

Impact of oral health guidance on the tongue-lip motor function of outpatients at a dental hospital

Yukiko Hatanaka¹  | Junichi Furuya¹  | Yuji Sato¹ | Yoshiki Uchida¹ | Tokiko Osawa¹ | Toshiharu Shichita¹ | Hiroyuki Suzuki²  | Shunsuke Minakuchi² 

¹Department of Geriatric Dentistry, Showa University School of Dentistry, Tokyo, Japan

²Gerodontology and Oral Rehabilitation, Department of Gerontology and Gerodontology, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan

Correspondence

Junichi Furuya, Department of Geriatric Dentistry, Showa University School of Dentistry, 2-1-1 Kitasenzoku, Ohta-ku, Tokyo 145-8515, Japan.
Email: furuyajunichi@gmail.com

Funding information

JSPS KAKENHI grant number 21K09985.

Abstract

Objective: To clarify the effect of oral health guidance on tongue-lip motor function in the outpatients visiting the Showa University Dental Hospital (Tokyo, Japan).

Background: The management of the oral function of older people visiting a dental hospital is important. Previous studies have revealed that tongue-lip motor function is easy to improve. However, the impact of oral health guidance on tongue-lip motor function in the outpatients of dental hospital requires further elucidation.

Materials and Methods: The participants (n = 35) included patients who were diagnosed with low tongue-lip motor function on evaluation by oral diadochokinesis (ODK) at the outpatient clinic. They underwent a second examination approximately 6-12 months later. Their demographic characteristics were recorded. Oral health guidance was provided through an educational leaflet on oral hypofunction when the participants visited the clinic. It included content on tongue twisters, voice training and a range of movement and muscle training of the tongue and lip.

Results: Following oral health guidance on tongue-lip motor function, the ODK values changed from 5.6 at the first examination to 6.0 at the second for /pa/, from 5.6 to 5.8 for /ta/ and from 5.2 to 5.4 for /ka/. This improvement was not significantly associated with age, sex, measurement period or number of visits.

Conclusion: The findings of this longitudinal study suggested that oral health guidance using an oral hypofunction educational leaflet may be effective in improving the tongue-lip motor function of outpatients who had low tongue-lip motor function, regardless of the measurement period or the number of visits to the dental hospital.

KEYWORDS

older people, oral diadochokinesis, oral function, oral health, oral hypofunction, tongue

1 | INTRODUCTION

Oral function can decrease due to ageing, disuse syndrome, systemic diseases and oral factors such as dental caries, periodontal

disease and ill-fitting dentures. Recent studies have shown that tooth loss, low occlusal force, and low masticatory and swallowing function might relate to low food intake or nutritional status.¹⁻⁴ Moreover, some longitudinal studies on community-dwelling older

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Gerodontology* published by Gerodontology Association and John Wiley & Sons Ltd.

people report that poor oral function might be a predictor of physical frailty and sarcopenia.⁵⁻⁷ These findings highlight the extreme importance of improving and maintaining healthy oral function in older individuals.

In 2018, a new dental syndrome called "oral hypofunction"⁸ was recognised by the National Health Insurance System in Japan. Oral hypofunction may occur in older patients; therefore, managing oral function, as well as dental caries and periodontal disease in geriatric dentistry, is an important social need.⁹ Oral hypofunction is defined as a syndrome in which oral function is reduced due to a complex process involving ageing and other factors such as disease and disability.⁸ It is a condition that involves three or more of the following seven examination items that the dentist can use to check patients' oral function every 6 months under health insurance: oral uncleanliness, oral dryness, decreased occlusal force, decreased tongue-lip motor function, decreased tongue pressure, decreased masticatory function and decreased swallowing function.

Tongue-lip motor function, assessed by oral diadochokinesis (ODK),⁸ refers to the skill and speed of tongue and lip movement. Watanabe et al¹⁰ conducted a cross-sectional survey of community-dwelling elderly people and reported that tongue-lip motor function declined with increasing age and progression of frailty. In a longitudinal study of community-dwelling older adults, Tanaka et al⁵ also reported that multiple oral dysfunctions, including decreased tongue-lip motor function, were associated with worsening frailty, long-term nursing care needs and mortality after 4 years. For the management of oral function and hypofunction in the dental outpatient clinic, oral health guidance may be important; however, the details are still unknown.

Improvement in tongue-lip motor function often does not require dental treatments such as prosthodontic treatment, and training methods such as articulation training do not require training equipment. On the contrary, among the components of oral hypofunction, xerostomia is related to polypharmacy and other conditions,¹¹ and tongue pressure is related to systemic muscle strength.¹² However, patients may be easily able to improve tongue-lip motor function through daily training in accordance with the oral health guidance provided by dentists. For example, Sakayori et al¹³ reported that group instruction in a programme for articulation and range of movement training of the tongue and lip among community-dwelling older people improved their tongue-lip motor function. Similarly, Shirobe et al¹⁴ reported that oral frailty measure programmes for community-dwelling older people helped improve their tongue-motor skill as assessed by ODK /ta/.

Considering previous reports, it is likely that oral health guidance is effective in identifying tongue-lip motor hypofunction in patients and encouraging them to improve it; however, this mechanism remains unclear. To our knowledge, there are no longitudinal studies on changes in tongue and lip motor function following oral health guidance using leaflets in dental outpatient clinics. Therefore, the purpose of this longitudinal study was to clarify the effect of oral health guidance using an oral hypofunction leaflet on tongue-lip

motor function in outpatients visiting the dental hospital diagnosed with low tongue-lip motor function.

2 | MATERIALS AND METHODS

2.1 | Participants

In this study, 105 patients who visited the outpatient clinic of geriatric dentistry at Showa University Dental Hospital (Tokyo, Japan) for maintenance between August 2018 and December 2019 were recruited. All recruited patients underwent examination for oral hypofunction⁸ for the first time. The inclusion criteria were as follows: tongue-lip motor function lower than the diagnostic criteria for oral hypofunction and mild periodontal disease or need only for denture maintenance at the time of the visit. The exclusion criteria were as follows: history of dental treatment, such as tooth extraction or placement of a new denture, at the time of the visit, which significantly changed the oral environment; difficulty in communication due to conditions, such as severe dementia and/or severe dysphagia; and dependence in activities of daily living (ADL). Forty-seven patients met the diagnostic criteria for low tongue-lip motor function in oral hypofunction. Twelve of these patients were excluded based on the exclusion criteria. Finally, 35 patients (mean age, 80.0 ± 7.1 years, 14 men and 21 women) participated in this study. They received oral health guidance from dentists and underwent a second ODK examination approximately 6-12 months later. All data were anonymously acquired after obtaining informed consent from the participants, who were informed that they were free to refuse participation via public announcement of an opt-out process. This study was approved by the Institutional Review Board of Showa University Dental Hospital (approval number: DH2018-032).

2.2 | Oral health guidance for low tongue-lip motor function

Based on the results of the first oral examination for the diagnosis of low tongue-lip motor function, oral health guidance was disseminated using leaflets recommended by the Japanese Society of Gerodontology (JSG).¹⁵ This leaflet had two sections: One focused on systemic aspects such as nutrition or exercise, and the other focused on oral aspects, including the following seven examination items: oral uncleanliness, oral dryness, decreased occlusal force, decreased tongue-lip motor function, decreased tongue pressure, decreased masticatory function and decreased swallowing function. The contents of each section provided patients instructions on improving oral function in their daily life. The oral health guidance included training for articulation, rapid speech and a range of movements of the tongue and lip conducted when the participants visited the clinic. Dentists explained these instructions to patients using the leaflet during their visit to the clinic. Approximately 6-12 months later, a second examination was conducted, and oral health guidance

was provided in the same manner when the patient visited the clinic for the maintenance of mild periodontal disease or denture.

2.3 | Outcomes

In this study, among the seven diagnostic criteria for oral hypofunction, we evaluated decreased tongue-lip motor function using ODK.⁸ Participants were instructed to pronounce as many /pa/, /ta/ and /ka/ syllables as possible during a 5 s period, and the number of syllables that could be pronounced per second was measured using an automatic measuring device (Kenkou-kun Handy; Takei Kiki Kogyo, Niigata, Japan). ODK was measured once for each /pa/, /ta/ and /ka/ syllable after sufficient explanation and advanced practice, and the values were recorded. The number of pronunciations of any one syllable (ie /pa/, /ta/, or /ka/) less than six times per second was defined as decreased tongue-lip motor function. The ODK values for /pa/, /ta/ and /ka/ at the first and second examinations were recorded. The criterion ODK value for low tongue-lip motor function was <6.0 syllables among the three syllables. The examinations were performed by five dentists who were skilled in oral function examination, and the examinations were well calibrated in advance. In addition, basic patient information, age, sex, time and number of visits between the first and second examinations, number of remaining teeth and denture use were recorded. ADL was evaluated using performance status (PS).¹⁶ The presence or absence of systemic diseases such as hypertension, diabetes, mental disorder, progressive neurological disease and oral cancer was also recorded.

2.4 | Statistical analysis

A sample size of 35 was determined using Gpower with the following conditions: effect size, 0.5; α , 0.05; and power, 0.8. Changes in the values of tongue and lip motor function (ie /pa/, /ta/ and /ka/) and the number of syllables corresponding to the criterion of decreased tongue-lip motor function in the first and second examinations were compared using Wilcoxon's signed-rank test. To examine the effects of these variables, multiple regression analysis was conducted with the difference in the values of tongue-lip motor function (ie /pa/, /ta/ and /ka/) from the first to the second visit as the dependent variable, and age, sex, number of visits, measurement period, number of remaining teeth and denture use as the explanatory variables. All significance levels were set at 5%. The statistical software used was SPSS (ver. 27; IBM Japan).

3 | RESULTS

3.1 | Participants' characteristics

Basic information about the participants is shown in Table 1. The patients' median age was 81.0 years. The median period between the

first and second examination was 7 months, and the median number of visits during that period was three. Approximately one-half of patients had hypertension, and approximately 17% had diabetes mellitus, but none showed any other mental disorders, progressive neurological diseases or oral cancers. In addition, all patients were non-smokers, and all ADLs were independent (PS = 0).

3.2 | Change in tongue-lip motor function

Table 2 show the comparison in tongue-lip motor function between the participants' first and second examination. At the second examination, the number of participants with low tongue-lip motor function defined as oral hypofunction was 30 (85.7%). The median ODK value of each syllable changed from 5.6 to 6.0 for /pa/, from 5.6 to 5.8 for /ta/ and from 5.2 to 5.4 for /ka/, respectively. For /pa/, /ta/, /ka/ and all syllables, the ODK values in the second examination were significantly higher than that in the first examination. The number of syllables below the criterion value (ie 6.0) for ODK of oral hypofunction in the second examination was significantly lower than that in the first examination.

Table 3 show the result of multiple regression analysis. For /pa/, /ta/, /ka/ and all syllables, ODK improvement was not significantly associated with age, sex, measurement period or number of visits, number of remaining teeth or denture use.

4 | DISCUSSION

The purpose of this longitudinal study was to clarify the effect of oral health guidance using an oral hypofunction educational leaflet on outpatients visiting the dental hospital. The findings of this study showed that the guidance was effective, and that tongue-lip motor function improved significantly, regardless of the number of visits over a period of approximately 6 months to 1 year.

The participants in this study were relatively robust; however, their tongue-lip motor function was slightly lower than that reported in previous studies.^{9,10} Watanabe et al¹⁰ reported that ODK values in robust older individuals in their 80s averaged 5.8 for /pa/ and 5.8 for /ta/. On the contrary, in the first examination in the current study, the average value was 5.3 for /pa/, 5.3 for /ta/ and 5.0 for /ka/. This finding could be attributed to the nature of the current study, which was a longitudinal survey of older patients with relatively poor oral function that were visiting a dental hospital, rather than a survey of community-dwelling older individuals.

The second examination, conducted between approximately 6 months and 1 year after the first examination, showed significant improvement in the values of ODK of /pa/, /ta/ and /ka/, as well as a significant improvement in the number of syllables below the criterion of oral hypofunction. In this study, after the first examination, oral health guidance on training and lifestyle for low tongue-lip motor function was provided using a leaflet and reinforced at each subsequent visit. The median measurement period

TABLE 1 Participants' characteristics

	Median	Q1-Q3
Age (y)	81.0	75.0-85.0
Measurement period (mo.)	7	6-9
Number of visits	3	1-6
Number of remaining teeth	16	3-22
	N	%
Sex		
Male	14	40.0
Female	21	60.0
Disease		
Hypertension	17	48.6
Diabetes	7	16.7
Mental disorder	0	0
Degenerative neurological disease	0	0
Oral cancer	0	0
Smoking		
Yes	0	0
Activity of daily living		
Independent	35	100
Denture use	27	77.1

Abbreviation: Q, quartile.

TABLE 2 Change in ODK between the 1st and 2nd examinations

	Median	Q1-Q3	Mean	SD	P-value
ODK /pa/					
1st examination	5.6	4.8-6.2	5.3	1.1	.001*
2nd examination	6.0	5.6-6.4	6.0	0.7	
ODK /ta/					
1st examination	5.6	4.4-6.0	5.3	1.0	.003*
2nd examination	5.8	5.4-6.2	5.8	0.8	
ODK /ka/					
1st examination	5.2	4.2-5.8	5.0	1.0	.027*
2nd examination	5.4	4.8-5.8	5.3	0.8	
Number of syllables below the criterion					
1st examination	3.0	1.0-3.0	2.3	0.9	.012*
2nd examination	2.0	1.0-3.0	1.7	1.0	

Abbreviations: ODK, oral diadochokinesis; Q, quartile; SD, standard deviation.

* $P < .05$; Wilcoxon's signed-rank test (1st examination vs. 2nd examination).

between the first and second examinations was 7 months, and the median number of visits was three, which suggested that most patients received guidance approximately once every 2-3 months. However, the findings of the multiple regression analysis showed that the measurement period and the number of visits were not associated with the degree of improvement in the ODK values or the number of remaining teeth and denture use. This highlights the importance of patient motivation in the management of tongue-lip

motor function. To maintain and improve tongue-lip motor function, educating patients on the decline of tongue-lip motor function and engaging them in exercises to improve the function in their own lives at home may be important. As for the guidance on the lifestyle of patients in the dental outpatient clinic, a previous study has shown the effectiveness of leaflet-based guidance and motivation, although it was based on nutritional guidance after denture delivery.¹⁷

TABLE 3 Multiple regression analysis of the amount of improvement in ODK of /pa/, /ta/ and /ka/ between the 1st and 2nd examinations

Explanatory variable	B	SE	β	P-value	VIF
ODK /pa/					
Age	0.007	0.026	0.044	.805	1.039
Sex 0 = male; 1 = female	-0.044	0.371	-0.021	.907	1.037
Measurement period	0.042	0.091	0.090	.643	1.237
Number of visits	-0.043	0.049	-0.166	.384	1.183
Number of remaining teeth	-0.048	0.028	-0.420	.099	2.035
Denture use	-0.178	0.589	-0.072	.765	1.922
ODK /ta/					
Age	-0.010	0.025	-0.072	.696	1.039
Sex 0 male; 1 female	0.162	0.354	0.083	.651	1.037
Measurement period	0.042	0.087	0.096	.635	1.237
Number of visits	-0.073	0.047	-0.306	.128	1.183
Number of remaining teeth	-0.006	0.027	-0.052	.839	2.035
Denture use	-0.131	0.563	-0.058	.818	1.922
ODK /ka/					
Age	-0.021	0.026	-0.143	.428	1.039
Sex 0 male; 1 female	0.215	0.373	0.102	.569	1.037
Measurement period	-0.055	0.091	-0.117	.549	1.237
Number of visits	-0.008	0.049	0.031	.871	1.183
Number of remaining teeth	0.049	0.028	0.426	.097	2.035
Denture use	0.834	0.593	0.339	.170	1.922

Note: $R^2 = .170$. Dependent variable is the amount of improvement of ODK of /pa/ from the 1st to the 2nd examination.

$R^2 = .101$. Dependent variable is the amount of improvement of ODK /ta/ from the 1st to the 2nd examination

$R^2 = .154$. The dependent variable is the amount of improvement in ODK of /ka/ from the 1st to the 2nd examination.

Abbreviations: ODK, oral diadochokinesis; SE, standard error; VIF, variance inflation factor.

In particular, patients were more likely to take an active role in improving tongue-lip motor function than in other subcategories of oral hypofunction. Prosthetic treatment is effective for decreased occlusal force and masticatory function that occurs after the loss of teeth,¹⁸⁻²⁰ while tongue-lip motor function could be recovered by articulation training, rapid speech and range of motion training of the tongue and lips.^{13,14,21} Furthermore, patients are more likely to be aware of the need for training in their daily lives through conversation, and they may have more easily understood the content and significance of the training of tongue-lip motor function, regardless of the number of visits to the dentist. Sakayori et al¹³ reported that the ODK values of /pa/, /ta/ and /ka/ improved after 3 months of group oral function instruction among community-dwelling older people. Shirobe et al¹⁴ similarly reported an improvement in tongue-lip motor function after individual training. Matsubara et al²¹ also reported similar findings in patients with mild cognitive impairment. The results of these previous studies support the findings of the current study in that ODK values are likely to improve with the implementation of oral

health guidance using an oral hypofunction educational leaflet for patients at a dental clinic. However, after the second examination, the tongue-lip motor function of 30 of the 35 patients remained within the diagnostic criteria of oral hypofunction. This result suggests that although oral health guidance may be effective, it may be difficult to expect improvement until the diagnostic criteria for oral hypofunction are met. It is, therefore, necessary to consider a more appropriate intervention method and to further examine whether the reference value of low tongue-lip motor function in oral hypofunction patients is high. In our recent previous research,²² we found that the ODK score of dental outpatients decreased with increasing age, and prevalence in low tongue-lip motor function patients was about 40%-60%. Combined with the results of the current study, these findings suggest that the reference value of ODK should be reconsidered in the future.

This study has several limitations. First, the participants of this study were patients who visited the Showa University School of Dentistry Hospital for regular maintenance check-ups. Therefore, it is highly likely that the patients had relatively high oral literacy

and could be easily motivated to improve their oral function. Second, patients who required dental treatment after the first examination were excluded from the study to eliminate the effects of a significant change in the oral environment. Third, although the oral health guidance was based on a leaflet, it was individualised depending on the personality and oral function of individual patients. Fourth, the tongue-lip motor function may be affected by other oral factors, such as tongue pressure and occlusal support; however, this was not considered in the present study because participants were patients visiting the hospital for a check-up. Finally, this study was performed by using patient medical records. Therefore, a period of more than 6 months was needed to conduct the second evaluation, which resulted in variations of measurement period and number of visits. Moreover, a control group without guidance could not be established because of ethical issues. Therefore, an interventional study should be conducted in the future.

5 | CONCLUSIONS

The findings of this longitudinal study suggested that oral health guidance using an oral hypofunction educational leaflet may be effective in improving the tongue-lip motor function of outpatients who have low tongue-lip motor function, regardless of the measurement period or the number of visits.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

The authors declare no conflicts of interest associated with this study. The funders had no role in the study design; in the collection, analyses or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

AUTHOR CONTRIBUTIONS

YH, JF and YS involved in conceptualisation. YH, YU and TO involved in data curation. YH, JF and YU involved in formal analysis. YS, TS, HS and SM involved in supervision. YH, HS and JF involved in writing—original draft. JF, YH, YS, YU, TS, TO, HS and SM involved in writing—review and editing. All authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL

This study was approved by the Institutional Review Board of Showa University Dental Hospital (Tokyo, Japan; approval number: DH2018-032).

PATIENT CONSENT

All data were anonymously acquired after obtaining informed consent from the participants by an opt-out process.

DATA AVAILABILITY STATEMENT

Data are not available due to ethical restrictions. Due to the nature of this research, the participants did not consent for their data to be shared publicly. Therefore, supporting data are not available.

ORCID

Yukiko Hatanaka  <https://orcid.org/0000-0003-2680-1538>

Junichi Furuya  <https://orcid.org/0000-0002-8018-4537>

Hiroyuki Suzuki  <https://orcid.org/0000-0003-0420-9146>

Shunsuke Minakuchi  <https://orcid.org/0000-0003-2217-7539>

REFERENCES

1. Sheiham A, Steele JG, Marcenes W, et al. The relationship among dental status, nutrient intake, and nutritional status in older people. *J Dent Res*. 2001;80(2):408-413. 10.1177/00220345010800020201
2. Inomata C, Ikebe K, Kagawa R, et al. Significance of occlusal force for dietary fibre and vitamin intakes in independently living 70-year-old Japanese: from SONIC Study. *J Dent*. 2014;42(5):556-564. 10.1016/j.jdent.2014.02.015
3. Lee IC, Yang YH, Ho PS, Lee IC. Chewing ability, nutritional status and quality of life. *J Oral Rehabil*. 2014;41(2):79-86. 10.1111/joor.12115
4. Okabe Y, Furuta M, Akifusa S, et al. Swallowing function and nutritional status in Japanese elderly people receiving home-care services: a 1-year longitudinal study. *J Nutr Health Aging*. 2016;20(7):697-704. 10.1007/s12603-015-0645-2
5. Tanaka T, Takahashi K, Hirano H, et al. Oral frailty as a risk factor for physical frailty and mortality in community-dwelling elderly. *J Gerontol A Biol Sci Med Sci*. 2018;73(12):1661-1667. 10.1093/geron/a/glx225
6. Hihara T, Goto T, Ichikawa T. Assessment of potential clinical cascade between oral hypofunction and physical frailty: covariance structure analysis in a cross-sectional study. *J Oral Rehabil*. 2020;47(1):61-66. 10.1111/joor.12862
7. Shimazaki Y, Nonoyama T, Tsushita K, Arai H, Matsushita K, Uchibori N. Oral hypofunction and its association with frailty in community-dwelling older people. *Geriatr Gerontol Int*. 2020;20(10):917-926. 10.1111/ggi.14015
8. Minakuchi S, Tsuga K, Ikebe K, et al. Oral hypofunction in the older population: position paper of the Japanese Society of Gerodontology in 2016. *Gerodontology*. 2018;35(4):317-324. 10.1111/ger.12347
9. Kugimiya Y, Watanabe Y, Ueda T, et al. Rate of oral frailty and oral hypofunction in rural community-dwelling older Japanese individuals. *Gerodontology*. 2020;37(4):342-352. 10.1111/ger.12468
10. Watanabe Y, Hirano H, Arai H, et al. Relationship between frailty and oral function in community-dwelling elderly adults. *J Am Geriatr Soc*. 2017;65(1):66-76. 10.1111/jgs.14355
11. Thomson WM. Dry mouth and older people. *Aust Dent J*. 2015;60(Suppl 1):54-63. 10.1111/adj.12284
12. Maeda K, Akagi J. Decreased tongue pressure is associated with sarcopenia and sarcopenic dysphagia in the elderly. *Dysphagia*. 2015;30(1):80-87. 10.1007/s00455-014-9577-y
13. Sakayori T, Maki Y, Hirata S, Okada M, Ishii T. Evaluation of a Japanese 'prevention of long-term care' project for the improvement in oral function in the high-risk elderly. *Geriatr Gerontol Int*. 2013;13(2):451-457. 10.1111/j.1447-0594.2012.00930.x
14. Shirobe M, Watanabe Y, Tanaka T, Hirano H, Kikutani T, Nakajo K, Sato T, Furuya J, Minakuchi S, Iijima K. Effect of an oral frailty measures program on community-dwelling elderly

- people: a cluster-randomized controlled trial. *Gerontology*. 2021;1-10. 10.1159/000516968. Epub ahead of print.
15. Japanese Society of Gerodontology. For Those Diagnosed with 'Oral Hypofunction' [leaflet for patients]. https://www.gerodontology.jp/committee/file/oralfunctiiondeterioration_distribution.pdf. Accessed May 10, 2021. In Japanese
 16. Oken MM, Creech RH, Tormey DC, et al. Toxicity and response criteria of the Eastern Cooperative Oncology Group. *Am J Clin Oncol*. 1982;5(6):649-655. 10.1097/00000421-198212000-00014
 17. Suzuki H, Kanazawa M, Komagamine Y, Iwaki M, Amagai N, Minakuchi S. Changes in the nutritional statuses of edentulous elderly patients after new denture fabrication with and without providing simple dietary advice. *J Prosthodont Res*. 2019;63(3):288-292. 10.1016/j.jpor.2018.12.010
 18. Bajoria AA, Saldanha S, Shenoy VK. Evaluation of satisfaction with masticatory efficiency of new conventional complete dentures in edentulous patients—a survey. *Gerodontology*. 2012;29(3):231-238. 10.1111/j.1741-2358.2012.00634.x
 19. Fueki K, Igarashi Y, Maeda Y, et al. Effect of prosthetic restoration on masticatory function in patients with shortened dental arches: a multicentre study. *J Oral Rehabil*. 2016;43(7):534-542. 10.1111/joor.12387
 20. Wallace S, Samietz S, Abbas M, McKenna G, Woodside JV, Schimmel M. Impact of prosthodontic rehabilitation on the masticatory performance of partially dentate older patients: can it predict nutritional state? Results from a RCT. *J Dent*. 2018;68:66-71. 10.1016/j.jdent.2017.11.003
 21. Matsubara C, Shirobe M, Furuya J, et al. Effect of oral health intervention on cognitive decline in community-dwelling older adults: a randomized controlled trial. *Arch Gerontol Geriatr*. 2021;92:104267. 10.1016/j.archger.2020.104267
 22. Hatanaka Y, Furuya J, Sato Y, et al. Associations between Oral Hypofunction Tests, Age, and Sex. *Int J Environ Res Public Health*. 2021;18:10256. 10.3390/ijerph181910256

How to cite this article: Hatanaka Y, Furuya J, Sato Y, et al. Impact of oral health guidance on the tongue-lip motor function of outpatients at a dental hospital. *Gerodontology*. 2022;39:83–89. <https://doi.org/10.1111/ger.12599>