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Effects of laughter yoga on oral motor and swallowing function of older adults with dementia

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Abstract

This study aimed to investigate the effects of laughter yoga on oral functions in older individuals with dementia. One male and 7 female individuals (mean age: 87.3 ± 3.0 years) participated in this study. Each session of the laughter yoga program lasted for approximately 20 minutes, and participants underwent eight identical sessions in two weeks. Before and after the laughter yoga program, participants underwent oral moisture measurement, oral diadochokinesis (OD) test, and repetitive saliva swallowing test (RSST). The OD test measured the number of times participants could pronounce syllables of /pa/, /ta/, and /ka/ in 5 seconds. Before intervention, participants could pronounce /ta/ and /ka/ 2.7 and 3.7 times, respectively, whereas after intervention, the results improved significantly to 4.3 and 4.5 times, respectively. No significant changes were noted for /pa/. For results of oral moisture measurements and RSST tests before and after intervention, no significant changes were noted. These results suggest that laughter yoga programs primarily improve the oral motor function rather than swallowing function.

Introduction

The importance of the effects of laughter on health has recently attracted attention [1,2]. The reported psychological effects of laughter include improved coping with stress [3], reducing loneliness/anxiety [4], and improving depression and insomnia [5]. In addition, laughter has been reported to have other effects, such as improving immune function [6,7], relieving pain [8], and suppressing blood glucose elevation [9].

Similar to spontaneous laughter, simulated laughter is also considered to have therapeutic effects [10]. Laughter yoga is a way to induce simulated laughter and was developed in 1995 by the Indian physician Madan Kataria and the yoga instructor Madhuri Kataria. Laughter yoga combines laughter exercises and yoga-style breathing methods to induce simulated laughter [11]. It has been reported that laughter yoga stimulates parasympathetic nerves and produces the psychological effects of reducing tension, anxiety, and panic symptoms [12]. In addition, a previous report has documented a significant decrease in the salivary amylase activity level in older individuals after laughter yoga [13].

As described above, previous studies on the effects of laughter yoga have mainly focused on stress relief. Therefore, the present study focused on improvement in oral functions in older individuals with dementia. Swallowing impairment is a major health care problem in older adults [14]. Laughter promotes the muscle movement of facial expression and vocalization [15]. Loud laughter may improve swallowing function because many of the same oral structures and mechanisms are used for speech and swallowing [16]. Older individuals suffer from various aging-associated oral function problems, such as reduced motor function of the tongue [17], deteriorated chewing ability due to loss of teeth [18,19], decreased saliva secretion [20], and delay of swallowing reflex [21]. The anatomic and physiologic changes in the pharyngeal area and oral tract occur with aging, affecting swallowing impairment [16]. Consequently, older individuals are prone to aspiration [22]. The swallowing function is particularly deteriorated in older individuals with dementia. In this study, we investigated the efficacy of a laughter yoga program for maintaining and improving the swallowing function in older individuals with dementia.

Materials and methods

Participants

Participants were residents of a group home nursing facility (GH) in Japan that could accommodate individuals with dementia. Nine residents-consented to participation in the study after oral and written explanations of the purpose were provided to them and their families. Study participation was voluntary, participants were guaranteed that there would be no disadvantages based on whether they participated in the study, and they could withdraw consent at any time. Given the fact that participants were older and had dementia, explanations were repeatedly provided, and consent was verified after the intervention started.

Outline of laughter yoga program

The events of the laughter yoga program are outlined in table 1. The program comprised 15 laughter events, and each laughter event lasted approximately 1–2 minutes. The total duration of the program was approximately 20–25 minutes. We constructed the program with simple actions that could be easily performed by older individuals. Visual aids, such as drawings and photographs, were used to help older individuals with dementia understand the program contents.

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Table 1. Laughter yoga program

Program contents
1. Breathing out
2. Body rocking and neck movement
3. Greeting laughter
4. Calcutta laughter
5. The magic of returning to childhood
6. Food laughter (takoyaki)
7. Eating laughter (chosen from the menu selection of noodles)
8. Lotus laughter
9. Food laughter (umeboshi)
10. Soft cream laughter or Baby laughter (daily)
11. Mix juice laughter
12. Gargle laughter
13. Singing traditional songs (moshimoshikameyo)
14. Body rocking and neck movement (same as 2)
15. Breathing out (same as 1)

Procedures and ethical considerations

Before intervention, we investigated basic attributes, cognitive function, and oral functions of the participants. The subjects participated in the laughter yoga program for 8 days. Each session of laughter yoga was held before lunch in a living room of GH. We checked with the facility staff to determine whether residents could participate in the laughter yoga program. The same items were evaluated during pre- and post-intervention examinations.

For the safety of participants, nurses were available to take care of any participant who experienced a change in physical condition. This study was conducted after approval was obtained from the Institutional Review Board of Ishikawa Prefectural Nursing University.

Cognitive function

The cognitive function of participants was measured with the Hasegawa Dementia Scale-Revised (HDS-R). HDS-R was established in Japan and has been used as a general diagnostic test for dementia, similar to the Mini-Mental State Examination (MMSE). The correlation between HDS-R and MMSE has been reported to be 0.78–0.87 [23]. HDS-R comprised simple questions, and the possible highest score was 30 points. Participants were requested to provide details regarding age, date, and location; repeat three words; consecutively subtract 7 from 100; recall numbers backward; recall three words; recall five objects; and describe names of vegetables. The number of correct responses was recorded and converted to an HDS-R score. Dementia was defined as an HDS-R score of ≤ 20 points [24].

Oral wetness

Oral moisture levels were measured using an oral moisture-checking device (Mucus®; Life Co., Ltd.). The device was vertically placed on the tongue dorsum of participants, and oral moisture levels were read while applying a constant level of pressure to the device [25,26].

Oral diadochokinesis

Oral diadochokinesis (OD) was measured using an oral cavity function testing device (TKK 3350 Kenkokun, Takei Scientific Instruments Co., Ltd.). We measured the number of times participants could pronounce /pa/, /ta/, and /ka/ in 5 seconds. To measure OD, participants repeated the /pa/ syllable as rapidly as possible for 5 seconds, and the number of articulations was recorded using a digital counter. The same procedure was repeated for syllables /ta/ and /ka/ [27].

Repetitive saliva swallowing test

The repetitive saliva swallowing test (RSST) was used to evaluate the ability to voluntarily repeatedly swallow, which was simple and relatively safe to perform. Participants were placed in a resting position, and the inside of the participant's mouth was moistened with water. They were instructed to repeatedly swallow air, and the number of swallows achieved was monitored and counted by the movement of laryngeal elevation, either visually or by palpating [28]. In this study, an investigator placed three fingers on the laryngeal prominence and the site corresponding the hyoid bone of participants and counted the movements of the laryngeal prominence for 30 seconds. In this 30-second period, participants swallowed saliva as many times as possible.

Statistical analysis

The statistical software program SPSS 13.0 J was used for analyses. For indicators of swallowing and cognitive functions, comparisons were made between values before and after the laughter yoga program intervention using paired t-test. A P value of ≤0.05 was considered statistically significant.

Results

The characteristics of participants are summarized in table 2. Individuals who participated in six or more sessions of the laughter yoga program were included in the pre-intervention and post-intervention evaluations. One individual who participated in only three laughter yoga sessions was excluded from the post-intervention evaluation. For OD, comparisons were made after excluding participants whose pre-intervention results were not available; therefore, six participants were included in analyses for /pa/ and /ka/ and seven were included in analyses for /ta/. For RSST, one participant was excluded due to refusal of the test, and another was excluded because of the inability to understand instructions due to cognitive impairment; thus, six participants were included in the analyses. The analysis set comprised one male and seven female participants with a mean age of 87.3 ± 3.0 years (84–91 years). Participants included in the analyses had an average of 5.5 ± 9.4 existing teeth, and 6 of them were denture users.

Oral functions before and after laughter yoga intervention are summarized in table 3. Pre- and post-intervention oral moisture levels were 29.5 ± 2.3 and 29.1 ± 1.5, respectively, indicating no significant change. In OD evaluation, repetition times for /ta/ were 2.7 ± 1.6 before intervention and 4.26 ± 2.08 after intervention. For /ka/, repetition times were 3.7 ± 0.9 before intervention and 4.5 ± 1.3 after intervention, demonstrating significant improvement ($P < 0.05$). However, pre- and post-intervention repetition times for /pa/ were 3.9 ± 1.9 and 4.6 ± 1.5, respectively, with no significant difference. Pre- and post-intervention RSST times were 5.0 ± 2.8 and 5.2 ± 2.6, respectively, with no significant difference.

Discussion

An oral moisture study using an oral moisture-checking device [26] showed that both sensitivity and specificity were 80% when value ≥ 29.6 was considered normal, ≤ 27.9 was considered xerostomia, and 28.0–29.5 was considered the boundary zone. In the present study, the mean oral moisture level was 29.1–29.5, indicating a somewhat dry level. In a previous study involving community-dwelling older individuals

Table 2. Characteristics of participants (n = 8)

Age (years)	87.3 ± 3.0 (84~91)
HDS-R*	8.6 ± 7.6 (1~16)
Number of remaining teeth	5.5 ± 9.4 (0~28)
Gender, n (%)	Male 1 (12.5%) Female 7 (87.5%)
Denture use, n (%)	All denture 4 (50.0%)
	Partial denture 2 (25.0%)
	No denture 2 (25.0%)
* HDS-R; Hasegawa Dementia Scale-Revised with 7 participants	

Table 3. Pre- and post-intervention of laughing yoga

		n	Mean (± SD)	P-value
Mouth moisture	Pre-intervention	8	29.5 (± 2.3)	0.36
	Post-intervention	8	29.1 (± 1.5)	
OD/pa/ (repetitions/ s)	Pre-intervention	6	3.9 (± 1.9)	0.13
	Post-intervention	6	4.6 (± 1.5)	
OD/ta/ (repetitions/ s)	Pre-intervention	7	2.7 (± 1.6)	0.02*
	Post-intervention	7	4.3 (± 2.1)	
OD/ka/ (repetitions/ s)	Pre-intervention	6	3.7 (± 0.9)	0.02*
	Post-intervention	6	4.5 (± 1.3)	
RSST (repetitions/30 s)	Pre-intervention	6	5.0 (± 2.8)	0.18
	Post-intervention	6	5.2 (± 2.6)	
*P < 0.05				

[29], mean repetitions/s for /pa/ and /ka/ were 6.2 ± 0.9 and 5.8 ± 0.9, respectively. Comparing a group with mild cognitive impairment (MCI) (n = 930) and control group (n = 2669), mean repetitions for /pa/ were 5.9 ± 0.9 in and 6.2 ± 0.9 and those for /ka/ were 5.5 ± 0.9 and 5.7 ± 0.9 in the MCI and control groups, respectively. Individuals who were diagnosed with dementia were not included in MCI group in the study by Watanabe et al. [29]. In contrast, all participants in the present study were diagnosed with dementia, indicating that the participants in this study had more advanced cognitive impairment than those in the study by Watanabe et al. [29]. For participants in our study, the mean OD/pa/ and OD/ka/ after intervention improved significantly to 4.6 ± 1.5 and 4.5 ± 1.3, respectively. These scores were worse than those of older adults in the MCI group in the study by Watanabe et al. (2018) [29].

For RSST, participants who could swallow saliva at least three times in 30 seconds were considered as normal [28]. In the present study, the mean number of times of swallowing before intervention was 5.0, indicating that swallowing functions were normal. Taken together, participants in the present study had normal swallowing function, a boundary level of oral moisture, and a deteriorated vocalization function that was lower than the level in healthy older individuals or in older individuals with MCI.

Although the vocalization function before intervention was lower than that of healthy older individuals, results for /ta/ and /ka/ on the OD test improved significantly as a result of the laughter yoga program. The /pa/, /ta/, and /ka/ tasks in the OD test were performed to evaluate functions of the lip and anterior and posterior motions of the tongue. Yamada, et al. [30] demonstrated a significant relationship between OD scores and masticatory performance, especially chewing ability [30]. Therefore, the improvement in OD shown in this study may lead to the improvement in the masticatory-swallowing ability of older individuals with dementia.

Participants might be able to move the tongue actively through baby laughter in the laughter yoga program. This may have contributed to significant improvements in the /ta/ and /ka/ tasks in the OD test results. The baby laughter event in the laughter yoga program includes laughter that is used when cradling a baby, in which the tongue is quickly and actively moved in the mouth. This movement may improve motor function when pronouncing syllables of /ta/ and /ka/ rather than that when pronouncing syllables of /pa/.

According to the International phonetic alphabet [31], "p," "t," and "k" are classified as bi-labial, alveolar, and velar, respectively. The articulation of "ta" and "ka" reflects movement in the oral cavity, but the articulation of "pa" reflects the motor function of the lip. This difference type of articulation may be associated with our result on of "pa," which indicated an insignificant change by our intervention. However, as the sample size of this study was small and the statistical power was not sufficient to detect a small difference, we are unable to confirm whether laughter yoga is effective for "pa." Therefore, future studies with a larger sample size exploring the improvement in "pa" articulation by laughter yoga are warranted.

Conclusion

In older individuals with dementia whose oral moisture levels and swallowing functions were nearly normal, the laughter yoga program improved the deteriorated motor function of the tongue and lip significantly rather than the swallowing function.

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Conflict of interest

The authors have no conflict of interest to declare.

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