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Longitudinal Evaluation of Community Support Project to Improve Oral Function in Japanese Elderly

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Abstract

Change in oral function was evaluated longitudinally in elderly persons participating in an Exercises for Healthy Oral Function program implemented as part of the Long-Term Care Prevention Project. The participants comprised high-risk and healthy persons aged 65 yr or over. A questionnaire was used to classify them into two groups ('every day or sometimes' or 'rarely') at the end of the study for a comparison of change in repetitive saliva swallowing test (RSST) scores and oral diadochokinesis between 3 time points: at before, at immediately after, and at 1 yr after completion of the program. The average RSST score showed a decrease at 1 yr after intervention, but the difference was not statistically significant. Oral diadochokinesis showed a significant increase for all syllables upon completion of the program compared with at the beginning. This was followed by a significant decrease at 1 yr later compared with at the time of completion in the 'rarely' group for all syllables, but not in the 'every day or sometimes' group. In addition, the number of repetitions was significantly lower in the 'rarely' group than in the 'every day or sometimes' group for all syllables at 1 yr after completion. The results of the present study suggest that Long-Term Care Prevention Projects are necessary to maintain and improve oral function.

Key words: Long-Term Care Prevention Project—Community Support Project—Improvement in oral function—Longitudinal evaluation

Introduction

Long-term care insurance became available in Japan in 2000, at which time the number of elderly persons requiring such support or nursing care was 2,182,000. This number

increased significantly to 4,108,000 in 2005, and 50% of these were categorized as needing level 1 support or long-term care^{4,5)}. This made clear the need for preventive measures aimed at obviating the demand for such care and slowing the pace of decline where health had

already begun to deteriorate. Therefore, in 2006, the Long-Term Care Prevention Project was launched²⁰. This project focused on two areas of activity: (1) the Community Support Project; and (2) prevention of deterioration in health to the point at which support or nursing care would become necessary in the elderly¹⁰. The Community Support Project involved identifying persons aged 65 yr or older and living independently who would be candidates for the second, preventive program²¹. At the same time, another project was implemented aimed at elderly persons not considered to be at high risk of requiring such care. The aim in this case was to help them actively participate in society¹⁹. Here it should be noted that, unlike in other countries, measures aimed at reducing the need for long-term care are considered to fall within the field of public health in Japan.

A number of studies have evaluated the Long-Term Care Prevention Project^{7,8,15,18,19}, one of which noted that ‘maintenance and improvement was recognized in 96.5% of high-risk elderly’ after implementation of a program aimed at improving oral function¹⁹. Statistically significant improvements in swallowing, articulation, the ability to close the mouth, and tongue mobility were also reported^{6,8,15,18}. The effects of intervention on oral diadochokinesis were thus clear. Meanwhile, another study showed that improvement in the rate of oral diadochokinesis was particularly marked when the number of articulations at before intervention was low¹⁶. On the other hand, a number of issues have been raised regarding such programs, including with regard to their effect on swallowing function, the number of participants, and the implementation period¹⁴. However, all of these studies compared pre- and post-implementation results only, with none attempting a longitudinal evaluation.

The purpose of the present study was to conduct a longitudinal evaluation of change in oral function in elderly persons participating in a program to improve oral function as part of the Long-Term Care Prevention Project.

Participants and Methods

1. Participants

Participants comprised high-risk and healthy persons aged 65 yr or over participating in the Long-Term Care Prevention Project for the elderly in Kamogawa City, Chiba Prefecture, Japan.

The high-risk elderly were defined as those deemed at high risk of deterioration in oral health. The participants were considered to be at high-risk if 1) an affirmative answer was given to 2 or more of the 3 items regarding oral function provided in a questionnaire (“Is it more difficult to eat hard food compared with 6 months ago?”; “Do you sometimes choke over tea or soup?”; and “Do you notice dryness in the mouth?”); and 2) problems with oral hygiene were revealed by visual inspection at a subsequent examination by their physician, with the patient scoring less than 3 in the repetitive saliva swallowing test (RSST)²². Participants comprised 1,997 persons in 2007, 1,671 in 2008, 256 in 2009, and 276 in 2010.

A total of 46 high-risk elderly (8 men and 38 women; average age, 77.11 ± 7.24 yr) were enrolled in the program.

The healthy elderly comprised individuals who were judged not to be at high risk at the 2007 or 2010 health checkups carried out as part of the program, but who desired to participate in the program anyway.

A total of 16 healthy elderly (1 man and 15 women; average age, 71.9 ± 4.35 yr) enrolled in the program.

2. Research period

The research periods for the Community Support Project covered January to March 2008, December 2008 to March 2009, November 2009 to March 2010, and November 2010 to February 2011. A subsequent evaluation at 1 yr after each research period was carried out in February 2009, February and July 2010, and March 2011 and March 2012, respectively. Details of the program are shown in Table 1.

Table 1 Participants and program period

Program period	n	Number of Sessions	Evaluation at 1 yr after completion
Jan–Mar 2008	healthy elderly: 11 high-risk elderly: 10	5	Feb 2009
Dec 2008–Mar 2009	high-risk elderly: 14	6	Feb and Jul 2010
Nov 2009–Mar 2010	high-risk elderly: 12	5	Mar 2011
Nov 2010–Feb 2011	healthy elderly: 5 high-risk elderly: 10	4	Mar 2012

3. Evaluation of oral function

Evaluation of each item was conducted by 2 dentists specializing in dysphagia rehabilitation, one with 14 and the other with 16 years' experience of treating this condition. Oral function was evaluated by means of (1) the RSST^{12,13}, and (2) oral diadochokinesis^{1,11}. Here, instruction was given to pronounce /pa/, /ta/, or /ka/ for 5 sec as quickly as possible in order to determine repetition speed.

4. Program to improve oral function

The main aim of the program, which consisted of 5 or 6 sessions of 120 min each from 13:30 to 15:30 every 2 to 3 weeks over a 3-month period, was to improve oral function. Guidance was given to a group of patients at each session. Instruction was given by a dentist and dental hygienist on oral health care (tooth brushing and denture cleaning to be carried out 3 times a day) and physical exercises aimed at enhancing feeding and swallowing function, which included facial muscle and tongue exercises and salivary gland massage (Exercises for Healthy Oral Function)⁹. To improve articulation, participants were also required to perform the Chiba Model Exercises for Clear Speech in the Elderly³ and sing nursery rhymes. To confirm that the instructions were being followed, a calendar was prepared and distributed to the participants.

5. Comparison of before and after intervention under program and at 1 yr later

The RSST scores at before, immediately after the program, and 1 yr later were evaluated, together with change in oral diadochokinesis.

Adherence to the Exercises for Healthy Oral Function at 1 yr after program completion was evaluated by means of a questionnaire, which classified the participants into two categories based on frequency of exercise: 'every day or sometimes' (one or more times a week); or 'rarely' (none or a few times a month). Based on the results, differences in RSST score and change in oral diadochokinesis were compared between the two groups.

6. Statistical analysis

The Student *t* and Mann-Whitney tests were used to determine differences in average values. The Tukey, Games-Howell, and Steel-Dwass tests were used for a multiple comparison. The PASW Statistics 18.0 software package (SPSS Japan, Tokyo, Japan) and R version 2.15.0 (The R Foundation for Statistical Computing, Vienna, Austria) were used for the analysis. A level of less than 5% was considered to indicate statistical significance.

7. Ethical considerations

This study was approved by the Ethics Committee of Tokyo Dental College (Receipt number 187; approved on October 16, 2007). Before implementation, an oral or written

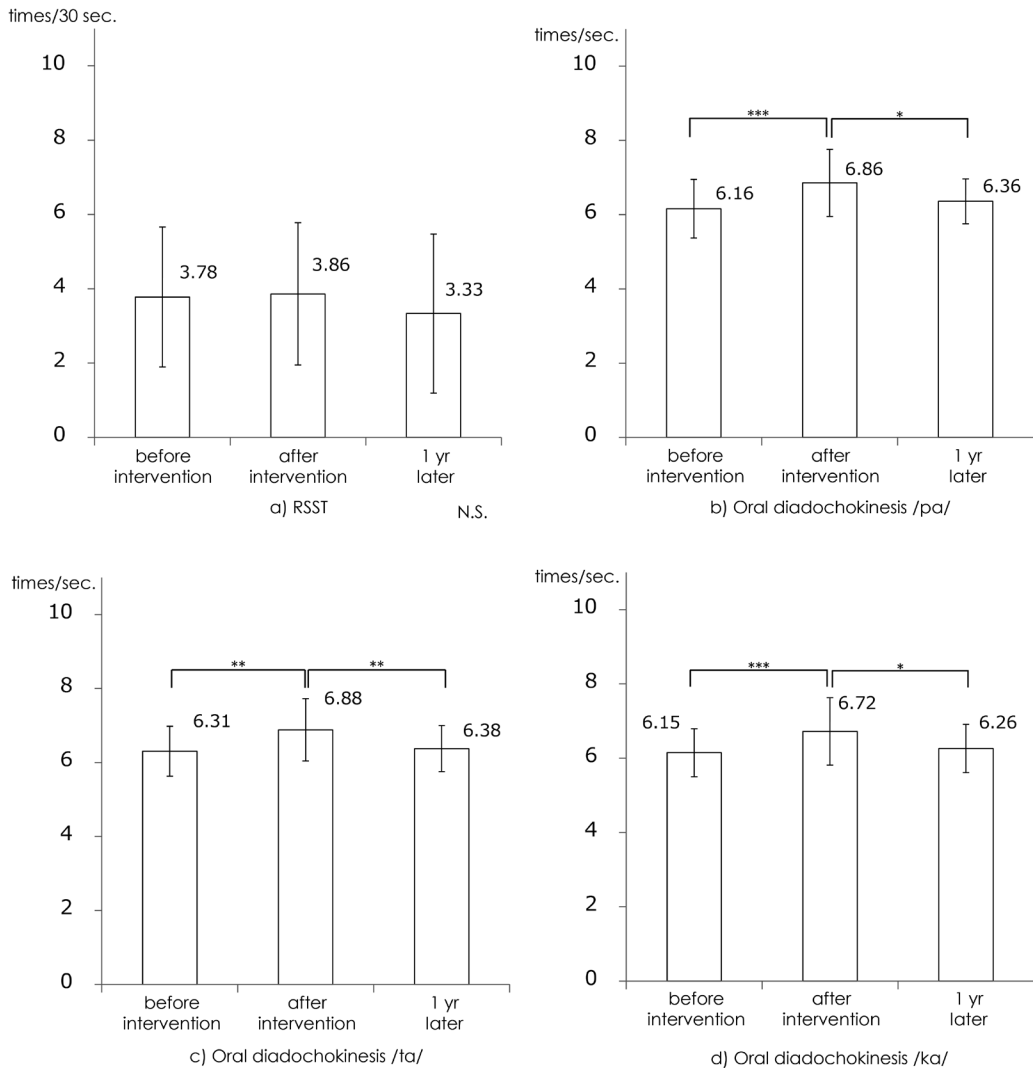


Fig. 1 Change in oral function at before, immediately after, and 1 yr after completion of program
 a) Tukey test b, c, d) Games-Howell test *: $p < 0.05$ **: $p < 0.01$ ***: $p < 0.001$

explanation was given to the participants with regard to the purpose and method of the survey, protection of personal information, freedom of consent, and withdrawal. Informed consent was obtained from all participants.

Results

A total of 62 participants were enrolled in

the study at before intervention. Of these, 26 dropped out over the course of 1 yr, leaving a total of 36 who were eligible for the statistical analysis: 27 high-risk and 9 healthy elderly comprising 4 men and 32 women with an average age of 74.83 ± 6.50 yr at before intervention.

Figure 1 shows change in oral function between at before, immediately after, and 1 yr after completion of the program.

The average RSST score was 3.78 ± 1.88 at before intervention, 3.86 ± 1.91 immediately after, and 3.33 ± 2.14 at 1 yr later. Although the score showed a tendency to decrease at 1 yr after intervention, the difference was not statistically significant.

The average score for oral diadochokinesis was as follows: /pa/: 6.16 ± 0.79 /sec at before intervention, 6.86 ± 0.90 /sec immediately after, and 6.36 ± 0.60 /sec at 1 yr later; /ta/: 6.31 ± 0.68 /sec at before intervention, 6.88 ± 0.84 /sec immediately after, and 6.38 ± 0.62 /sec at 1 yr later; /ka/: 6.15 ± 0.65 /sec at before intervention, 6.72 ± 0.91 /sec immediately after, and 6.26 ± 0.65 /sec at 1 yr later. The number showed a significant increase for all syllables upon completion of the program compared with at the beginning (/pa/: $p < 0.001$; /ta/: $p < 0.01$; /ka/: $p < 0.001$). This was followed by a significant decrease at 1 yr later compared with at the time of completion (/pa/: $p < 0.05$; /ta/: $p < 0.01$; /ka/: $p < 0.05$).

At 1 yr after completion of intervention, 2 participants (5.6%) answered that they had practiced the Exercises for Healthy Oral Function 'every day', 22 (61.1%) answered 'sometimes', and 12 (33.3%) answered 'rarely'.

The participants were subsequently divided into one of two groups depending on frequency of exercise ('every day or sometimes'; or 'rarely') and change in oral function compared between each time point. The results are shown in Fig. 2. No clear difference was observed in RSST score between the two groups at any time point.

In terms of oral diadochokinesis, no clear difference was observed in any of the three syllables between the two groups at before and immediately after the program. A significant increase was observed in the number of times /pa/ and /ta/ could be pronounced at the end of the program in both groups. No difference was observed in trend in either group in pronunciation of /pa/ and /ta/ between before and after intervention. The number of times /ka/ could be pronounced showed a significant increase in the 'every day or sometimes' group, but not in the 'rarely' group between at before and immediately

after completion of the program. At 1 yr later, this number significantly decreased in the 'rarely' group for all syllables, while the decrease in this number for the 'every day or sometimes' group showed no significant difference. In addition, the number of repetitions was significantly lower in the 'rarely' group than in the 'every day or sometimes' group for all syllables at 1 yr after completion.

Discussion

The results of the present study showed that oral function improved after completion of the program, but tended to decline at 1 yr later. This decline in performance was particularly marked in the results for oral diadochokinesis, with a significant decrease being observed in those who rarely practiced the Exercises for Healthy Oral Function as instructed during the year following program completion in comparison with those who practiced every day or sometimes. This indicates that the program does improve oral function, but only if adhered to with regularity. In one earlier study by Tomita *et al.*¹⁸⁾ targeting patients requiring support or nursing care, a transient increase in the RSST score as a result of intervention was followed by a decrease after an 11-month break. In their program, instruction was given 4 to 6 times a year by dentists and dental hygienists. In the present study, instruction was also given to continue the Exercises for Healthy Oral Function at home after program completion. Nonetheless, 33.3% answered that they had rarely done so at 1 yr later. This suggests that failure to habitually practice the prescribed exercises was a factor in the observed decrease in oral function at 1 yr after program completion in this group. In one study on a program to improve oral function¹⁴⁾, the participants reported difficulty in incorporating new habits into their daily routine. This suggests that it can be difficult to acquire new behaviors, and that the timing of such training must be carefully considered and such behavior repeatedly encouraged¹⁹⁾.

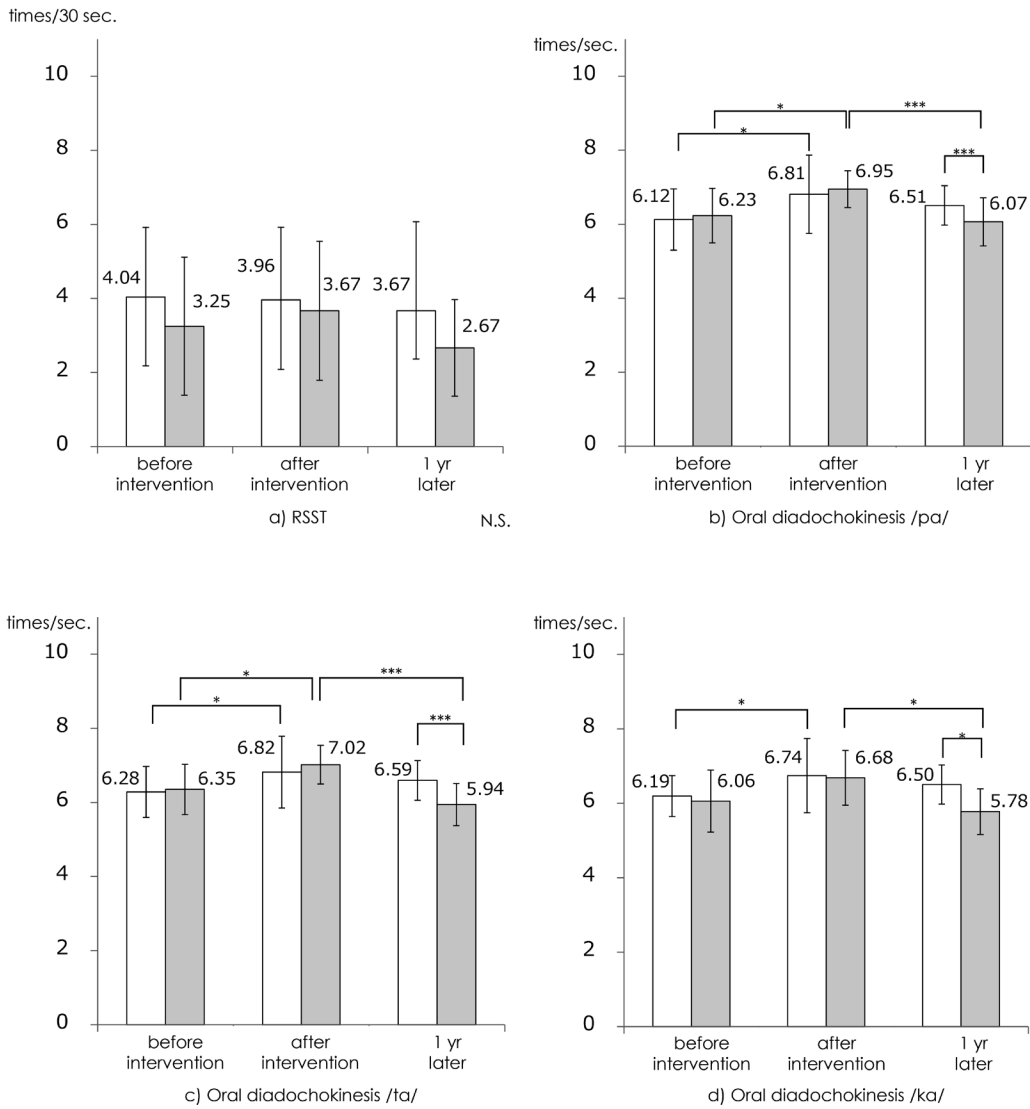


Fig. 2 Change in oral function at before, immediately after, and 1 yr after completion of program; participants divided into 2 groups: 'every day or sometimes' or 'rarely'

□: everyday/sometimes ■: rarely

a) Tukey test, Steel-Dwass test b, c, d) Games-Howell test, Steel-Dwass test *: $p < 0.05$ ***: $p < 0.001$

Usually limited to a 3- or 4-month period, Community Support Projects are initiated at the local government level, and follow-up after completion is at the discretion of the authority concerned. Independent follow-up by local government following program completion has been reported, however¹⁷⁾. The results of the present study suggest that long-

term care projects are necessary to maintain and improve oral function.

One limitation of this study is that the average age of the two groups (healthy and high-risk elderly) was different, which may have skewed the results. Therefore, further study is needed to clarify the present results.

The purpose of the present study was

to conduct a longitudinal evaluation of change in oral function in elderly persons participating in a program to improve oral function implemented as part of the Long-Term Care Prevention Project. The items to be evaluated were selected based on the recommendations of the Ministry of Health, Labour and Welfare²⁰⁾. However, here we focused on swallowing function and pronunciation, rather than attempting to carry out a more general evaluation of oral function. Further study is needed to broaden the range of such items evaluated, including amount of saliva and chewing ability.

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