



Original Article

The effectiveness of a desensitization technique for mitigating oral and facial tactile hypersensitivity in institutionalized older persons: A randomized controlled trial



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Abstract *Background/purpose:* Oral health care provision in long-term care settings is often limited by specific behaviors exhibited by residents, which may be interpreted as a refusal of care. Such behaviors can be attributed to oral tactile hypersensitivity (TH), which is characterized by aberrations in the perception of oral stimuli. TH is also associated with a decline in ingestion and swallowing function. The purpose of this study was to examine the effectiveness of a technique for mitigating TH (TMH) among institutionalized older persons.

Materials and methods: In this study, 18 institutionalized older persons (Mean age, 90.6 ± 4.5 years; 92.9% females) with TH were randomized to a control group or an intervention group. Pre- and post-intervention assessments were conducted for seven participants in each group. Routine oral care was provided by the facility's staff in both groups. TMH in the intervention group was performed by a dental hygienist over a 3-month period.

Results: In the intervention group, the number of areas with TH was significantly reduced ($P = 0.027$). No significant change was observed in the control group.

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Conclusion: The results of this study suggest that TMH can effectively mitigate TH. Our findings provide clinicians with an additional treatment option for hypersensitivity in older patients. Additional long-term studies with larger sample sizes are required to confirm the effectiveness of this technique.

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Introduction

Oral health care for older adults in long-term care facilities is important for many reasons, such as the prevention of aspiration pneumonia.^{1–5} However, the provision of oral care in long-term care settings is often challenging,^{6–8} with the most frequently reported problems being the refusal of care by uncooperative residents and inadequate staff knowledge or skill.⁷ The refusal of care is a result of the residents' behavior, which is attributed to tactile hypersensitivity (TH).^{6,9,10} TH is defined as the response elicited when an afflicted area is touched; this may include spasms occurring either locally or systemically throughout the body.^{9–11} Within the oral cavity, TH is characterized by facial distortion and an inability to open the mouth due to the stiffening of the lips and facial muscles; this is often interpreted as a refusal of oral care and food intake.^{6,12} In addition, according to Tamura et al.,¹⁰ TH can accelerate the decline in ingestion and swallowing function in elderly individuals. Therefore, mitigating TH should be considered important not only in facilitating the provision of oral health care but also in preventing the deterioration of the nutritional status.

A number of previous studies have investigated TH in children with disabilities,^{9,13–16} and a desensitization technique has been established for the management of this condition.^{13,15} However, only one study has assessed the effectiveness of desensitization in mitigating TH in older adults. This study was conducted among eight older adults hospitalized in long-term care settings, and it reported post-intervention reductions in the number of TH areas that were causing refusal of care initially.⁶ Nevertheless, to date, no comprehensive study assessing the effectiveness of this technique has been conducted.

In this pilot randomized controlled trial, we evaluated the effectiveness of a desensitization technique provided in conjunction with routine oral care in mitigating TH among institutionalized older persons.

Materials and methods

Participants

A survey was conducted to determine the prevalence of TH in 80 residents (Mean age, 91.1 ± 6.2 years; 8 males and 72 females) institutionalized at an older adult care facility in Tokyo.¹⁵ A total of 18 (22.5%) residents were identified with TH and enrolled into a randomized controlled trial. Residents were allocated to the intervention and control groups

using permuted block randomization (Fig. 1). Three participants died before the start of the intervention, and one participant was hospitalized after the intervention began. As a result, 7 participants (Mean age, 90.0 ± 3.5 years; 1 male and 6 females) in the intervention group and 7 participants (Mean age, 91.1 ± 5.6 years; 7 females) in the control group were included in the final analysis.

This study was conducted in accordance with the Declaration of Helsinki and with the approval of the Ethics Committee of our university (number: 972). All procedures were carried out with adequate understanding and written consent from the participants or their families.

Baseline survey

Baseline assessments were conducted prior to the intervention period. The survey variables consisted of sex, age, nursing care level, ability to communicate, number of areas with TH, number of present teeth, number of functional teeth, halitosis, oral hygiene score, oral bacteria count, body mass index (BMI), nutritional intake process, form of staple food consumed, risk of food spillage, and intake of water-thickening fluids while hydrating. Data regarding sex, age, nursing care level, BMI, nutritional intake process, risk of food spillage, and intake of water-thickening fluids while hydrating were obtained from the facility's nursing care records and nutritional assessments. All other variables, other than the number of areas with TH, were assessed by a single dental hygienist.

The participants were considered to have an adequate ability to communicate if they were able to follow the examiner's instructions during the oral examinations, or if they were able to verbally greet others. The facility staff were asked to report each participants' usual communicative behavior.

To ensure consistency in the assessment of the number of areas with TH, the facility's dentist and two dental hygienists collaborated prior to study commencement. Nine areas were examined on the face (forehead, left and right cheeks, area surrounding the mouth) and in the oral cavity (right and left buccal mucosae, maxillary and mandibular vestibules, palate). The examiners examined the facial areas sequentially by touching them with their palms, followed by touching the inside of the mouth with their index fingers.^{9–11} The total number of areas with TH were determined based on the assessments of all three examiners. Evidence of TH included the occurrence of spasms locally or generally throughout the body upon touching an area and the appearance of facial changes, such as facial distortion due to the stiffening of the lips or facial muscles.

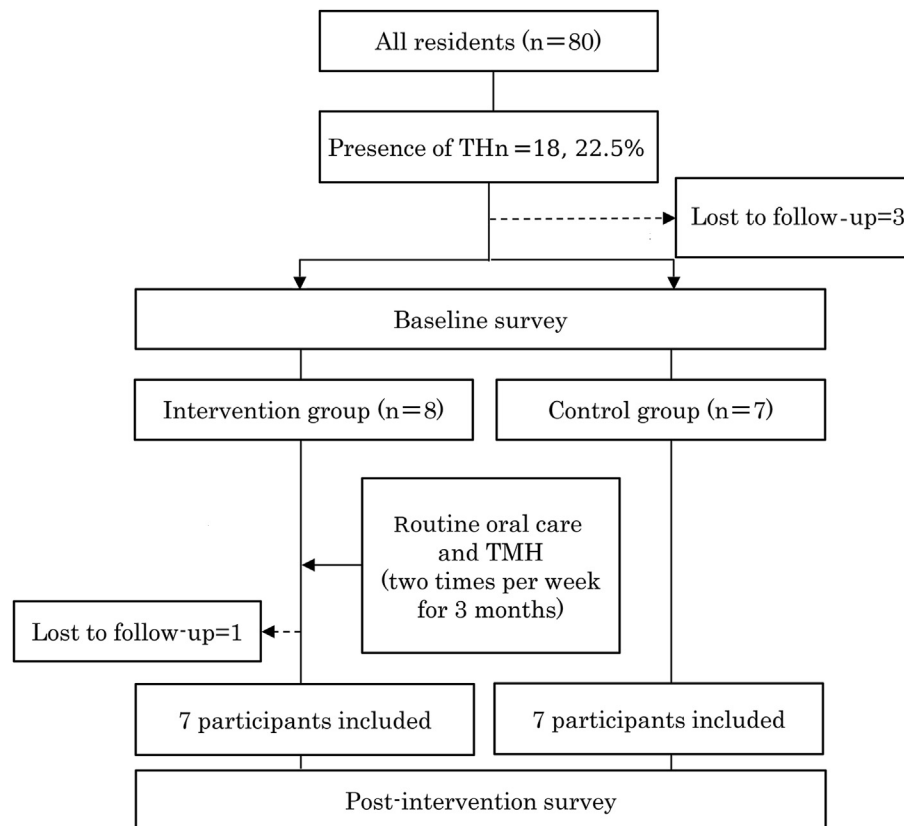


Figure 1 Flow of participants in the randomized controlled trial. TH: tactile hypersensitivity, TMH: the technique for mitigating TH.

TH was not assessed if: (1) the opinions of the examiners differed; (2) the results of the examination were inconclusive; or (3) participants turned their face away or shook their head to show disapproval rather than exhibiting muscular contractions. Manual examinations were performed on all participants, and no participants were judged to have refused the examination.

Regarding the variables examined, the number of present teeth denoted the number of natural teeth, not including retained roots. The number of functional teeth was the sum of the number of present teeth and prosthetic teeth (e.g., dental implants, bridges, dentures). The oral hygiene score was assessed on a 0- to 6-point scale and was calculated based on the criteria of the Debris Index.^{17,18} We assigned scores on a 0- to 3-point scale as follows: 0 (no plaque), 1 (plaque covering not more than 1/3rd of the tooth surface or the presence of stains regardless of the surface area covered), 2 (plaque covering 1/3–2/3rd of the tooth surface), and 3 (plaque covering more than 2/3rd of the tooth surface). A total of 6 teeth were assessed: one maxillary and mandibular molar on the left and right sides, and one maxillary and mandibular anterior tooth. Denture teeth were assessed in the same manner. The buccal and lingual surfaces of each tooth were examined separately, and the higher score was used as the representative score. Finally, the oral hygiene score was calculated by summing the individual scores and dividing the total by the number of surfaces assessed.

Oral bacterial counts (from 1 to 7) were measured at the center of the posterior dorsal tongue surface, using a

bacterial counter (Panasonic Healthcare Co., Tokyo, Japan).² Samples were collected by running a cotton swab anteriorly and posteriorly over a distance of 1 cm on the surface of the tongue thrice by applying even pressure at all times. As bacterial counts are known to differ before and after meals, all samples were collected before lunch.

Halitosis was assessed on a 0- to 5-point scale based on the organoleptic measurement: 0 (absence of odor), 1 (barely noticeable odor), 2 (slight malodor), 3 (moderate malodor), 4 (strong malodor), and 5 (severe malodor).^{19,20}

We documented whether residents were fed orally or through a gastrostomy tube. For those residents who ingested food orally, we also recorded the form of staple food consumed, risk of food spillage, and intake of water-thickening fluids while hydrating. The form of staple food consumed was assessed on a 0- to 4-point scale as follows: 0 (rice), 1 (soft-cooked rice), 2 (rice porridge), 3 (bread porridge), and 4 (pureed foods). The risk of food spillage was determined through the observations of the facility staff who assisted the residents with their meals.

Intervention procedures

The intervention and control groups were assessed before and after the intervention period (Fig. 1). Dental hygienists performed routine oral care and the technique for mitigating TH (TMH) on the participants. The TMH was applied two times per week for 3 months (April–June 2014), for 10 min each in the morning and evening. Routine oral care

was provided on the intervening days by the facility staff, who were responsible for the general care of residents in the institution. To ensure consistency in routine oral care, training sessions and lectures on oral hygiene procedures were held for all facility staff designated to provide oral care. Specifically, basic tooth brushing and denture cleaning methods were demonstrated. The dental hygienist also monitored the performance of the facility staff prior to trial commencement to ensure that there were no deviations from the recommended techniques for routine oral care.

The TMH used was based on a previously reported method developed for children with special needs.¹⁶ In our study, an area with TH was touched with the palm and a finger was held on the area until any change (e.g., tightening of the lips to prevent the incursion of the finger or distortion of the face) had ceased (Fig. 2). The dental hygienist proceeded to touch another area and repeat the process. In case of oral and facial TH, touching began from the distal side in the following order: forehead, left and right cheeks, around the mouth, mucous membranes of the left and right cheeks, maxillary and mandibular vestibules, and the palate. The dental hygienist assigned to perform the desensitization technique in the trial was trained by a different dental hygienist who had the requisite knowledge and experience of its use in older dependent adults.

Post-intervention survey

At the end of the 3-month intervention, a post-intervention survey was conducted for the intervention and control groups. The following variables were assessed: number of

areas with TH, oral hygiene score, oral bacterial count, halitosis, form of staple food consumed, and BMI.

Statistical analysis

To analyze significant differences in the baseline survey variables, Mann–Whitney U tests were used for continuous variables and Chi-squared tests were used for categorical variables. Wilcoxon signed-rank tests were used to investigate the effect of the intervention. All statistical analyses were performed using the SPSS Statistics 20® software (IBM, Tokyo, Japan). The significance level was set at $P < 0.05$.

Results

Baseline survey

No significant differences were observed between the intervention and control groups in any of the baseline variables (Table 1).

Effects of the technique for mitigating tactile hypersensitivity

A comparison of the pre- and post-intervention results for both groups is shown in Table 2. In the intervention group, the number of areas with TH and halitosis at post-intervention was significantly lower than that of the baseline values.

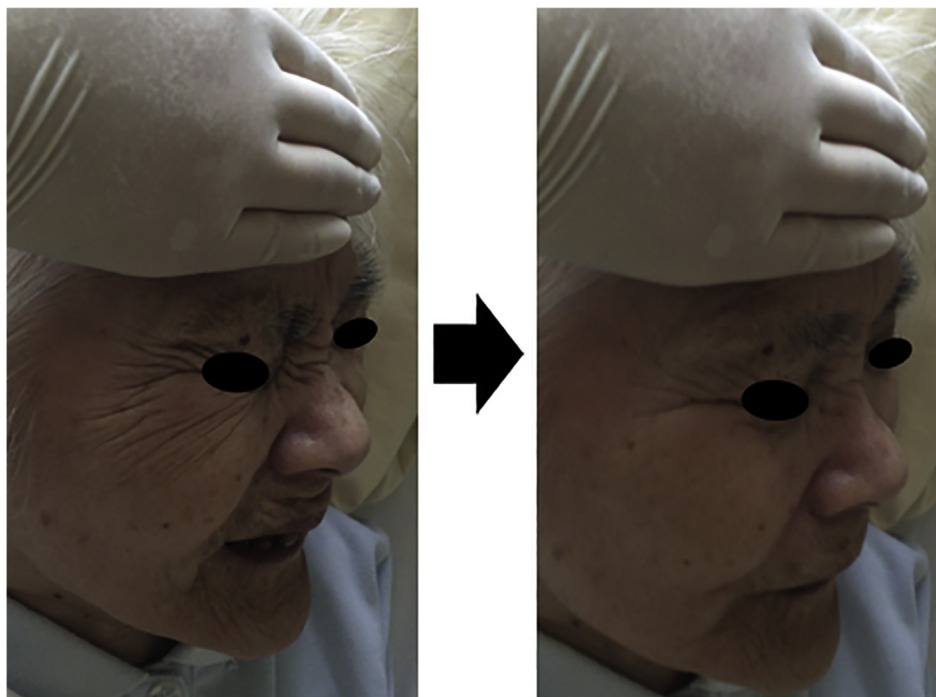


Figure 2 Methodology of the technique for mitigating tactile hypersensitivity (TMH). An area with TH was touched with the palm (left), and a finger was held there till the change in the participant's facial expression subsided (right). This method was repeated for all other areas with TH. The pictures are displayed with permission from the participant. TH: tactile hypersensitivity.

Table 1 Results of the baseline survey.

	Total (n = 14)	Intervention group (n = 7)	Control group (n = 7)	P-value
	Mean ± SD n (%)	Mean ± SD n (%)	Mean ± SD n (%)	
Sex, female	13 (92.9)	6 (85.7)	7 (100.0)	0.500
Age, years	90.6 ± 4.5	90.0 ± 3.5	91.1 ± 5.6	0.710
Nursing care level	4.9 ± 0.4	4.7 ± 0.5	5.0 ± 0.0	0.383
Ability to communicate	4 (28.6)	2 (28.6)	2 (28.6)	0.720
Number of areas with TH	5.4 ± 2.2	5.0 ± 2.4	5.7 ± 2.1	0.620
Number of present teeth	4.0 ± 7.5	5.1 ± 10.2	2.9 ± 3.9	0.710
Number of functional teeth	10.9 ± 11.9	15.1 ± 12.7	6.6 ± 10.2	0.259
Oral hygiene score	2.2 ± 2.1	1.2 ± 1.8	3.5 ± 1.9	0.111
Oral bacteria count, lv	3.6 ± 1.3	3.6 ± 1.5	3.6 ± 1.1	0.902
Halitosis	3.0 ± 0.7	3.3 ± 0.8	2.7 ± 0.5	0.259
BMI	18.7 ± 2.2	18.3 ± 2.0	19.1 ± 2.5	0.620
Nutritional intake process				
Fed orally	13 (92.9)	7 (100.0)	6 (85.7)	0.500
Gastrostomy tube	1 (7.1)	0 (0.0)	1 (14.3)	
Form of staple food consumed	2.4 ± 1.2	2.1 ± 1.2	2.7 ± 1.1	0.535
Risk of food spillage, yes	9 (69.2)	5 (71.4)	4 (66.7)	0.657
Intake of water-thickening fluids while hydrating, yes	10 (76.9)	5 (71.4)	5 (83.3)	0.563

TH, tactile hypersensitivity. lv, level. BMI, body mass index.

Discussion

Providing oral health care in nursing homes is often challenging, as many residents exhibit behaviors that are interpreted as a refusal of care. One cause of such behavior is thought to be TH.^{6,9,10} A desensitization technique has been developed previously to mitigate such behavior in children with special needs.¹⁶ In a field study investigating oral TH in older adults requiring long-term care,²¹ Tamura et al. reported that the TMH for adults in care and special-needs children follows the same methodology, even though the adults' degree of psychological refusal may be higher. Therefore, it was later suggested that the desensitization technique could also be applied to older adults as well.²²

However, there has been a lack of studies on the use of this technique in institutionalized older persons with TH.^{10,12,21} Indeed, only one study has assessed changes in TH in older adults following the use of a desensitization technique⁶; however, no comparisons were made with a control group. Thus, we conducted this pilot randomized controlled trial to elucidate the effect of TMH and routine oral care on TH in institutionalized older persons.

While the TMH used in this study was based on previous research, no prior studies have compared its effectiveness with a control group in reducing TH in dependent older adults. As a result, the required sample size to verify its effectiveness was not clear. The present trial was conducted on the target population with the intent of

Table 2 Effects of TMH on the face and oral cavity.

		Intervention group (n = 7)			Control group (n = 7)		
		Mean ± SD	Median	P-value	Mean ± SD	Median	P-value
Number of areas with TH	pre	5.0 ± 2.4	5	0.027*	5.7 ± 2.1	5	0.072
	post	2.4 ± 3.3	1		4.3 ± 2.5	4	
Oral hygiene score	pre	1.2 ± 1.8	0	0.317	3.5 ± 1.9	3.0	1.000
	post	0.8 ± 1.1	0		3.5 ± 1.9	3.0	
Oral bacteria count, lv	pre	3.6 ± 1.5	4	0.395	3.6 ± 1.1	3	0.066
	post	4.4 ± 1.7	5		4.6 ± 0.5	5	
Halitosis	pre	3.3 ± 0.8	3	0.039*	2.7 ± 0.5	3	0.157
	post	2.1 ± 1.6	2		3.0 ± 0.6	3	
BMI	pre	18.3 ± 2.0	18.0	0.317	19.1 ± 2.5	18.0	0.257
	post	18.0 ± 1.6	18.0		18.7 ± 2.8	18.0	
Form of staple food consumed	pre	2.1 ± 1.2	2	0.317	2.7 ± 1.1	2	1.000
	post	2.4 ± 0.8	2		2.7 ± 1.1	2	

TH, tactile hypersensitivity. lv, level. BMI, body mass index.

*Significance at 5%.

informing the sample size needed for a larger scale trial to be carried out in the future. The reduction in the number of TH-affected areas in the intervention group could be attributed to the increased stimulation of the face and oral cavity, which was lacking during routine oral care. Such stimulation may have facilitated the easier acceptance of other sensations in the same region. In our study, we made a distinction between the psychological refusal of care and refusal due to TH. Nonetheless, there was a significant reduction in the number of TH-affected areas in the intervention group, which confirmed the effectiveness of TMH in mitigating TH.

A significant reduction in halitosis was observed only in the intervention group. The results suggest that regular oral care and TMH by a dental hygienist may improve oral hygiene and perioral movement and self-cleaning. In the intervention group, the post-intervention oral hygiene score was lower than the pre-intervention score; however, this did not reach statistical significance. This result may have been due to the small sample size.

TH has been reported to cause not only oral care problems but also difficulties with food ingestion.⁹ Food ingestion training for children with special needs often commences with the elimination of TH.²² Therefore, in the present study, it was expected that mitigating TH would improve dietary intake and nutritional status in the intervention group; however, no significant differences were observed in the form of food consumed or BMI. These results may have been due to the lack of specific interventions targeting food consumption or the brevity of the study period.

There are limitations to this study. First, our TMH was based on a desensitization technique developed for use in children with special needs because no methods have been established for managing TH in institutionalized older persons. Consequently, a significant amount of research is needed to further optimize the use of TMH in this population. Second, there was no opportunity for the dental hygienist to interact with the control group during the intervention period. Thus, it is possible that the mitigating effect observed in the intervention group may have been due to stress alleviation from time spent with the dental hygienist rather than the elimination of TH. Third, the current study was not able to fully investigate the duration of treatment required to mitigate TH or the long-term effects of TMH after intervention cessation.

This study presented important findings concerning the relief of TH in older adults requiring long-term care. However, we do not believe that it provides sufficient evidence. Based on the present results, we plan to increase the sample size, extend the intervention period, and include an observation period after the end of the intervention. Additionally, we hope that the results of this study will serve as a basis for similar investigations in research institutes in other countries, and that a method of TMH will be eventually established for older adults requiring long-term care.

In conclusion, the results of this pilot randomized controlled trial suggested that TMH was effective in mitigating TH among institutionalized older persons. Based on these results, we plan to conduct further research to optimize and standardize the use of TMH in this population group.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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