception[10,11], while others demonstrate such an influence[12-14]. Different tastes are perceived throughout the tongue, with the palate's participation[15]. Since dentures cover the whole palate, taste in this case may be affected. Moreover, the material from which dentures are made (i.e., acrylic resin) is subject to sorption and solubility[16] over time, which could be a factor in changes in taste.

The possibility of impaired taste perception in complete denture wearers may explain swallowing changes found in these individuals[17,18]. Oropharyngeal sensory perception is essential to begin and control swallowing[19].

This investigation aimed to assess the perception of salty, sweet, and citric tastes in toothless complete denture wearers. The hypothesis is that their perception of these tastes is decreased in comparison with toothed individuals.

METHODS

This investigation complied with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the Clinics Hospital of Ribeirão Preto, Brazil, under number 2.846.389 and CAAE number 606.11716.8.0000.5440. All research participants signed an informed consent form.

This cross-sectional study, conducted between 2019 and 2021, had a convenience sample of 31 wearers (experimental group) of removable bimaxillary complete dentures, whose base and teeth were made of acrylic resin. Participants should have worn them for at least 3 months and at most 5 years, and the dentures should be in good condition and have an adequate maxillomandibular relationship. The control group had 26 healthy people with at least 24 teeth.

Volunteers had no oral diseases, their teeth or dentures were in good condition, they had no systemic diseases and were cognitively able to assess the tastes in the examination. Individuals with mucosal lesions, fractured or worn teeth, and incapable of assessing the tastes were excluded.

Taste sensitivity was assessed with filter paper strips soaked in liquids with salty, sweet, and citric tastes, placed over the participants' tongue dorsum. The filter paper strips (JProlab – 40 x 40 mm, 80 g) were 8 cm long, and their tips measured 2 x 1 cm (Figure 1). Each participant was assessed with six strips soaked in liquids with the said tastes, twice each and in a random order. Those who wore dentures were wearing them during the assessment. The volunteers did not know the sequence of the tastes with which they were being tested.

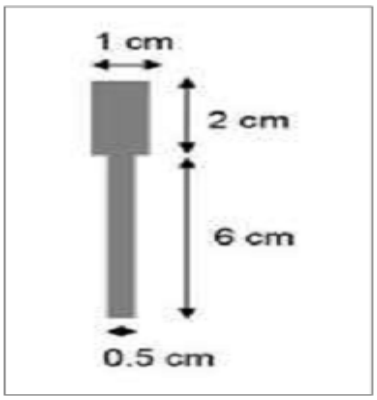

Figure 1. Filter paper strip used in taste assessments

The tastes were obtained by adding 9 g of sucrose to 10 mL of water; 9 g of sodium chloride to 10 mL of water; and 9 g of lime juice (juice powder manufactured by Clight) to 10 mL of water. After at least 5 seconds and at most 20 seconds holding in their mouths the strips that had been soaked in each of these tastes, volunteers indicated which taste they perceived in each test, while the examiner took notes on whether the identification was right or wrong. After each stimulation with a given taste, participants drank 10 mL of water for oral cleaning.

Before beginning the assessment, participants were shown images corresponding to each taste (to the citric taste, an image of a lime cut in half; to the sweet taste, a drawing of a sugar bowl; and to the salty taste, a

drawing of a salt jar) to ensure they understood to what each taste referred and provided answers accordingly.

Differences between percentage rates of rightly and wrongly recognized tastes were assessed with a binomial regression model with an identity link function and comparisons adjusted for age[20]. Analyses were performed in SAS software 9.4.

RESULTS

The characteristics of the study participants are shown in Table 1. Denture wearers had lower educational attainments and were older (65±10 years) than control individuals (59±9 years). Participants from both groups reported food restrictions, with no difference in proportion ($p > 0.05$).

Table 1. Characteristics of individuals in the control group (n = 26) and denture-wearer group (n = 31)

Characterization	Control		Denture	
	n	%	n	%
Sex				
Males	12	46	16	52
Females	14	54	15	48
Educational attainment				
Up to 8 years	2	8	25	81
More than 8 years	24	92	6	19
Avoids certain foods				
Yes	1	4	4	13
No	25	96	27	87

Captions: n = number; % = percentage

The percentage rate of errors was similar between the control (9.6±13.5%) and experimental groups (10.5±15.5%) ($p = 0.80$). The proportion of correct taste identifications was not different between the two groups (Table 2, $p > 0.05$).

Table 2. Number and percentage of tests whose tastes were correctly identified by individuals in the control group (n = 26) and denture-wearer group (n = 31)

Tastes	Control		Denture	
	n	%	n	%
Salty	52	100	61	98
Sweet	46	88	52	84
Citric	43	83	54	87
All	141	90	167	90

$p > 0.05$ binomial regression
Captions: n = number; % = percentage

The distribution of participants who did not recognize the taste in either test, in one test, or recognized it in both tests was not different between the two groups (Table 3, $p > 0.05$).

Table 3. Number and percentage of individuals with none, one, or two correct taste identifications in the control group (n = 26) and denture-wearer group (n = 31)

Perception	Control		Denture	
	n	%	n	%
Salty				
None	0	0	0	0
One	0	0	1	3
Two	26	100	30	97
Sweet				
None	1	4	3	10
One	4	15	4	13
Two	21	81	24	77
Citric				
None	1	4	0	0
One	7	27	8	26
Two	18	69	23	74

$p > 0.05$ binomial regression
Captions: n = number; % = percentage

DISCUSSION

In the group assessed in this study, no difference was found in the frequency of sweet, salty, and citric taste perception between toothless complete denture wearers and toothed individuals. Differences in mean age and educational attainment between denture wearers and non-wearers did not lead to differences in the assessment of taste perception.

The dentures worn by toothless individuals were made of acrylic resin, which is considered to hinder sensitivity[12], though it was not confirmed in this investigation.

Blocking oral sensitivity with anesthesia changes swallowing, which demonstrates the importance of this perception[21]. It takes place as chemical substances in foods stimulate taste buds, triggering a nervous impulse, particularly on the tongue[3]. The perception mechanism is different for each of the tastes that were assessed [3].

This study's hypothesis is justified by the lack of proper contact between tested substances and the receptors due to the dentures, hindering their identification. The results indicate that this hypothesis is not true. No difference in the frequency of taste recognition was found between denture wearers and non-wearers.

Previous studies indicate that another result is possible. The perception of sweet and sour tastes while wearing dentures has been described as weaker[12], and that of bitter tastes, as particularly difficult[13,14]. The possibility of perceiving tastes in ingested foods (even if not at the same intensity as before beginning to wear dentures) is important for the procedure to actually improve toothless people's quality of life, without interfering with the perception of food characteristics. Other investigations found no change in taste perception[10,11], which may be due to the stimuli they used, the intensity of the stimuli (substance concentration), the form of assessment, or differences in dentures. The study did not assess the intensity of the perception which, though present, may have been weaker.

Taste perception in the tests used in this study was not always present in all individuals. Only the salty taste was recognized in both tests by all control individuals. Overall, tastes were correctly recognized in 80% to 90% of the tests, which is quite similar to the result found in the same population and described in a previous study[22]. Control individuals did not recognize correctly in 10% of the tests.

The method used is an alternative to assess taste perception[13]. However, other methods may have greater sensitivity and specificity for this assessment[14,23].

This investigation has limitations. Three tastes were assessed, which is enough to demonstrate the lack of differences between complete denture wearers and toothed individuals. The group of denture wearers was a little older than the control group, which might have led to differences in the results[14] – however, it did not happen, perhaps because the age difference was small. The educational attainment might also have interfered, expecting that those with more years

of school attendance would be better able to identify tastes – which was not found in this investigation. Moreover, using stimuli in different concentrations may demonstrate differences between denture wearers and non-wearers.

CONCLUSION

No difference in salty, sweet, and citric taste perception frequency was found between acrylic resin complete denture wearers and toothed individuals.

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MRM, ABR, CHLS, ROD: research organization, data acquisition and analysis, manuscript writing.