

Research Article

## Effect of 12 Months of Oral Exercise on the Oral Function of Older Japanese Adults requiring Care

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### Abstract

**Objective:** The present study aimed to elucidate the relationship between oral exercise and oral function among older adults requiring care in the nursing facilities of Japan. **Methodology:** The subjects were adults aged 65 years or above, requiring care and admitted to the nursing facilities for older adults in Japan. The subjects performed the assigned oral exercises, which included the exercises focused on the neck, shoulder, upper limbs, tongue, lips, cheek movement, vocalization, and deep breathing, in groups under the guidance of medical welfare specialists. The exercises were performed for approximately 15 min once a day, three days a week, for 12 months. The oral function was evaluated prior to the commencement of the oral exercise sessions, and subsequently at three months, six months, nine months, and 12 months after the implementation of exercises. The evaluations included the Dysphagia Risk Assessment for Community-dwelling Elderly (DRACE), tongue pressure, and oral diadochokinesis (OD) assessments. **Results:** The oral function was evaluated in 20 older adults who performed the assigned oral exercises for 12 complete months. The average DRACE score prior to the commencement of the exercise sessions was  $2.55 \pm 0.64$ , while the DRACE score after 12 months of exercise implementation was  $2.60 \pm 0.49$ . The average value of tongue pressure prior to the oral exercises was  $21.02 \pm 2.27$  kPa, while that after 12 months was  $20.26$



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$\pm 1.76$  kPa. The average OD value for the “pa” syllable prior to the exercises was  $4.46 \pm 0.19$  times per second, while that after 12 months was  $4.64 \pm 0.19$  times per second. The OD value for the “ta” syllable prior to the exercises was  $4.61 \pm 0.22$  times per second, while that after 12 months was  $4.58 \pm 0.26$  times per second. The OD value for the “ka” syllable prior to the exercises was  $4.19 \pm 0.26$  times per second, while that after 12 months was  $4.04 \pm 0.22$  times per second. The paired one-way analysis of variance revealed no significant difference between the oral function evaluation values prior to and after the oral exercises. Conclusions: The results of the present study suggest that oral function in older Japanese adults requiring care could be maintained for 12 months by performing oral exercises.

### **Keywords**

Older adults requiring care; oral function; oral exercise

## **1. Introduction**

In older adults requiring care, oral function has a great influence on the quality of life [1, 2]. Therefore, in recent years, Japan has witnessed increased efforts to improve or at least maintain oral function in older adults. In this regard, oral exercises are employed as a general approach with older adults requiring care. The oral cavity comprises multiple muscle groups. Oral exercises, which primarily include muscle exercises, are believed to strengthen the perioral muscles, either structurally or functionally, thereby improving or maintaining oral function. Currently, oral exercises are applied widely in preventive nursing care in Japan. However, the current evidence in favor of the beneficial effects of oral exercise is scarce.

Previous studies conducted to evaluate the effects of oral exercise on oral function have demonstrated improvements in the Repetitive Saliva Swallowing Test (RSST) and oral diadochokinesis (OD), both of which are oral function evaluations, after the implementation of three months of intervention for older adults requiring care [3]. In another related study, long-term participation in an exercise program was observed to be positively associated with tongue motor function in independent older women [4].

While a three-month intervention for older adults living in nursing homes was demonstrated to improve lip closure and OD [5], the results of the food test conducted in the same study revealed no difference prior to and after the intervention [5]. In another study conducted with six older adults who performed oral exercises for three months, no improvement was observed in the RSST, OD, and food test results [6]. However, in a study conducted with 10 older adults using day service, who performed oral exercises for six months, improvement was observed in salivary wetness, cheek swelling, and tongue movement after the intervention, while the bite force quotient and awareness of swelling remained unchanged [7]. Yet another study reported that two months of intervention for the in-patients (mean age:  $79.2 \pm 9.0$  years) having an impaired swallowing function could not improve OD [8]. These findings suggest that due to differences in the existing studies in terms of the included subjects and evaluation methods, no consensus has been reached so far on the effect of oral exercises on oral function in older adults. In addition, there is a lack of sufficient relevant data

as the studies reporting interventions conducted for over six months or those including older adults requiring care as subjects are scarce.

In this context, the present study was aimed to elucidate the effect of oral exercises on the oral function in older adults requiring care by implementing long-term oral exercises and then comparing the oral function prior to and after the exercise implementation.

## **2. Methodology**

### **2.1 Research Subjects**

The subjects of the present study were older adults requiring care who were: aged 65 years or above, residing in one of the selected three nursing homes in Hyogo Prefecture, and able to communicate with each other. Consent to participate in the present study was a prerequisite for inclusion.

At the beginning of the study, a total of 88 older adults agreed to participate in the study and were willing to continue the oral exercises assigned to them throughout the study period of 12 months. However, during the period, certain participants performed the assigned oral exercises on less than three days per week and had to be excluded from the final analysis. Moreover, the subjects for whom the oral function could not be assessed were also excluded. In the end, the 20 participants who continued with the oral exercises for 12 complete months and for whom all oral function evaluation values could be assessed were included in the final analysis.

### **2.2 Study Protocol**

All the older adults requiring care included in the present study received guidance throughout the oral exercise sessions. The oral function was assessed prior to the commencement of the exercise sessions and then after the implementation of these oral exercises at different time points.

#### **2.2.1 Oral Exercises**

In order to select the oral exercises to be used in the present study, the literature was searched for the exercises presenting beneficial effects in relation to oral function [9]. The literature search sites consulted for this search were Ichushi-Web, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and MEDLINE (Medical Literature Analysis and Retrieval System On-Line). The preferences set for the search were "aged 65+ years", and the keywords used were "oral exercise" and "swallow exercise". The search revealed a total of 150 articles, which were then carefully studied. Among these, the case studies that were limited to specific diseases and the reports that did not discuss the relationship between oral exercises and oral function were excluded from the analysis. Finally, 14 relevant articles were retained. These articles suggested that the oral exercise sessions presented better effects when performed at least two days a week, for a long period of time (over two months), including a combination of multiple exercises - most of which were of approximately 15 min duration, and instructed by medical welfare professionals.

The literature review [9] identified exercises that could be performed and continued for a longer period regardless of the physical and mental condition of the older adults and with less burden on the caregivers. These exercises included the ones focusing on the neck, shoulder, front-to-back and

top-to-bottom upper limb region movements, tongue area motion, lip opening and closing motions, cheek inflation and deflation, vocal exercising, and deep breathing. The vocal exercise for the syllables “pa-ta-ka”, which improves the functions of the tongue, lips, pharynx, and larynx, and also prevents dysarthria and aspiration in aged people, was included [10]. Subsequently, these selected exercises were performed by older adults in groups under the supervision of medical welfare professionals, such as nurses, physiotherapists, and caregivers, for approximately 15 min once a day, for a minimum of three days a week [Figure 1].



**Figure 1** The oral exercise sessions being conducted.

### 2.2.2 Oral Function Evaluation

The oral function was evaluated prior to the commencement of the oral exercise sessions, and subsequently at three months, six months, nine months, and 12 months after the exercise implementation.

## **2.3 Survey Items and Oral Function Evaluation Methods**

The subjects’ basic attributes were obtained and their oral functions were evaluated.

### 2.3.1 Basic Attributes of the Subjects

The information regarding the age, gender, level of care required, the disease that raised the requirement for care, denture status, food form consumed, and the degree of independence of eating of all subjects was provided by the staff of the host institution. Japan currently has five levels of care requirements, with Level 1 indicating the lightest care requirement and Level 5 indicating the care requirement of the most critical degree.

### 2.3.2 Oral Function Evaluations

The following three evaluations were performed to determine the status of oral function in the subjects: risk of dysphagia, tongue pressure, and oral diadochokinesis (OD). The evaluations were conducted with the cooperation of three nurses.

**Risk of Dysphagia.** The risk of dysphagia was assessed using the Dysphagia Risk Assessment for Community-dwelling Elderly (DRACE) tool [11], which is a 12-item questionnaire developed to assess the decline in the swallowing function in community-dwelling older adults. This tool is also applicable to older adults living in nursing care institutions. DRACE contains the following questions: “Do you have fever sometimes?”; “Do you feel that having a meal has become more time-consuming than previously?”; “Do you experience difficulty in swallowing at certain times?”; “Do you sometimes experience difficulty in eating something hard?”; “Does food spill out of your mouth sometimes?”; “Do you choke at certain times during your meals?”; “Do you sometimes choke when you consume liquids such as tea?”; “Are there times when the foods you swallow flow back into your nasal tract?”; “Does your voice sometimes change after eating or drinking?”; “Does sputum form in your throat during meals or after eating/drinking?”; “Do you sometimes feel as though the food you consumed has got stuck in your chest?”; “Are there times when food or a sour fluid flows back from your stomach toward your throat?”. DRACE identifies the indications of dysphagia from the preparatory phase to the esophageal phase in a well-balanced manner. The likelihood of occurrence for each item is rated from 0 to 2; “occurs frequently: 0”, “occurs sometimes: 1”, and “never occurs: 2”. Finally, the risk of pulmonary dysphagia is determined based on the total score. An increase in the DRACE score represents an increased risk of swallowing function deterioration, with a score of 5 or higher suggesting the risk of pulmonary dysphagia [12]. Responses to all the items on the questionnaire provided by the subjects were recorded by the interviewing individuals.

**Tongue Pressure.** Tongue pressure was determined using the measuring instrument TPM-01 (manufactured by JMS Co. Ltd., Hiroshima, Japan). TPM-01 comprises a digital tongue pressure meter, a connecting tube, and a tongue pressure probe. The balloon section of the tongue pressure probe, which is pressurized automatically as predetermined for the measurement device, was inserted into the oral cavity above the tongue while the participant was seated. The participant is instructed to elevate the tip of the tongue to the palate using maximum force for 5-7 s, and during these few seconds, the intensity of the force with which the balloon was crushed is measured. Tongue pressure measurements were performed twice, consecutively, using the method described in a previous study [13], and the mean of the measured values was recorded as the tongue pressure level (kPa). In older adults aged  $\geq 70$  years, a tongue pressure level of 20 kPa or greater is considered appropriate [13].

**Oral Diadochokinesis (OD).** The oral function improvement program initiated by the Preventive Care Project of Japan regards OD as an indicator of the articulation function. In the present study, the participants were asked to alternately repeat the syllables “pa-ta-ka” as rapidly as possible, and while they did this, the frequency of the utterances was assessed. The syllable “pa” allowed the evaluation of lip functions, the syllable “ta” allowed evaluating the functions of the anterior region of the tongue, and the syllable “ka” allowed evaluating the functions of the posterior region of the tongue. These measurements were performed using an automatic counting OD-measuring

instrument named Kenkou-kun (manufactured by Takei Scientific Instruments) [14]. Vocalizations of 5-second duration were performed inside a quiet room, and from those five-second utterances, the one-second average utterance rate was calculated.

## **2.4 Data Analysis**

Oral functions in the older adults requiring care, who were able to perform the oral exercises for 12 complete months, were evaluated at five different time points: prior to the commencement of the oral exercise sessions, after three months, after six months, after nine months, and after 12 months of exercise implementation. The associations with the oral functions were analyzed by performing paired one-way analysis of variance. Further, based on the results, the older adults were categorized into two groups - those with improved or maintained oral function and those with declined oral function. The associations with the basic attributes (level of care required, the disease that raised the requirement for care, denture status, food form consumed, and the degree of independence of eating) were analyzed using the  $\chi$ -square test or the Fisher's exact probability test. The significance threshold was set at 0.05. The statistical software IBM SPSS version 26.0 was employed for conducting the statistical analyses.

## **2.5 Ethical Considerations**

The present study was conducted after obtaining consent for participation from all subjects as well as from the individuals affiliated with the surveyed nursing homes. The objectives and the procedure of the study, the optional nature of study participation, protection of personal information, and publication of the results of the study were thoroughly explained to all subjects and the individuals affiliated with the surveyed nursing homes.

The survey was approved by the Research Ethics Review Committee of the School of Nursing, Himeji University (2016-N005).

## **3. Results**

### **3.1 Basic Attributes**

The basic attributes of the subjects are presented in Table 1. The oral function evaluation values of the subjects were obtained prior to and after the exercises for 20 older adults (8 men and 12 women) who continued with the assigned oral exercises for 12 complete months. The average age of these subjects was  $84.0 \pm 7.7$  years. Among them, 9 subjects (45.0%) belonged to Level 1-2 of care requirement and 11 subjects (55.0%) belonged to Level 3-5 of care requirement. The diseases that raised the requirement for care (multiple answers) were dementia (in 9 subjects; 45.0%), heart disease (in 9 subjects; 45.0%), fracture (in 7 subjects; 35.0%), joint disease (in 5 subjects; 25.5%), cerebrovascular disease (in 5 subjects; 25.5%), and Parkinson's disease (in 2 subjects; 10.0%). Denture was absent in 4 subjects (20.0%), while there was partial denture in 2 subjects (10.0%) and full denture in 14 subjects (70.0%). The food forms consumed were normal food (5 subjects; 25.0%), soft food (2 subjects; 10.0%), chopped food (12 subjects; 60.0%), and mixer food (1 subjects; 5.0%). In terms of the degree of independence of eating, 13 subjects (65.0%) were completely independent, 4 subjects (20.0%) were partially assisted, and 3 subjects (15.0%) were supervised by a caregiver.

**Table 1** The basic attributes of the subjects (N = 20).

Items		M±SD or n (%)
Age (years)		84.0 ±7.7
Gender	Male	8 (40.0)
	Female	12 (60.0)
Level of care required	Level 1 to 2	9 (45.0)
	Level 3 to 5	11 (55.0)
Diseases that raised the requirement for care (multiple answers)	Dementia	9 (45.0)
	Heart disease	9 (45.0)
	Fracture	7 (35.0)
	Joint disease	5 (25.5)
	Cerebrovascular disease	5 (25.5)
	Parkinson's disease	2 (10.0)
Denture status	No denture	4 (20.0)
	Partial denture	2 (10.0)
	Full denture	14 (70.0)
Food form	Normal food	5 (25.0)
	Soft food	2 (10.0)
	Chopped food	12 (60.0)
	Mixer food	1 (5.0)
	Degree of independence of eating	Independent
	Partially assisted	4 (20.0)
	Be watched by caregiver	3 (15.0)

### 3.2 Oral Functions

The oral function evaluation values prior to the commencement of the oral exercise sessions, and subsequently at three months, six months, nine months, and 12 months after exercise implementation are presented in Table 2.

**Table 2** The oral function evaluation values prior to and after the implementation of the oral exercises among subjects (N = 20).

Oral function evaluation items	Period	M	F	p
DRACE (score)	Improvement	2.55 ±0.64	1.871	.124
	After 3 months	1.90 ±0.62		
	After 6 months	1.60 ±0.44		
	After 9 months	1.80 ±0.55		
	After 12 months	2.60 ±0.49		

Tongue pressure (kPa)	Before	21.02 ±2.27	3.988	.005**
	After 3 months	23.81 ±2.49		
	After 6 months	26.21 ±2.39		
	After 9 months	20.86 ±1.84		
	After 12 months	20.26 ±1.76		
OD (times per second)/pa/	Before	4.46 ±0.19	.521	.721
	After 3 months	4.38 ±0.21		
	After 6 months	4.58 ±0.23		
	After 9 months	4.65 ±0.21		
	After 12 months	4.64 ±0.19		
/ta/	Before	4.61 ±0.22	.558	.694
	After 3 months	4.31 ±0.23		
	After 6 months	4.62 ±0.21		
	After 9 months	4.61 ±0.29		
	After 12 months	4.58 ±0.26		
/ka/	Before	4.19 ±0.26	.564	.690
	After 3 months	3.86 ±0.24		
	After 6 months	4.10 ±0.21		
	After 9 months	4.06 ±0.28		
	After 12 months	4.04 ±0.22		

A paired one-way analysis of variance was performed.

\*\* :  $p < 0.01$

### 3.2.1 Risk of Dysphagia (DRACE scores)

The average DRACE score prior to the commencement of the oral exercise sessions was 2.55 ±0.64, with three subjects (15.0%) having a score of 5 or higher. The average score at three months after the implementation of the oral exercises was 1.90 ±0.62, with four subjects (20.0%) having a score of 5 or higher. The average score at six months was 1.60 ±0.44, with 2 subjects (10.0%) having a score of 5 or higher. The average score at nine months was 1.80 ±0.55, with two subjects (10.0%) having a score of 5 or higher. The average score at 12 months was 2.60 ±0.49, with five subjects (25.0%) having a score of 5 or higher.

### 3.2.2 Tongue Pressure

The average value of tongue pressure prior to the commencement of the exercise sessions was 21.02 ±2.27 kPa. Moreover, 10 of the 20 subjects (50.0%) could not exert a force of 20 kPa. The average value of tongue pressure at three months after the implementation of exercises was 23.81 ±2.49 kPa. At this time point, seven subjects (35.0%) could not exert a force of 20 kPa. The average value of tongue pressure at six months was 26.21 ±2.39 kPa, with seven subjects (35.0%) unable to exert a force of 20 kPa. The average value at nine months was 20.86 ±1.84 kPa, with 12 subjects



(60.0%) unable to exert a force of 20 kPa. The average value at 12 months was  $20.26 \pm 1.76$  kPa, with 11 subjects (55.0%) unable to exert a force of 20 kPa.

### 3.2.3 OD

The average OD value for the “pa” syllable prior to the exercises was  $4.46 \pm 0.19$  times per second. The average OD values for the “pa” syllable at three months, six months, nine months, and 12 months were  $4.38 \pm 0.21$  times per second,  $4.58 \pm 0.23$  times per second,  $4.65 \pm 0.21$  times per second, and  $4.64 \pm 0.19$  times per second, respectively.

The OD value for the “ta” syllable prior to the exercises was  $4.61 \pm 0.22$  times per second. The OD values for the “ta” syllable at 3 months, 6 months, 9 months, and 12 months were  $4.31 \pm 0.23$  times per second,  $4.62 \pm 0.21$  times per second,  $4.61 \pm 0.29$  times per second, and  $4.58 \pm 0.26$  times per second, respectively.

The OD value for the “ka” syllable prior to the exercises was  $4.19 \pm 0.26$  times per second. The OD values for the “ta” syllable at 3 months, 6 months, 9 months, and 12 months were  $3.86 \pm 0.24$  times per second,  $4.10 \pm 0.21$  times per second,  $4.06 \pm 0.28$  times per second, and  $4.04 \pm 0.22$  times per second, respectively.

### 3.3 Analysis of the Oral Function Prior to and After the Oral Exercises

Oral function evaluation values prior to the oral exercises and subsequently at three months, six months, nine months, and 12 months after the implementation of the oral exercises were analyzed by performing paired one-way analysis of variance (Table 3). No significant difference was observed in the DRACE scores and OD values among the different time points. The tongue pressure values, however, presented a significant difference ( $p < 0.05$ ) between the six-month time point and the other time points (Table 3). Oral function pre-exercise was compared with oral function at 12 months post-exercise, and based on this comparison, the participants were categorized into two groups - those with improved or maintained oral function and those with declined oral function (Table 4). The associations between the five oral function evaluation items and the basic attributes of the subjects were analyzed, and no significant differences were revealed ( $p > 0.05$ ).

**Table 3** Analysis of tongue pressure in the subjects ( $N = 20$ ) at different time points during the study period.

Period		Difference of the <i>M</i>	SE	<i>p</i>
After 6 months	Before	5.20	1.89	.013*
	After 3 months	2.41	1.48	.121
	After 9 Months	5.36	1.40	.001**
	After 12 months	5.96	1.99	.007**

A paired one-way analysis of variance was performed.

\*:  $p < 0.05$ ; \*\*:  $p < 0.01$

**Table 4** Differences in the oral function evaluation items in the subjects (*N* = 20) pre-exercise and at 12 months post-exercise.

Oral function evaluation items	Function	n (%)
DRACE (score)	Improvement	12 (60.0)
	Decrease	8 (40.0)
Tongue pressure (kPa)	Improvement	9 (45.0)
	Decrease	11 (55.0)
OD (times per second)/pa/	Improvement	11 (55.0)
	Decrease	9 (45.0)
/ta/	Improvement	11 (55.0)
	Decrease	9 (45.0)
/ka/	Improvement	10 (50.0)
	Decrease	10 (50.0)

#### 4. Discussion

The present study involved assigning oral exercises to older adults requiring care based on beneficial outcomes of these exercises reported in previous studies and subsequently assessing the effect of these oral exercises when continued for 12 months on the oral function in these adults.

Several methods are available for evaluating the oral function, and the selection of the most suitable method should be based on the subjects and the other situations in the research work undertaken. In the pre-exercise evaluation of the subjects in the present study, the RSST used in a previous study was quite difficult to implement as it was painful for the subjects to swallow the saliva due to decreased saliva volume in the oral cavity. Moreover, the lip closure force measurement method used in that study involved applying a plastic measuring plate to the lips, which caused brittleness and dryness in the lip skin, leading to the subjects suffering from damage and pain in the lips. Therefore, in the present study, the oral function was assessed using three different evaluations: dysphagia risk assessment using a questionnaire, tongue pressure measurement, and evaluation of the articulation function in terms of OD.

The results of the analysis of the oral function data obtained from these three evaluations revealed that no significant difference existed in the oral function evaluation values when comparing the values after 12 months to the respective values prior to the commencement of the oral exercise sessions. Therefore, it was clear that oral function in the older adults who performed oral exercises was maintained for 12 months. Although the changes occurring in the physical function due to aging vary with different individuals, it is reported that approximately 80% of the older adults gradually undergo a decline in their physical activities during daily living, beginning from the age of late 70s [15]. Moreover, it is stated that the symptoms of decline in the oral function appear as a subset of the overall decline in the physical function rather than the specific decline in the oral function due to aging [16]. The average age of the subjects in the present study was nearly 84.0 years. Therefore, it is probable that most of the subjects in the present study were in the phase of life where both their physical and oral functions were declining. Previous studies have also reported that among the age-related decline in different physical functions, the decline in the tongue pressure and OD of the “ka” syllable are particularly prominent [17]. According to these facts,

the finding of the present study that oral function in the subjects was maintained for 12 months could be considered a positive outcome of oral exercise. Therefore, it was inferred that oral exercise assisted in suppressing the decline in the oral function associated with aging.

The only exception was the tongue pressure value, which although exhibiting a significant improvement at six months, decreased thereafter. A previously reported community survey of older adults demonstrated that while the OD and RSST values tended to increase after three months of an intervention, both values decreased one year later [18]. A study [15] stated that the reason behind the decrease in the function evaluation value after one year was the inability to continue with the exercises, which was perceived as a difficult-to-develop habit. In the present study as well, the number of subjects at the beginning of the intervention was 88, while after 12 months, this number reduced to only 20. One of the main reasons for this discontinuation of exercises could be the decline in cognitive function. The intervention encountered various challenges during the 12-month study period, because of the age-related changes, not only in the oral function, rather in various other functions. In particular, the decline in cognitive function of the subjects hindered the performance of the assigned oral exercises and the appropriate evaluation of the oral function among the subjects. Therefore, it is suggested to maintain the cognitive function of the subjects to ensure the continuity of the intervention for oral function. Certain other barriers to the continuation of oral exercises have also been reported previously. For instance, it is stated that oral exercises are difficult to continue when performed alone, and are, therefore, recommended to be performed in groups [19]. However, older adults experience difficulty in continuing the exercises even in groups owing to their susceptibility to infections due to aging. Influenza infections are prevalent every year, particularly in the winter season, rendering such gatherings risky. Such gatherings are rendered further difficult and risky in the current situation of the widespread coronavirus disease 2019 pandemic. Therefore, it is imperative to develop ways to increase the sustainability of the interventions without the requirement of a group. Furthermore, it is difficult, in the long run, to improve the already deteriorated function of the oral cavity in older adults requiring care if their general health condition is weakened. Therefore, to maintain the oral function in older adults at an effective level, it is important to commence the oral exercises prior to the beginning of the functional deterioration due to aging.

The basic attributes of the subjects could also have contributed to the difference observed between the subjects with improved or maintained oral function and those with declined oral function. However, no such relationship was revealed in the present study, which could be due to the small sample size of the study. Moreover, the results obtained for the subjects who continued the exercises for 12 months were not compared to the results obtained for those who could not continue the oral exercises, which renders it difficult to generalize these findings. It is, therefore, important to conduct future studies with higher sample sizes and comparative analyses based on the exercise intensity.

It is important to note that approaches other than those involving oral exercises for improving oral function are also being explored. Examples of such approaches include repeated front vowel holding and swallowing [20], shaker exercise [21], and resistance training [22]. Certain such approaches do not even require performing specific tasks such as oral exercises. Although these other approaches might not have proven to be effective previously depending on the situation [23, 24], methods for improving or simply changing these approaches have been developed in recent years [25, 26]. Therefore, while it is necessary to maintain and improve oral function in older adults

requiring care using the established methods with demonstrated beneficial effects, it is also important to promote the development of novel approaches other than those involving oral exercises.

## 5. Conclusions

Oral function in older adults requiring care has a significant effect on the quality of life of these adults. The increasing realization that oral exercises could assist in improving oral function prompted the present study, which was aimed at comparing oral function prior to and after the implementation of oral exercises. The findings of the present study demonstrated that when older adults requiring care performed oral exercises regularly for a long duration, no deterioration was observed in their oral function even after 12 months, indicating maintenance of the oral function even after a year.

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## Author Contributions

The author did all the research work of this study.

## Competing Interests

The author has declared that no competing interests exist.

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