

# Clinical Utility of the Twiddle Muff for Older Patients with Dementia

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## Abstract

**Objective:** In the United Kingdom, the twiddle muff is used in dementia care. The purpose of this study was to examine the clinical usefulness of the muff in treating psychological stress in older people with dementia, and to examine how to use it in dementia care.

**Methods:** Eighteen patients aged  $\geq 65$  years with a "level of independence in activities of daily living for older people with dementia" of I–III who were using long-term care insurance services were included in the study. Participants were asked to freely touch the muff for 20 minutes, and measurements of the salivary amylase activity levels and mood inventory (MI) taken before and after the intervention were compared.

**Results:** The mean salivary amylase activity values tended to decrease after the intervention, although this was not statistically significant, and no significant changes were observed in the five MI factors: "nervousness and excitement," "exhilaration," "fatigue," "depression," or "anxiety." The female participants shared stories about their childhood or family during the intervention, and provided positive feedback on the muffs.

**Conclusions:** Muffs may promote life reviews and positively affect the mental health of older people with dementia.

**Key words:** dementia, life review, mental health, psychological stress, twiddle muff

## Abbreviations:

**MI:** mood inventory

**BPSD:** behavioral and psychological symptoms of dementia

**QOL:** quality of life

**UK:** United Kingdom

## Introduction

Owing to the aging population, the number of people with dementia in Japan is expected to reach approximately 7 million by 2025, and 1/5 older people will develop dementia [1]. The behavioral and psychological symptoms of dementia (BPSD) increase stress levels in these patients and their families and affect their quality of life (QOL). Although the development and dissemination of rehabilitation and care models for BPSD are expected [2], there are insufficient reports on the effectiveness of non-pharmacological interventions for BPSD [3,4].

People with dementia are said to feel strong anxiety and loneliness about the change in their connections and relationships with those close to them owing to the loss of language and communication skills and of their previous roles. Reduced communication deepens the sense of isolation among people with dementia, affecting their mental health and leading to the emergence of BPSD [5]. Kimura et al. [6] reported that communication with validation as an emotional intervention in older people diagnosed with Alzheimer's disease and emerging BPSD significantly improved salivary amylase activity levels and face scale ratings and that salivary amylase activity levels were elevated when BPSD were emerging.

In the United Kingdom (UK), the twiddle muff (muff) is widely used as a form of dementia care. The muff is a thermal protection device made of tubular knitted fabric with ribbons, buttons, and other accessories sewn on the inside and outside, and it is warmed by inserting hands from both sides. Twiddle means "to fiddle with the hands," and touching or inserting hands into the muff provides a sense of security. In the UK, there seems to be a custom wherein volunteers and housewives who enjoy knitting make muffs and gift them to local hospitals and facilities for older people. Older people with dementia reportedly feel a sense of security and can reduce their mental stress by touching the muffs. However, we have found no reports verifying the effectiveness of muffs.

In Japan, since 2018, dementia support groups have been making muffs and giving them to nearby older people's care facilities [7], with the aim of bringing smiles to older people with dementia and expanding new connections with local people through the creation of the muffs. Suzuki and Togashi [8] reported the use of muffs as an alternative to mitten-type restraint belts in an effort to minimize the use of physical restraints in patients who refuse treatment or care due to BPSD or delirium. However, the use of muffs in dementia care may be limited, and their clinical usefulness and utilization have not been fully explored. We hypothesized that if the usefulness of muffs in improving the mental health of older people with dementia could be demonstrated, it would lead to higher-quality evidence-based dementia care practices. Therefore, we conducted this study to examine the clinical usefulness of muffs in treating mental stress and mood in older adults with dementia.

## Methods

### 1. Study Participants

#### (1) Eligibility and Exclusion Criteria

Persons aged  $\geq 65$  years who were certified as requiring long-term care and using long-term care insurance services (geriatric health care facilities, day rehabilitation, and day care), and whose "level of independence in daily living for older people with dementia" was between I and III, were eligible for inclusion. Patients who had difficulty in daily conversations such as answering simple questions; motor or sensory impairment of the fingers due to central or peripheral neuropathy; skin diseases such as ringworm; severe cardiovascular disease; severe mental illness; or were otherwise judged by the attending physician or nurse in charge as having difficulty participating in the study, were excluded.

#### (2) Target Number of Participants

The change in salivary amylase activity was defined as the primary outcome, and the required sample size was calculated to be 18 patients, by setting the effect size to 20.0, the standard deviation (SD) of the result to 21.0, alpha error to 0.05, and power ( $1-\beta$ ) to 0.8, referring to previous studies. The target number of participants was set to 20, bearing in mind those who might be excluded from the analysis population. Data were collected between September 2021 and December 2021.

#### (3) Evaluation Items:

##### • **Physiological Index:** Salivary Alpha-Amylase Activity Level

Heart rate variability, electroencephalogram, and salivary cortisol levels are objective evaluation indices of mental stress, but there are many problems in using these indices in clinical situations because the measurement methods are complicated and the analysis is time-consuming [9]. In this study of older people with dementia, we used salivary amylase activity as a stress marker as it has a relatively small physical and mental burden on participants and rapid changeability. The salivary amylase level is an indicator of sympathetic nervous system activation [10-12]. Salivary amylase activity increases in response to unpleasant stimuli and decreases in response to pleasant stimuli; it is thus used as an evaluation index for physical and mental stress responses, to discriminate between pleasant and unpleasant stimuli.

Samples for the measurement of salivary amylase activity were collected at least 30 minutes after meal consumption and after the oral cavity had been thoroughly cleaned by brushing of the teeth. In this study, a special test tip was placed under the tongue of the study participants for 30 seconds to collect saliva, and salivary amylase activity values were measured using a salivary amylase monitor (Dry Clinical Chemistry Analyzer, Nipro Corporation, Osaka, Japan).

**• Psychological Index: Mood Inventory (MI)**

The mood inventory (MI) is a self-administered questionnaire that objectively and multidimensionally measures changes in mood over a short period and is intended to measure an individual's temporary mood state [13]. It consists of a total of 40 items, and evaluates five factors: "nervousness and excitement," "exhilaration," "fatigue," "depression," and "anxiety," and the answers to each item are given using a four-point scale ranging from "not at all applicable" to "very applicable." The content of the items was easy to understand using expressions used in daily life. Higher scores indicated stronger emotions. The researcher read the questions orally, listened to the participants' verbal and pointing responses using response cards, then completed the questionnaire as a proxy.

**(4) Intervention Method**

The researcher prepared a muff and handed it to the participants, who were instructed to touch it freely for 20 minutes in a sitting position in a stable chair in a private room. During the intervention period, the researcher stayed out of the participants' sight to avoid visual and auditory stimuli. If participants spoke to the researchers, their content was recorded. Eating and drinking was prohibited during the study period.

**(5) Analysis Method**

The Wilcoxon signed-rank test was used to compare the mean, SD, and maximum and minimum values as summary statistics before and after the intervention. The significance level for the test was set at two-sided  $p < 0.05$ , and IBM SPSS Ver. 26 (IBM Corp, Armonk, NY, USA) was used for the analysis.

**(6) Ethical Considerations**

The participants and their families were informed in writing and orally of the purpose of the study, that they would not be disadvantaged by cooperating in the study, that it could be interrupted or terminated, that the results would be reported in conference presentations and papers and would be treated in an aggregated manner, that personal information would not be disclosed, and that all data would be deleted and destroyed after the results were published. After publication of the results, all data were deleted and discarded. This study was reviewed and approved by the Ethics Review Committee of the Precision Healthcare Research Organization (Approval No. 21001-3).

## Results

### (1) Summary of Study Participant Characteristics (Table 1)

The average age of the 18 participants was 84.4 years (range: 67–96 years), 15 were female and 3 were male, and 6 were ranked as I, 7 as IIa, and 5 as IIb in terms of their level of independence.

### (2) Changes in Parameters Measured Before and After the Intervention (Table 2).

The mean change in salivary amylase activity level (after intervention - before intervention) was -20.1 (range: -130.0–59.0, SD 52.7) kU/L. Comparing the mean salivary amylase activity levels before and after the intervention, (55.2 (SD 14.4) before vs. 35.1 (SD 8.6) after the intervention), there was a decreasing trend, but no statistically significant change in all five MI factors: nervousness and excitement, exhilaration, fatigue, depression, and anxiety. No statistically significant changes were observed.

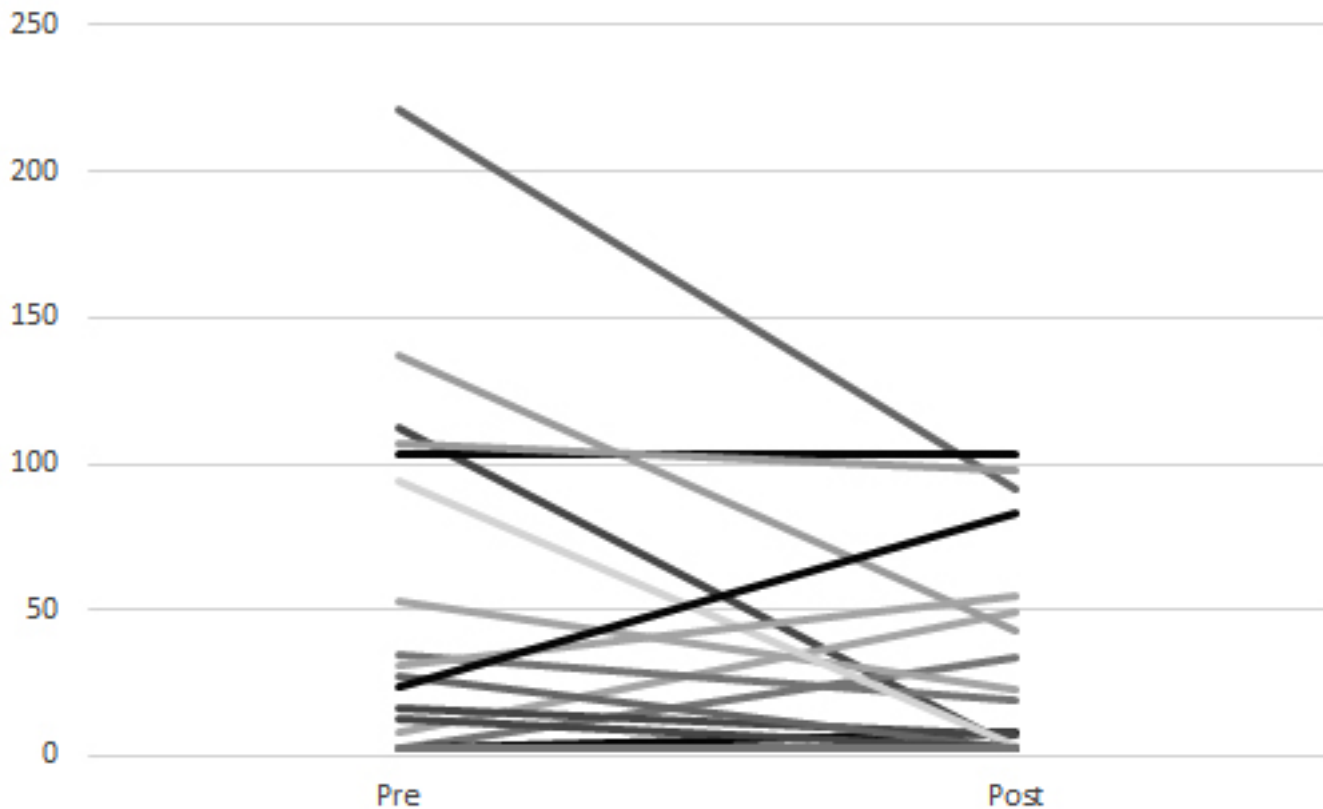
**Table 1. Summary of participant characteristics (N=18)**

Age	Average (range)	84.4 (SD9.2)	(67–96)
Gender	Female	15	(83.3%)
	Male	3	(16.7%)
Types of Dementia	Alzheimerstype	4	(22.2%)
	Vascular type	6	(33.3%)
	Unknown	8	(44.4%)
Degree of Independence in Daily Living for Older People with Dementia	I	6	(33.3%)
	II a	7	(38.9%)
	II b	5	(27.8%)
Degree of Independent Living for Older People	1	5	(27.8%)
	2	6	(33.3%)
	3	3	(16.7%)
	4	3	(16.7%)
	5	1	(5.6%)

**Table 2. Changes in parameters measured before and after the intervention (average values)**

	Before	After	p*
salivary amylase activity level (kU/L)	55.2 (SD59.2)	35.1 (SD35.5)	0.201
MI nervousness and excitement	13.1 (SD4.0)	12.1 (SD2.1)	0.253
MI exhilaration	20.0 (SD4.1)	19.6 (SD3.5)	0.614
MI fatigue	14.3 (SD3.8)	15.2 (SD4.0)	0.324
MI depression	12.3 (SD3.7)	12.3 (SD4.5)	0.964
MI anxiety	17.8 (SD4.7)	15.9 (SD4.4)	0.064

\* Wilcoxon signed-rank test; MI: Mood inventory

**Figure 1: Changes in salivary amylase levels of each participant pre and post intervention****(3) Participants' Narratives During the Intervention**

The study participants' acceptance of the muff was good, and positive comments were made about it, such as "it's warm," "it feels good," and "it's cute." None of the participants refused to touch the muff or was disturbed during the intervention.

As a rule, during the intervention, the researcher was only to respond and listen to the research participants when they spoke to them, and they stood behind the participants. However, many of the female participants talked to the researcher about episodes related to yarn handicrafts, their childhood, and their families. Most narratives were positive reflections of past events and memories. Table 3 and Figure 2 present the state of the research participants and the content of their narratives, respectively.

**Figure 2: Intervention in progress**

Table 3. Research participant state and narrative content

70's female	She talked about how she used to do yarn handicrafts and make muffs before she got sick, her memories of her mother when she was a child, and her own son.
70's male	He fell asleep with his hand in the muff. He occasionally moved his hand inside the muff.
80's male	He talked about the work of a community councilor, both the rewards and the lack of manpower.
70's female	She talked about how she used to knit sweaters for her son, and do western sewing, although she could no longer do it because her hands shook.
80's female	She said with admiration, "The muff is woven beautifully".
90's female	She teared up, saying that she is old and unwilling to do many things.
90's female	She was still, not saying a word.
90's female	She talked about how she used to do a lot of yarn knitting as a hobby, knitting socks, scarves for herself, etc. She said that when she was a child, rainy days were happy days because her mother, who usually worked in the fields, would stay home when it rained and teach her how to knit.
60's female	She told of how her mother made her a hand-knitted baby dress when she gave birth. She shared her memories, saying that she herself was not good at knitting and that her mother had made her children's clothes and accessories instead. She had difficulty with numbness in her right paralyzed upper limb, but spoke of her right hand being warm in her muff.
70's male	He talked about his hobbies, his work, his family, and his hometown.
80's female	She talked about her frustrations with her family and the difficulties she had in the past.
80's female	She mentioned how, when she was a child, a lady neighbor had taught her how to make hand-knitted socks, how she was so happy when she finished them, and how difficult it was when her house burned down during an air raid.
90's female	She talked about her work and her daughter who sometimes talked to her via videophone.
90's female	She picked up the muff and said, "You knit well, I used to knit a lot in the past." "The sweater I am wearing now was knitted by me for my grandchildren." She told us that the night before a field trip, she worked through the night to finish clothes for all three of her daughters, that she used to make matching outfits for them, and that she also liked to knit.
90's female	She spoke about how she and her husband met, and about her son and daughter.
80's female	She mentioned that she is grateful for all the attention she receives at the facility, and that she has seen people making muffs at a local facility.
70's female	She spoke happily of her son and daughter-in-law. She spoke of how much she missed her own mother and regretted not having been able to give her filial piety.
90's female	She happily spoke of how her father bought her a knitting machine when she was single, and she took knitting classes. She picked up the muff and said, "It's beautifully knitted."

## Discussion

In dementia care, muffs are often used with the expectation of suppressing overactive symptoms such as anxiety and aggression seen in BPSD, but their effects on reducing mental stress and encouraging life reviews have not yet been reported. Although the results of this study did not allow us to conclude that the 20-minute use of the muff improved the mental stress and mood of older people with dementia in a clinically significant way, they suggested that exposure to the muff may promote life review and have a positive effect on the mental health of the participants.

Life reviews, which involve positive reflections on memories, are reportedly effective in improving the psychosocial functioning of older people with dementia and enhancing psychological well-being, self-esteem, depressive symptoms, and cognitive function [14,15]. The validation method, which is practiced as a dementia care method, is a communication technique based on listening and empathy that allows older people with dementia to talk and express their feelings using their preferred senses (sight and touch) and techniques, such as reminiscing and touching [16]. The fact that many participants in this study talked about their memories suggests that touching the muff provides a familiar and pleasant visual and tactile stimulus that encourages the expression of emotions and life reviews. Kimura et al. reported that listening to a patient with empathy and respect and sharing relaxed moments, even during a short intervention of 10–15 min, was effective in relieving stress in older people with dementia [6]. Suzuki et al. also reported that more active communication inhibits the control of interactions and difficult-to-cope-with behaviors, and influences the improvement of QOL in older people with dementia [17]. From these previous studies, it can be inferred that listening to and empathizing with the emotions and narratives expressed by study participants had a positive impact on the mental health of the older adults with dementia. Limitations of this study include the small sample size, potential selection bias in the recruitment of study subjects, and the fact that the results of this study cannot be generalized.

The clinical usefulness of muffs for older patients with dementia in this study was not the suppression of overactive symptoms of BPSD or the sedative effect, but rather the improvement of their mental health by evoking pleasant memories through pleasant visual and tactile stimulation using the muffs, activation of brain function, and promotion of communication. When using muffs for dementia care, care providers should consider the suitability of the muff based on the participant's life history, as well as the environmental setting and accessories to be attached to the muff. In addition, when applying the muff, the care provider should not only hand the muff to the patient but also listen to the patient's story, to promote life review and improve mental health.

Further research should be conducted on the clinical usefulness of muffs and their methods for older people with dementia by further expanding the subject population and the scope of study.

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