



DG Beekmans
DE Slot
GA Van der Weijden

User perception on various designs of tongue scrapers: an observational survey

Authors' affiliations:

DG Beekmans, Academic Center for Dentistry at the University of Groningen (RuG), Groningen, The Netherlands
DE Slot, GA Van der Weijden, Department of Periodontology, Academic Center for Dentistry Amsterdam (ACTA), University of Amsterdam and VU University, Amsterdam, The Netherlands

Correspondence to:

D.E. Slot
Department of Periodontology
Academic Centre for Dentistry Amsterdam (ACTA)
University of Amsterdam and VU University Amsterdam
Gustav Mahlerlaan 3004
1081 LA Amsterdam
The Netherlands
Tel.: +31 20 59 80 179
E-mail: d.slot@acta.nl

Abstract: *Aim:* The aim of this study was to identify the participants' preference and perception of effectiveness with respect to nine commercially available tongue scrapers. As secondary aim, perception of discomfort and suspected sharpness were assessed. In addition, the first impression of the design of the various tongue scrapers was evaluated. *Materials and methods:* This was an observational survey without blinding to the products. At first impression, participants were given nine tongue scrapers and were asked to immediately use all, and to point out which of the scrapers they preferred most. Subsequently, a 14-day familiarization period followed. At the follow-up appointment, all participants received a questionnaire which used a visual analogue scale (VAS) to evaluate their perception of the various scrapers used. Questions regarding the perceived efficacy, discomfort and pain were posed. Data were analysed statistically by ANOVA. *T*-tests were used for 'post hoc' analysis and Bonferroni corrections were used for multiple comparisons. *Results:* In total, 50 participants completed the assessment. The primary parameter 'efficacy' showed scores that ranged from 4.09 to 6.43 ($P < 0.001$) for the nine tongue scrapers. The secondary parameters 'sharpness' (range from 3.31 to 6.26) and 'discomfort' (range from 5.67 to 8.33) showed significant differences as well ($P < 0.001$). A significant negative correlation ($R = -0.850$; $P = 0.004$) between the perceived sharpness and discomfort was observed. *Conclusion:* The perception of effectiveness varied among the various tongue-cleaning device designs. No single feature stood out as being specifically related to perception of effectiveness. Sharpness and comfort were negatively correlated. Comfort and effectiveness were positively correlated. The results from this study indicated that participants found TS6 and TS8 to be the most comfortable and the most effective. However, TS8 scored higher for inducing a higher gag reflex.

Key words: attitude; cleaner; experience; perception; scraper; spatula; tongue; tongue cleaning

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Introduction

The mouth is an environment in which microorganisms thrive. The most prominent place for the accumulation of microorganisms is the dorsum surface on the tongue, at which papillae and furrows are forming a unique ecological oral site with a dynamic structure that favours the development of the biofilm (1, 2). The very back of the tongue provides a particularly hospitable environment for many anaerobic bacteria because it is relatively undisturbed by normal activity in the mouth. It

tends to be poorly cleansed, and it often harbours a number of substances on which the bacteria feed. A tongue scraper (also called a tongue cleaner) is an oral hygiene device designed to clean the dorsal surface of the tongue. Cleaning the dorsum of the tongue removes the white/yellow coating of bacteria, decaying food particles, fungi (such as *Candida*) and dead cells which can be the origin of bad breath (1). It can also help reduce potential pathogenic organisms which cause tooth decay and gum problems (3). By removing food debris from the tongue surface, taste buds are able to function more effectively and detected the subtle flavours in food (4).

Tongue scraping has been practiced for hundreds of years and dates back to ancient times in India. Traditional Indian medicine recommends tongue cleaning as part of one's daily hygiene regimen, to remove the toxic debris. Tongue cleaning was also performed by the Romans and was recorded in Europe in the 18th and 19th centuries. Throughout the centuries, tongue scrapers have been constructed of handcrafted thin, flexible strips of wood, various metals such as sterling silver, ivory, mother-of-pearl, whalebone, celluloid, tortoiseshell and plastic. Tongue cleaning has recently gained professional attention in the Western countries, but appreciation by the public is still small (5).

Many people brush their tongues with toothbrushes, but a toothbrush is designed to clean the solid, unmoving structure of the teeth. Using a tongue scraper on the spongy, flexible surface of the tongue dislodges bacteria as well as their food source and therefore effectively cleans the surface of the tongue (6). Today's tongue scrapers are ergonomically shaped in accordance with the anatomy of the tongue and are optimized to lift and trap the plaque coating. Clinical studies have shown that the daily use of a tongue scraper results in a significant reduction in the tongue coating that cause bad breath and other problems (7).

With the many different types of tongue cleaners, their effectiveness may vary with respect to the shape, dimensions, configuration, quality of the contact surfaces and materials used.

The aim of this study was to identify the participants' preference and perception of effectiveness with respect to nine commercially available tongue scrapers. The participants were questioned about their perception of effectiveness, comfort and sharpness of each tongue scraper as well as if each scraper triggered their gag reflex. In addition, the first impression of the design of the various tongue scrapers was evaluated.

Materials and methods

The study protocol was submitted to the Dutch Trial Register and adhered to the ethical principles of the Declaration of Helsinki. Participation in this study was voluntary. Before enrolment, all participants were given oral and written instructions as well as a description of the aim, rationale and duration of study participation. All participants signed an informed consent form prior to the study procedures. The study was performed at the faculty of Dentistry of the University of Groningen (RuG).

Participants and tongue scrapers

Subjects were invited to participate via a recruitment letter. In total, 50 participants were included at the start of this study. The inclusion criterion was that the participants were ≥ 18 years of age. Participants were excluded if they were unwilling or did not have the dexterity to use a tongue scraper. For a detailed description of the design of the nine tongue scrapers, see Table 1. The tongue scrapers are abbreviated as TS1 to TS9. Company names and brand names are added.

Design and procedures

For each participant, two appointments were made. At the first appointment, participants were provided with all nine tongue scrapers. A questionnaire was given to the participants in which the following topics were questioned: shape, ergonomics, width, flexibility, user friendliness and sharpness of the cleaning surface (Table 2). For each topic, the participants were asked to point out which scraper they preferred the most. Subsequently, participants were sent home with the instruction to use the nine tongue scrapers during the next 14 days. This familiarization period was intended to allow sufficient usage time and experience with the various tongue scrapers. At their second appointment, participants completed a second questionnaire. The questionnaire used a visual analogue scale (VAS) as the assessment method. For details with respect to the questions, see Tables 3–6. In short, the participants were questioned about the perception of effectiveness, the perception of comfort, suspended sharpness of the tongue scraper and the gagging reflex. They were requested to answer the various questions by placing a vertical mark on a 10-cm-long uncalibrated line; the left extreme presented 'the most negative aspect' 0, whereas the right extreme presented 'the most positive aspect' 10. The participants were asked to mark on each line a point that they considered to represent best their perception for each individual tongue scraper. The marks on the VAS were measured to the nearest millimetres. A VAS score of 10 was considered to represent the most effective, most comfortable, highest gagging reflex and concerning the sharpness of the tongue scraper a score of 5 to represent the most neutral score neither dull nor too sharp. Furthermore, the participants also answered more general questions regarding their habitual use of tongue scrapers, their age, gender and whether they were left- or right-handed.

Data analysis

In total, data from 50 participants were analysed. The collected data were entered into SPSS (Statistical Package for the Social Sciences, IBM SPSS Statistics for Windows, Version 20.0, IBM Corp., Armonk, NY, USA) for analysis among the various tongue scrapers. An one-way ANOVA was used to determine the possible existence of a difference among the nine tongue scrapers. The '*post hoc*' analyses were used to search for the origin of the significant differences between

Table 1. A detailed description of the nine different tongue scrapers (see the online appendix for pictures); brand names, name of the tongue scraper, single/double ended, the kind of edge, the surface and the amount of rows on the edge

Tongue scraper	Brand (company name, city, country)	Type (name of the tongue scraper)	Ended (single/double)	Edge (dull/sharp/bristle tufts)	Surface (small/large)	Row (number of rows)
TS1	Curaden Swiss, Marlestone, Australia	Curaprox [®] 201	Single	Sharp	Small	1
TS2	Curaden Swiss, Marlestone, Australia	Curaprox [®] 202	Single	Sharp	Small	2
TS3	Sunstar Americas Inc., Chicago, USA	GUM [®]	Single	Brush	Small	2
TS4	Dentaid BeNeLux B.V., Houten, the Netherlands	Halita [®]	Single	Sharp	Large	1
TS5	Lactona Corporation, Lansdale, USA	Lactona [®]	Single	Dull	Small	1
TS6	GABA BV, Weesp, the Netherlands	Meridol [®]	Single	Dull	Small	5
TS7	One Drop Only, Berlin, Germany	Ragy [®]	Single	Brush	Large	1
TS8	SCRAPY, Amsterdam, the Netherlands	Scrapy [™]	Double	Sharp	Small/Large	1
TS9	TePe Munhygienprodukter AB, Malmö, Sweden	TePe [®]	Single	Sharp	Large	3

Table 2. Participants' (N = 50) first impression of the various aspects of the nine tongue scrapers: six features of the tongue scraper were questioned. Highest scores are bold

Scraper	Regarding the following aspects which tongue scraper do you prefer?								
	TS1	TS2	TS3	TS4	TS5	TS6	TS7	TS8	TS9
Feature:									
Shape of the tongue scraper	0	0	2	2	0	36	0	10	0
Ergonomics of the tongue scraper	0	0	7	1	0	36	0	6	0
Width	2	4	4	9	0	6	2	18	5
Flexibility	1	1	5	1	1	31	3	5	2
User friendliness	1	4	9	4	0	15	0	15	2
The sharpness of the cleaning surface	3	3	6	8	0	7	1	18	4

Table 3. VAS results with perception of effectiveness of the tongue scrapers

Question	Tongue scraper	Mean (SD)	Range	P-value*
How well is your tongue cleaned? <i>0 = not good at all 10 = very good</i>	TS1	5.17 (2.61)	0.30–9.30	0.000
	TS2	5.60 (2.39)	1.20–9.50	
	TS3	5.32 (2.48)	0.30–9.80	
	TS4	5.73 (2.30)	0.30–9.60	
	TS5	4.51 (3.38)	0.50–9.80	
	TS6	6.08 (2.40)	0.10–9.80	
	TS7	4.09 (2.53)	0.00–8.50	
	TS8	6.43 (2.58)	0.90–9.80	
	TS9	5.05 (2.37)	0.30–10.00	
			95% CI	P-value [†]
Post-testing	TS6	TS7	0.329; 3.647	0.005
	TS8	TS5	0.261; 3.579	0.008
	TS8	TS7	0.683; 4.001	0.000

*Mean VAS scores, SDs, tested with ANOVA

†Post hoc testing between groups, 95% confidence interval, P-values with Bonferroni correction for multiple comparisons.

the different tongue scrapers. The Bonferroni corrections were applied for multiple comparisons. P-values ≤ 0.05 were accepted as statistically significant.

Results

Participants

The study started with a group of 50 participants and all of the participants attended the two visits of the trial. Analysis of the demographics showed that four participants were left-handed and 46 right-handed. The mean age was 23 years (SD = 7.21), within a range from a minimum age of 18 to a maximum age of 49 years. More women ($n = 39$) than man ($n = 11$) participated in this trial. Before this evaluation, 45 participants had never used a tongue scraper before. One participant habitually used a tongue scraper once a day. Two participants used their scraper on average once a week and two participants less than once per 2 weeks.

First impression

There are various features that may contribute to the perceived quality of the tongue scrapers, and six aspects were evaluated at first impression (Table 2). Two tongue scrapers were selected more frequent than the others: TS6 and TS8. TS6 was first choice for the shape as well for the ergonomics and the flexibility of the scrapers. TS8 was favourite with regard to the width and the sharpness of the cleaning surface.

Table 4. VAS results with the perceived comfort of the tongue scrapers

Question	Tongue scraper	Mean (SD)	Range	<i>P</i> -value*
To what extent is the tongue scraper comfortable? <i>0 = not comfortable</i> <i>10 = very comfortable</i>	TS1	5.88 (2.91)	0.00–9.80	0.000
	TS2	5.67 (2.83)	0.50–9.90	
	TS3	7.80 (1.83)	1.7–9.80	
	TS4	6.45 (2.22)	1.10–9.90	
	TS5	7.10 (2.38)	2.40–9.90	
	TS6	8.33 (1.76)	0.80–9.90	
	TS7	8.01 (2.03)	2.00–9.90	
	TS8	6.73 (2.26)	2.40–10.00	
	TS9	6.69 (2.25)	2.40–9.80	
			95% CI	<i>P</i> -value†
Post-testing	TS1	TS3	3.409; 0.442	0.001
	TS1	TS6	3.937; 0.971	0.000
	TS1	TS7	3.611; 0.645	0.000
	TS2	TS3	3.619; 0.652	0.000
	TS2	TS6	4.147; 1.181	0.000
	TS2	TS7	3.821; 0.855	0.000
	TS4	TS6	3.367; 0.401	0.002
	TS4	TS7	3.041; 0.075	0.028
	TS6	TS8	0.119; 3.085	0.020
	TS6	TS9	0.161; 3.127	0.014

*Mean VAS scores, SDs, tested with ANOVA.

†*Post hoc* testing between groups, 95% confidence interval, *P*-values with Bonferroni correction for multiple comparisons.

The user friendliness of TS6 and TS8 was comparable, and they both ended up with the highest score (9).

Perception of effectiveness

After a fortnight of daily scraping, all participants completed a questionnaire to evaluate of their opinions. With respect to the perception of ‘efficacy’ as primary parameter participants, mean scores ranged from 4.09 (TS7) to 6.43 (TS8), see Table 3. Statistical analysis showed a significant difference between the nine tongue scrapers (*P* = 0.000). Post-testing showed that the TS8 and TS6 tongue scrapers were perceived to be significantly more effective than the TS7 which was perceived as the least effective. In addition, the TS8 was found to be more effective than the TS5 (*P* = 0.008) and no other significant differences were observed.

Comfort and sharpness

With respect to secondary outcome parameters, comfort and sharpness data are shown in Tables 4 and 5. Sharpness was perceived ranging from 3.31 TS7 to 6.26 TS1, with TS8 (5.15) being the closest to the neutral score of 5. Comfort was perceived within a range of 5.67 TS2 and 8.33 TS6, as TS6 to be appreciated closest to the optimal score of 10. For both sharpness and comfort, statistical analysis showed a significant difference between the nine tongue scrapers. Post-testing showed that TS3, TS6 and TS7 created more comfort than TS1 and

Table 5. VAS results with the perceived sharpness of the tongue scrapers

Concept	Tongue scraper	Mean (SD)	Range	<i>P</i> -value*
How do you experience the sharpness of the tongue scraper? <i>0 = not sharp</i> <i>10 = too sharp</i>	TS1	6.26 (2.39)	0.30–10.00	0.000
	TS2	6.14 (1.99)	0.40–9.90	
	TS3	4.04 (1.75)	0.10–8.70	
	TS4	5.50 (1.72)	0.10–8.90	
	TS5	3.55 (2.27)	0.20–9.90	
	TS6	4.06 (1.89)	0.20–9.10	
	TS7	3.31 (2.16)	0.10–9.50	
	TS8	5.15 (1.98)	0.00–8.60	
	TS9	4.50 (1.96)	0.40–9.10	
			95% CI	<i>P</i> -value†
Post-testing	TS1	TS3	0.915; 3.521	0.000
	TS1	TS5	1.409; 4.015	0.000
	TS1	TS6	0.897; 3.503	0.000
	TS1	TS7	1.651; 4.257	0.000
	TS1	TS9	0.463; 3.069	0.001
	TS2	TS3	0.789; 3.395	0.000
	TS2	TS5	1.283; 3.889	0.000
	TS2	TS6	0.771; 3.377	0.000
	TS2	TS7	1.525; 4.131	0.000
	TS2	TS9	0.337; 2.943	0.002
	TS4	TS3	0.153; 2.759	0.013
	TS4	TS5	0.647; 3.253	0.000
	TS4	TS6	0.135; 2.741	0.015
	TS4	TS7	0.889; 3.495	0.000
	TS8	TS5	0.297; 2.903	0.003
	TS8	TS7	0.539; 3.145	0.000

*Mean VAS scores, SDs, tested with ANOVA.

†*Post hoc* testing between groups, 95% confidence interval, *P*-values with Bonferroni correction for multiple comparisons.

Table 6. The gagging reflex

Concept	Tongue scraper	Mean (SD)	Range	<i>P</i> -value*
Did the use of the tongue scraper create a gagging reflex? <i>0 = no gagging reflex</i> <i>10 = high gagging reflex</i>	TS1	2.01 (2.26)	0.10–9.50	0.000
	TS2	1.86 (2.15)	0.10–9.50	
	TS3	2.00 (2.04)	0.10–9.50	
	TS4	3.16 (2.94)	0.20–9.50	
	TS5	2.01 (2.21)	0.10–9.50	
	TS6	1.80 (2.01)	0.10–9.50	
	TS7	3.29 (2.92)	0.20–10.00	
	TS8	3.78 (3.29)	0.20–9.80	
	TS9	2.73 (2.68)	0.20–9.50	
			95% CI	<i>P</i> -value†
Post-testing	TS8	TS1	0.135; 3.401	0.020
	TS8	TS2	0.281; 3.547	0.007
	TS8	TS3	0.145; 3.411	0.018
	TS8	TS5	0.129; 3.395	0.020
	TS8	TS6	0.335; 3.601	0.004

*Mean VAS scores, SDs, tested with ANOVA.

†*Post hoc* testing between groups, 95% confidence interval, *P*-values with Bonferroni correction for multiple comparisons.

TS2. TS6 and TS7 created more comfort than TS4. TS6 created more comfort than both TS8 and TS9.

Further post-testing showed that TS1 and TS2 were considered sharper than TS3, TS5, TS6, TS7 and TS9. TS4 was considered sharper than TS3, TS5, TS6 and TS7, and TS8 were considered sharper than TS5 and TS7. No other differences were observed.

The possibility of a correlation between sharpness and comfort was considered (sharpness could be a cause of the perceived discomfort). When comparing the outcomes on this aspect, the lowest scores for comfort are found for TS1 and TS2, which also have the highest sharpness scores. This indicates that perceived 'comfort' can likely be explained by the perception of sharpness, as is illustrated in Fig. 1. A two-tailed Spearman's rank-order correlation showed that perceived comfort and sharpness of the nine tongue scrapers had a strong, negative correlation, which was statistically significant ($r_s(9) = -0.850, P = 0.004$). Figure 2 shows perception of effectiveness and comfort when corrected for sharpness. It is apparent that TS6 and TS8 have the highest score.

Gagging reflex

The question related to the induction of a gagging reflex (Table 6) had VAS scores ranging from 1.80 (TS6) to 3.78 (TS8). Statistical analysis showed a significant difference between the nine tongue scrapers. Post-testing showed the gagging reflex induced by TS8 was significantly higher than TS1, TS2, TS5, TS3 and TS6.

Discussion

Recently, a systemic review from our group assessed the efficacy of mechanical tongue cleaning on breath odour and tongue coating. The results demonstrated that mechanical

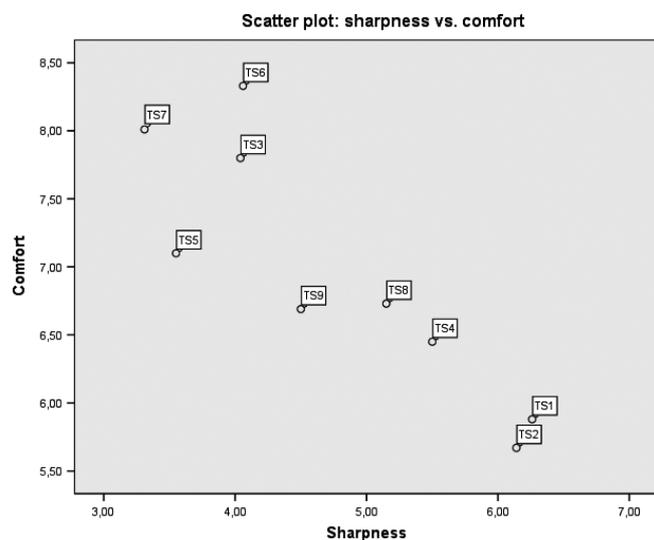


Fig. 1. A scattered plot comparing perceived sharpness with comfort. TS1 and TS2 have the highest score of sharpness and the lowest score of comfort. Y-axis = comfort; X-axis = sharpness.

approaches, such as tongue brushing or tongue scraping, have the potential to successfully reduce breath odour and tongue coating (6). This raises the question what type of tongue scraper should dental professionals advise to their patients. The aim of the present study was to identify the participants' preference and perception of effectiveness with respect to various commercially available tongue scrapers. As far as we could find out, this is the first study to compare different tongue scrapers with distinct features. Two scraper types had bristle tufts on the active side, five had one or more sharp edges, and two had dull edges (see Table 1).

Visual analogue scale measurements

For almost 100 years, the visual analogue scale is an accepted tool to measure a single construct and is widely used (8, 9). The VAS is easy to use, to construct and diverse. It is considered a valid and reliable solution to evaluate subjective phenomena (8–11). The validity is related to whether a phenomenon is abstract or concrete. Individual perceptions are fully private experiences, which are subjective (12). It is difficult to use objective criteria (a measurement scale) for subjective abstracts such as the perception of 'effectiveness', 'comfort' and 'sharpness' (9). However, recently a study about the Bluestone Mouthfeel Questionnaire (a VAS questionnaire testing participants' perceived and subjective perception of how their mouths felt) indicated the visual analogue scale to be valid for this purpose (13). Furthermore, with a comparison of nine different scrapers and a large number participants ($n = 50$), clear trends should become visible.

Efficiency

With respect to the efficacy of the tongue scrapers, differences were observed between all nine tongue scrapers. Scores ranged from 4.09 (TS7) to 6.43 (TS8). The TS8 and TS6 tongue scrapers were perceived to be significantly more effective than the TS7 and the TS8 to be more effective than the TS5. A possible explanation in the observed differences could be found in the different characteristics of the tongue scraper being small/large, dull/sharp and flat/brushed. Flat scraping surfaces tend to have more perceived effectiveness than ones with bristle tufts (Table 3). Sharp or dull edges do not seem to have a specific influence at the perceived efficacy. Furthermore, no clear trend could be observed with respect to particular surface characteristics of the tongue scrapers that were found to be the most efficient.

Perception of effectiveness, comfort and sharpness

The sharpness level of 5 (presumed to be neutral; i.e. neither too dull nor too sharp) was not exceeded by any of the dull/bristle tufted tongue scrapers (TS5, TS6, TS3 and TS7). Of the sharp-edged tongue scrapers, only TS9 had a sharpness score lower than 5. In general, the sharp-edged tongue scrapers had, as expected, the highest perceived sharpness scores. The

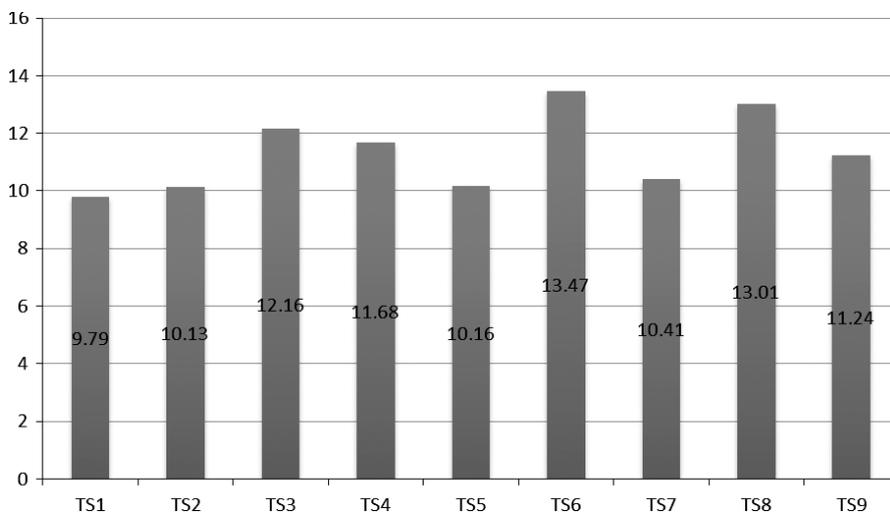


Fig. 2. A bar chart presenting perception of effectiveness and comfort while corrected for sharpness scores of the nine tongue scrapers. X-axis = the nine different tongue scrapers; Y-axis = the cumulative outcome of the perception of effectiveness + comfort corrected for sharpness.

analysis showed that perceived 'comfort' can be explained by the perceived sharpness; a significant negative correlation ($R = -0.850$) between these two aspects exists (Fig. 1). With respect to sharpness, the TS8 (mean = 5.15) is perceived as the best accepted tongue scraper (being close to score '5') and TS6 as the most comfortable one (mean = 8.33). However, low and/or high sharpness and low and/or high comfort scores do not guarantee a high level of perceived efficacy (Fig. 2). By combining the aspects efficacy and comfort but correcting for sharpness, the TS6 and TS8 show the highest scores.

Gagging reflex

Another aspect of comfort is the induction of a gagging reflex which contributes to the negative image of the tongue scraper (4, 14). The gagging reflex induced by TS8 was significantly higher than TS1, TS2, TS5, TS3 and TS6 (see Table 6). A possible explanation could be the difference in size of scraper surfaces, but no consistency is seen related to this aspect with TS8 having both a small and large scraping surface. Another study has shown that the gagging reflex is reduced with a tongue scraper compared to a toothbrush (4). In the current study, however, no clear trends in tongue scrapers with bristle tufts compared to edged surfaces can be seen. Nevertheless, with VAS scores ranging from 1.80 to 3.78 on a 0- to 10-point scale, the gagging reflex seems not to be an issue of discomfort that really stands out.

Effectiveness of tongue scrapers versus toothbrushes

According to the literature, both tongue brushing and tongue scraping tend to reduce the bacterial load on the dorsum of the tongue (4, 15). However, tongue scraping is considered to be more effective than tongue brushing (4, 16). The perceived cleaning efficiency of the tongue scraper is almost 20% higher than a toothbrush (4). The current study includes two tongue scrapers with bristle tufts (TS7 and TS3) and seven tongue scrapers without bristle tufts. The results showed significant

differences between both the scrapers TS6 and TS7, TS8 and TS7 with TS7 (having bristle tufts) being perceived as less effective. TS3 did not show any statistically significant differences as compared to other tongue scrapers, see Table 3. Although one tongue scraper with bristle tufts showed to be less effective compared to two-edged tongue scrapers without bristle tufts, this significant difference does not apply to every other tongue scraper. No particular trend was observed in tongue scraper designs. The tongue cleaners with bristle tufts were perceived as being less effective than the tongue scrapers with flat/serrated edged surfaces.

Study design

For the present study, it was decided to give the participants the complete assortment of tongue-cleaning devices that they were to evaluate at one time. In this observational study, no attempt was made to control the order in which each subject used each cleaner so as not to interfere with the participants' perceptions of each device's effectiveness. Because the study subjects were allowed to decide the order in which they used each of the tongue-cleaning devices, this may have affected their assessment and the study results. Participants were not given specific instructions on how frequently, or at which time of the day, to use each of the nine different tongue cleaners. It is possible, based on their personal preferences, that participants may have used some scrapers more often and/or for more days than others.

Limitations

- If someone compares various tongue scrapers at the same time, the order in which the scrapers are used may affect participants' perceptions. In this observational study, no attempt was made to control this.
- The trial did not prescribe to the participants a specific instruction on how frequent and at which time of the day to use the nine tongue scrapers. It is possible that, based on a

first impression, participants may have used some scrapers more often than others.

- One practical limitation is participant blinding. As visual differences between tongue scrapers are obvious, this particular limitation cannot be overcome.
- The TS8 has two sides (one small loop and a larger loop). No specific instruction was given on how to use this two-sided scraper.

Directions for further research

- Evaluating whether perception of effectiveness corresponds with clinical efficacy in removing tongue coating.

Conclusion

The perception of effectiveness varied among the various tongue-cleaning device designs. No single feature stood out as being specifically related to perception of effectiveness. Sharpness and comfort were negatively correlated. Comfort and effectiveness were positively correlated. The results from this study indicated that participants found TS6 and TS8 to be the most comfortable and the most effective. However, TS8 scored higher for inducing a higher gag reflex.

Clinical relevance

Scientific rationale for study

Tongue scrapers are effective in maintaining oral health and improving bad breath. Assessing patient perception to different tongue scrapers may aid the dental care professional in giving advice and contribute to the improvements of tongue scrapers to be designed.

Principal findings

The nine tongue scrapers differed significantly from each other with regard to perception of effectiveness, comfort and sharpness. A negative correlation exists between perceived sharpness and reported comfort. Tongue scrapers TS6 and TS8 were perceived to be both the most comfortable and the most effective.

Practical implications

The insight into people's preferences gained by conducting this study could contribute positively to improved acceptance of the use of tongue scrapers by the general public. The two tongue scrapers that were rated the most favourably by the study subjects differed significantly in their design. Therefore, we cannot recommend one specific brand at this time. It may actually be beneficial to have the opportunity of suggesting two tongue scraper options to patients so that they may make the final choice. This would actively involve them in the decision process and may lead to better compliance.

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Conflict of interest and source of funding

The authors declare that they have no conflict of interests.

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Supporting information

Additional supporting information may be found in the online version of this article.

Appendix S1. Pictures of the nine different scrapers used