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Meditation on the Soles of the Feet Practice Provides Some Control of Aggression for
Individuals with Alzheimer's Disease

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Abstract

Alzheimer's disease is a progressive neurodegenerative condition that affects cognition, mental and physical health, and functionality of older people. As the disease progresses from mild to moderate stage, there is a concomitant increase in several behavioral variables, chiefly agitation, anger, and aggression. Currently there are no evidence-based treatments for these behaviors in this population. In this study, three individuals with moderate Alzheimer's disease were taught an informal mindfulness practice, meditation on the *Soles of the Feet* (SoF), as a self-management strategy. All three were able to learn and use the practice to manage their verbal and physical aggression. Their use of the SoF practice was correlated with decreased perceived psychological stress for their spouses and caregivers, as well as for the participants but to a much smaller degree. In terms of social validity, the participants, their spouses, and caregivers rated the SoF practice as acceptable, effective, with no unintended effects, and indicated they would recommend the practice to others. However, they also rated SoF as effortful for the participants because it involves the participants remembering to use the practice with rising anger, a requirement particularly challenging for those with memory problems.

Key words: Alzheimer's disease, memory, aggression, Soles of the Feet, stress, social validity.

Alzheimer's disease is an irreversible progressive neurodegenerative condition, and Alzheimer's dementia is the dementia stage of the disease (Alzheimer's Association, 2018). About five million Americans were diagnosed with Alzheimer's disease in the United States in 2013, but this figure is expected to increase three-fold to 14 million people by 2050 (Hebert, Weuve, Scherr, & Evans, 2013). Current estimates in the United States suggest that 10% of people 65 years and older have Alzheimer's disease, with prevalence rates being correlated with age—3% of 65-74, 17% of 75-84, and 32% of 85 and older having diagnosed with Alzheimer's dementia (Hebert et al., 2013). However, pathophysiological changes may begin 20 years or earlier in some people before clinical symptoms of Alzheimer's disease manifest (Scheltens et al., 2016). The pace at which people may experience the continuum of changes from preclinical to clinical symptoms and from mild to moderate to severe Alzheimer's disease varies greatly across individuals (Aisen et al., 2017).

The currently limited understanding of the continuum of the change process presents great difficulty for disease management and treatment (Aisen et al., 2017; Pressmann & Miller, 2014). Clinically, the key features of Alzheimer's disease include cognitive impairment, behavioral dysfunction, mood disorders, and progressive memory loss (Nowrangi et al., 2015). In terms of treatment, acetylcholinesterase inhibitors (i.e., galantamine, rivastigmine, donepezil, and tacrine) and memantine are the mainstay of pharmacological treatments, but they have only modest cognitive and behavioral effectiveness (Kamkwala & Newhouse, 2017). Furthermore, these drugs may produce side effects (nausea, vomiting, diarrhea, loss of appetite), especially at higher doses (Nash & Swantek, 2018). Some of the common behavioral symptoms of Alzheimer's disease (e.g., depression, agitation, aggression, restlessness, anxiety) are also treated with medicines in an effort to improve quality of life, but they are used only when non-pharmacological treatments have proven ineffective (Kales et al., 2015).

Non-pharmacological treatments have typically been used for behavioral symptoms of Alzheimer's dementia (Gitlin et al., 2012). These symptoms are typically psychiatric manifestations of dementia that include but are not limited to psychosis, depression, agitation, aggression, and argumentativeness (Lyketsos et al., 2011). A wide range of non-pharmacological interventions (such as in the Newcastle Model, Jackman & Berry, 2015) have

been used for these conditions, including individual and group activities, simplifying the environment and tasks, and changing caregiver communication style and content (Cohen-Mansfield, 2018; Gitlin et al., 2009). One of the issues with most of these interventions is that they rely on family or paid caregivers to implement them (Brodaty & Arasaratnam, 2012). An exception is the use of assistive technologies for enabling individuals with Alzheimer's dementia to manipulate their environment and activities through the use of customized devices (Singh et al., 2014). However, assistive technologies have not been used to enable people with Alzheimer's dementia to manage their disruptive behavior that is upsetting to themselves as well as their families and caregivers.

For people with Alzheimer's disease, at least 20% of outpatients and 40% in long-term residential care exhibit agitation and aggressive behavior (Lyketsos et al., 2000; Selbæk et al., 2013). The topography of these behaviors varies widely across individuals, and may include restlessness, irritability, repetitive calling out, cursing, combativeness, and verbal and physical aggression (Cohen-Mansfield et al., 1995). The management of agitation and especially aggression is a priority because it exacerbates caregiver burden (Okura & Langa, 2011), leads to poorer functioning of the individual (Okura et al., 2010), and hastens placement in long-term residential care (Okura et al., 2011). Although 16 individualized guidelines for the management of aggression in people with dementia have been published, adherence to the guidelines has been modest at best and there is no consensus on what may constitute optimal treatment for the various etiologies of aggression in this population (Vickland et al., 2012).

There is suggestive evidence that mindfulness-based interventions may be effective in enhancing a number of conditions in people who have precursors of Alzheimer's disease, i.e., mild cognitive impairment (MCI) or subjective cognitive decline (SCD) (Berk et al., 2018). For example, people with MCI show improvements in cognition, quality of life, and well-being (Wells et al., 2013). People with SCD show reductions in the severity of worry (Berk et al., 2017; Lenze et al., 2014), decreased cognitive complaints, increased memory and self-efficacy, improved attention regulation (Smart et al., 2016), and decreased depression, anxiety, and stress (Wetherell et al., 2017). These studies suggest that mindfulness-based interventions may be effective for those with mild or moderate Alzheimer's dementia.

Mindfulness-based procedures have proven to be effective in the self-management of anger and aggression. For example, a number of informal mindfulness practices have been shown to be particularly effective in this regard, with studies establishing their effectiveness across people with a range of disabilities and disorders (Singh et al., 2017). Meditation on the *Soles of the Feet* (SoF) has been the most extensively researched practice by multiple research groups (Singh & Jackman, 2017). Thus, the primary aim of the present study was to provide an initial evaluation of the effects of using the SoF practice for the self-management of aggression by individuals with moderate Alzheimer's disease. A second aim was to provide preliminary data on the collateral effects of the practice on the stress of the participants, their spouses, and other caregivers. A third aim was to assess the social validity of the SoF practice in this population.

Method

Participants

Participants were referred by local family physicians if they had expressed an interest in the SoF mindfulness intervention, could clearly communicate their wishes, and were able to engage in the 4-week training. The family physicians excluded possible participants if they had one of the following conditions: affective disease, schizophrenia, alcoholism, drug or psychoactive substance addiction, epilepsy, Parkinson's disease, or intellectual and developmental disabilities. They also excluded any one with motor system disorders, the presence of serious somatic disease, and sight or hearing problems (which would make it difficult to respond to the intervention instructions).

The first three individuals (Dave, Jim, and Joseph—all pseudonyms) who met the inclusion and exclusion criteria were accepted for the intervention. Consent was obtained from family members, caregivers, and the participants who did not lack the capacity to make informed judgments. In addition, the family members represented the participants' interests and wishes. Their Alzheimer's dementia was verified on the Mini-Mental State Examination (MMSE; Folstein et al., 1975) on which they scored between 10 and 21 (i.e., mild to moderate dementia). Their cognitive function was assessed on the Alzheimer's Disease Assessment Scale

(ADAS; Rosen, Mohs, & Davis, 1984), using the 11 element cognitive subscale (ADAS-cog), with a rating of 0 corresponding to no difficulties and 70 to deep dementia. All three participants were on acetylcholinesterase inhibitors (i.e., donepezil) and continued their drug regimen (which included other medicines for medical and physical conditions) during the course of the study.

Dave was 71 years old, had a score of 17 on the MMSE, 30 on the ADAS-cog, and 16 years of education. Jim was 69 years old, had a score of 21 on the MMSE, 30 on the ADAS-cog, and 13 years of education. Joseph was 72 years old, had a score of 18 on the MMSE, 28 on the ADAS-cog, and 16 years of education. All three had periodically exhibited agitation and engaged in aggression against family members during early stage Alzheimer's disease, but their agitation and aggression worsened as they progressed to the moderate stage of the disease. All three participants indicated that they got agitated rather quickly when their memory periodically appeared to worsen and that they were verbally and physically aggressive at times for reasons that were not clear to them. Ratings on the Questions About Behavior Function (Paclawskyj et al., 2000) indicated nonsocial motivation for their aggression, which could be explained in terms of frustration at not being able to remember. Finally, all three participants stated that they felt badly about their unacceptable behavior, apologized to their victims following the events, and wanted to stop engaging in these behaviors. They expressed an interest in controlling their aggressive behavior because they did not want to hurt their spouses and caregivers either emotionally or physically, and wanted to show them gratitude for providing care and safety.

Procedure

Experimental Design. We used a multiple-baseline design across the three adults with Alzheimer's disease (Barlow et al., 2009). This design is used to evaluate outcomes of interventions in small samples and is particularly useful for intensively studying the process of change because of its strong internal validity. In addition, it lends itself to aggregating data across multiple studies of the same treatment to determine general effectiveness of the intervention, which can be an advantage when evaluating an established intervention with a new population (Cushing et al., 2014).

There were three phases: baseline, training, and intervention.

Baseline. This was the pretreatment phase and, by design, no experimental or other independent variables were manipulated during this phase. The spouses, caregivers, and the participants engaged in their usual daily life activities. The only difference was that the primary caregivers collected and recorded event data on verbal and physical aggression of the participants on a daily basis. A second caregiver independently collected the same data for two hours a day on two randomly chosen days a week. The spouses and caregivers used whatever procedures and techniques they were using prior to the initiation of this study to manage the behavior of the participants. Typically, this involved verbal instructions, physical redirection, and gentle physical hold for caregiver and participant safety. The baseline phase was in effect for 3, 5, and 8 weeks across Dave, Jim, and Joseph, respectively.

Training. An experienced therapist taught the SoF practice to the participants during daily 30-min individual sessions during the first week and 15-min sessions during the following three weeks of training. Training was provided to each participant in the presence of his spouse and caregivers once a day, at a regular time except when the participant was agitated, five days a week for four weeks.

In the first training session, the therapist discussed with the participant his request to be taught a self-management mindfulness procedure and described the SoF practice as the procedure of choice. Discussion topics included the nature of the SoF practice, its origins, evidence-base, training steps, and initial intake information gathering. During this and subsequent interactive training sessions the therapist encouraged the participant to ask questions in an effort to not only gauge his understanding of the intervention but also to track his retention of information presented during the training. In the second training session, the participant went through the written handout of the training steps of the SoF practice, discussed questions arising from learning the steps, and then practiced the training steps with the therapist (see Table 1 for the training steps). In the third training session, the participant went through the training steps with the therapist and then reversed roles and “taught” the trainer the steps of the SoF practice.

<Insert Table 1 about here>

In the fourth training session, the participant went through the training steps with the therapist and then, together with the spouse and caregiver, worked with the participant to determine possible triggers and high-risk situations that made him upset or angry, his typical reaction to the triggers and high-risk situations, and ascertained whether he wanted to learn how to react differently to them (i.e., the therapist elicited the participant's "values statement" in Acceptance and Commitment Therapy terminology). Then, the therapist explained to him that while he could not change the occurrence of the triggers and high-risk situations, he had a choice as to how he could respond mindfully without reacting to them. Finally, the therapist explained that using the SoF practice will enable him to develop the ability to observe the arising anger, take a step back, and then deliberately choose a response rather than react to a trigger or high-risk situation with verbal or physical aggression. In the fifth session, the participant again went through the training steps with the trainer. The trainer taught the participant to pay attention to the triggers that gave rise to his anger and to use the SoF practice to regulate his emotional response without verbal or physical aggression. The participant and therapist practiced SoF focused on triggers to aggression as visualized from a recent aggressive incident by the participant.

During the next three weeks, the therapist worked with the participant on paying attention to current triggers that gave rise to his aggressive behaviors, how to recognize new triggers that may arise in the future, and how to use the SoF practice to effectively control his anger at the moment of arising. The therapist involved the spouse and caregiver in helping the participant to recognize his triggers and in initiating the use of the SoF practice to regulate his response to these triggers. The spouse and caregiver were taught to recognize the participant's visual triggers (e.g., clenching of fists, facial cues, agitation, unfocused staring, flushed cheeks, verbal chatter, and destructive behaviors), and to verbally direct the participant to use the SoF practice. Each daily session ended with the participant practicing the SoF practice in response to triggers that gave rise to an aggressive event preceding the training session. In the absence of the therapist, the participant was required to practice with his spouse and caregiver whenever an incident occurred that resulted in the participant engaging in verbal or physical aggression. Following the four weeks of face-to-face training, the participant was instructed to

continue using the SoF practice with the triggers that gave rise to his verbal and physical aggression.

In general, the training utilized positive reinforcement principles and used errorless training techniques to maximize learning in individuals who gradually succumbed to memory loss (Clare et al., 2000). Training sessions were scheduled at times when the spouse and caregiver thought the participants would be most receptive to the training, least stressed, and not likely to be agitated. The SoF training was adapted from procedures presented in the SoF trainer's manual (Singh et al., 2011).

Intervention. Following the four weeks of training, Dave, Jim, and Joseph used the SoF practice for 41, 39, and 36 weeks, respectively, to manage their verbal and physical aggression.

Fidelity of SoF Training. The therapist's training sessions with the participants and caregivers were videotaped twice a week (i.e., 8 sessions) on a random schedule using GoPro Hero5 Black Edition camera. A master trainer rated the videotapes on the 40-item SoF Trainer Monitoring Form for fidelity of the training. Fidelity of training averaged 87%, 90% and 89% for Dave, Jim, and Joseph, respectively.

Measures

Behaviors and Data Collection. Data on the participants' verbal and physical aggression were collected daily during baseline, training, and intervention phases. Verbal aggression was operationalized as yelling, cursing, or screaming at spouse and caregivers. Physical aggression was defined as hitting, punching, and slapping others. All three participants engaged in each of the topographies of verbal and physical aggression.

Family members as well as paid caregivers provided daily care for each of the three participants. We trained a family member (i.e., spouse) and the paid caregivers to collect data on each participant's verbal and physical aggression. Data were collected between 12 and 14 hours a day by either the caregiver or the spouse, depending on who was the primary caregiver at the time. The caregivers were employed for 10 hours a day, so the spouse was responsible for collecting data for the rest of the day, usually early mornings and late evenings. The

caregivers and spouse learned to collect the data using an iPhone app that enabled recording of both events in real time, i.e., discrete instances of verbal and physical aggression. Closely connected strings of verbally aggressive statements were counted as a single event, and each instance of a physical aggression was counted as a single event.

On two randomly chosen days a week, the spouse independently collected data for an additional 2 hours, in two one-hour periods, at the same time as the caregiver. Inter-rater agreement was computed by comparing the data collected by the caregiver against those of the spouse when both collected the data on the same events. Agreement was defined as the caregiver and the spouse recording the same verbal and physical aggression acts as occurring at about the same time (i.e., within ± 2 min.). Percentage of inter-rater agreement was calculated by dividing agreements by the sum of agreements and disagreements and multiplying by 100. Agreement was 86%, 95% and 91% for verbal aggression for Dave, Jim, and Joseph, respectively, and 100% for physical aggression across the three participants. Disagreements on verbal aggression were related to decisions regarding when one string of verbally aggressive statements ended and the next one began.

Perceived Psychological Stress. The Perceived Stress Scale-10 (PSS-10; Cohen, Kamarck, & Mermelstein, 1983) is a 10-item, 5-point (0 = never, 4 = very often) self-rating scale, with higher scores indicating greater psychological stress. The PSS-10 has adequate psychometric characteristics (Cohen & Williamson, 1988). This scale provides an index of the degree to which people perceive their lives as stressful and indicates how often they have found their lives to be unpredictable, uncontrollable, and overloaded in the previous month. The participants, their spouses, and the primary caregiver for each participant completed the PSS-10 at two time points: on the last day of the baseline (pre-intervention) and on the last day of 30-weeks of SoF implementation, i.e., weeks 37, 39, and 42 for Dave, Jim, and Joseph, respectively.

Social Validation. Social validity of the intervention was rated on a 5-item measure using a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree), in which the participants, their spouses, and their primary caretakers indicated how much they agreed or disagreed with statements regarding the acceptability, effectiveness, unintended effects, recommendation for use by others, and ease of implementing the SoF procedure. Higher summed scores indicate

greater social validation. The social validity ratings were completed on the last day of 30-weeks of SoF implementation for each participant.

Data Analyses

The data were analyzed using standard procedures for applied behavior analysis that involved visual evaluation of trends between adjacent stages (Barlow et al., 2009). The trends between baseline and SoF intervention were examined quantitatively using a phi (Φ) coefficient that estimates Percent of All Non-overlapping Data (PAND; Parker et al., 2007). In case of an effective intervention, frequencies of aggressive behavior were expected to be lower during intervention compared to the baseline reflected by no or little overlap between baseline and intervention data. No overlap indicates that all data points at baseline are higher than those at subsequent time points (i.e., intervention) corresponding to $\Phi = 1$, while complete overlap ($\Phi = 0$) reflects no change over time (Parker et al., 2007; Parker & Vannest, 2009). A probability to obtain given Φ -value by chance is reflected by the related p -value under the null hypothesis of no intervention effect (i.e., complete overlap). Statistically significant change is evident when $p < .05$.

Results

Physical Aggression. Weekly incidence of physical aggression for Dave, Jim and Joseph during baseline, training and the SoF intervention is plotted in Figure 1 and related statistics including mean, range, and Φ coefficients are summarized in Table 2. The graph shows clear downward trends for all participants, with little overlap between baseline and intervention. The intervention mean scores ranged from 2.28 to 4.76 compared to the baseline range of 17.00-22.75. This downward trend was statistically significant at both individual and group levels with Φ ranging from .77 to .89 and all p -values $<.001$ (Table 2). There was an absence of Dave aggressive behaviors during his final 6-weeks, which could be better explained by his rapid decline in health. For this reason, the phi analyses were conducted for Dave with these data been removed.

<Insert Table 2 about here>

<Insert Figure 1 about here>

Verbal Aggression. Similarly, a downward trend was observed for frequency of verbal aggression between the baseline and intervention for all three participants, which is presented graphically in Figure 2 with corresponding statistics presented in Table 2. Lower verbal aggression mean scores were associated with intervention and ranged from 4.38 to 5.95 in contrast to the higher baseline mean scores of 34.00-48.00 range. Note that overall verbal aggression mean values were higher at both the baseline and intervention compared to physical aggression. For all three participants the individual and overall downward trends were statistically significant as evidenced by Φ range of .86 - 1.00 and all p -values $<.001$ (Table 2).

<Insert Figure 2 about here>

Perceived Psychological Stress. The participants, their spouses, and primary caregivers rated their own perceived psychological stress on the PSS-10. Figure 3 shows the individual ratings at two time points, before intervention and 30 weeks following SoF implementation. The data show that there was a small reduction in the perceived stress of the three participants, but still remained within the high stress range. The perceived stress for Dave and Jim's spouses and caregivers decreased from high to moderate range. The perceived stress for Joseph's spouse decreased but remained within the high range while that of his caregiver decreased but remained within the moderate range.

<Insert Figure 3 about here>

Social Validity Ratings. The participants, their spouses, and primary caregivers rated the social validity of the SoF practice from their own perspective on the last day of 30 weeks of implementation. The five items were rated on a 5-point scale, with higher ratings indicating higher social validity. Table 3 presents the individual ratings. Across the three sets of raters, the average rating for acceptability was 4.00, effectiveness 4.22, unintended effects 5.00, ease of implementing the SoF practice 2.78, and recommend for use by others 5.00. All raters noted that implementing the SoF practice was effortful in terms of the participants remembering to use the SoF practice consistently, especially during periods of more pronounced memory loss and high stress for the participants. Furthermore, it required additional reminders from the spouse and caregivers to use the practice.

<Insert Table 3 about here>

Discussion

Alzheimer's disease, by definition, progressively robs an individual of a lifetime of memories. While this is an emotionally devastating experience, short-term memory loss results in functional disability that individuals with Alzheimer's disease and dementia find very frustrating at the very least. This frustration sometimes leads to emotional outbursts, often directed to family members—typically to spouses—and caregivers, and occasionally results in physical aggression. If remembered later, the individuals are often contrite and apologetic, but given the nature of their disease they are likely to engage in the same behavior again.

This study indicates that individuals with Alzheimer's disease and dementia appear capable of learning and using the SoF practice while in the moderate stage of the disease. Even while experiencing memory loss, the three participants were able to master the training steps of the practice and use it fairly effectively in the daily rhythm of their lives. Close inspection of the data shows individual variation in their use and effectiveness across the three participants. Dave had periods of total control interspersed with periods of agitation-linked spikes in aggression. Towards the end of the study, he had five weeks of increased agitation and aggression, similar to baseline rates, and then six weeks of no aggression. The absence of aggression was not because of better self-control, but a period of rapid decline in health status and transition from this life during the 43rd week of the study. Similar periods of total control interspersed with spikes in agitation-linked aggression were evident in the data for Jim and Joseph. Given the idiosyncratic course of the disease across individuals, it is hazardous to predict how well such individuals will do across time. But what can be predicted with some degree of confidence is that individuals will progressively lose self-control as the disease takes its course, probably due to an interaction of cognitive, health, and mental health status.

The data on perceived psychological stress are indicative of the burden endured by people who have this disease, and probably by most people with any form of dementia, and their family members and caregivers. Although the sample in this study was miniscule given the prevalence rate of the disease, it does point to the fact that spouses and caregivers face very

high stress that can be reduced to more manageable levels. Thus, enabling people with Alzheimer's disease to control their agitation and aggression to some degree for even short periods has a collateral positive effect on the stress level of their spouses and caregivers. The perceived psychological stress by the participants themselves paints a slightly different picture—enabling them to manage their agitation and aggression suggests that it may not only stop the increase in their perceived stress but also reduce it slightly. Given only pre- and posttest data on their stress limits the conclusions that can be drawn, but the data do suggest further research is warranted that determines if using SoF halts the progression of stress with age and if it also reverses the trend.

The data on social validity suggest that the participants, spouses, and caregivers perceived SoF to be acceptable, effective, and with no reported side effects. They also indicated that they would recommend this mindfulness practice to others with Alzheimer's disease. However, the participants, spouses and caregivers indicated that implementing the practice was effortful for the participants. This would be aligned with expectation that anyone with progressive memory loss would have to put in increasing effort to remember and use the mindfulness practice at times when they are at the height of stress and agitation, and possibly not in a mental state of rational thought. Given the nature and effects of Samatha meditation in producing tranquility, it may be instructive to research if teaching people with early stage Alzheimer's disease (or even prior to that given the genesis of the disease almost 20 years prior to its overt presence), would enable them to be better prepared to deal with the ravages of the disease in later life. In addition, there is evidence of preserved new learning of face-name association and motor skills in the early and moderate stages of Alzheimer's disease (Bahar-Fuchs, 2013) indicating greater potential for learning SoF as an early intervention to preempt challenging behaviors at later stages.

Given the projected increase in the number of people with Alzheimer's disease and dementia, and the lack of proven management strategies for behavioral problems that arise due to the disease (Vickland et al., 2012), it is imperative that alternative strategies be developed and evaluated for effectiveness in this population. Informal mindfulness-based practices have been reported to be one of the promising strategies for self-management of

anger and aggression (Singh, 2018). The SoF practice has been demonstrated to be reasonably effective in the self-management of anger and aggression across a range of populations (Singh & Jackman, 2017). In the present study, three individuals with moderate Alzheimer's disease were able to use the SoF practice fairly effectively to self-manage their verbal and physical aggression. However, it was clear that the effects of the practice correlated with changes in their condition, with levels of aggression rising when their condition worsened. Although no formal qualitative data were collected, anecdotal information from the participants, their spouses and caregivers indicated that they viewed the SoF practice as not only reasonably effective but also aligned with their values. It actively engages the participant in his own wellness based on a practice that is non-aversive, and enhances the dignity of the individual while facing a progressive disease. Like with any learning-based intervention, the SoF practice is likely to work best in the early stages of dementia, suggesting that future research should explore a preventative approach. That is, would using mindfulness-based practices at the earliest stages of Alzheimer's disease and other conditions that lead to dementia delay or reduce the occurrence of behavioral disturbances associated with these conditions?

Limitations and Future Research Directions

Given that this is an initial proof-of-concept study, it is not without limitations. Although the multiple-baseline design across subjects is an internally valid and robust single-subject experimental design, it does not speak to external validity of the intervention. The study demonstrated that SoF was used by three individuals to self-manage their verbal and physical aggression, but it does not provide the basis for projecting its effectiveness beyond these participants. Given the limitations of the current data on the effectiveness of the SoF practice with this population, it may be salutary to (1) systematically replicate the study with other samples of participants with dementia (Barlow et al., 2009), and (2) assess the effects of the SoF practice in a quasi-experimental time-series study to provide a more robust proof-of-concept. Another limitation inherent in self-management procedures that are experiential is that it is incredibly difficult to provide data on the fidelity of implementation. The SoF practice requires the individual to intuit rising anger and then engage in a mental antidote to dissipate it. Given that both the intuition and antidote are experiential, internal responses, the fidelity of

implementation cannot be directly observed but only correlated with changes in the person's overt aggressive behavior.

In sum, the present study provides a glimpse of the possibility of helping individuals with Alzheimer's disease to self-manage their agitation and aggression in order to prolong their mental health and wellness in the face of a progressive disease. If the current findings can be replicated and substantially extended in other studies, it may create a pathway for using informal mindfulness-based procedures to help reduce the suffering of people with dementia, as well as that of their family members and other caregivers.

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Compliance with Ethical Standards

Conflict of Interest: The authors declare no conflict of interest and they do not work for, consult to, own shares in or receive funding from any company or organization that would benefit from this article.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants.

Table 1. Training steps for *Meditation on the Soles of the Feet* practice

1. If you are standing, stand in a natural rather than an aggressive posture, with the soles of your feet flat on the floor.
2. If you are sitting, sit comfortably with the soles of your feet flat on the floor.
3. Breathe naturally, and do nothing.
4. Cast your mind back to an incident that made you very angry. Stay with the anger.
5. You are feeling angry, and angry thoughts are flowing through your mind. Let them flow naturally, without restriction. Stay with the anger. Your body may show signs of anger (e.g., rapid breathing).
6. Now, shift all your attention fully to the soles of your feet.
7. Slowly, move your toes, feel your shoes covering your feet, feel the texture of your socks, the curve of your arch, and the heels of your feet against the back of your shoes. If you do not have shoes on, feel the floor or carpet with the soles of your feet.
8. Keep breathing naturally and focus on the soles of your feet until you feel calm.
9. Practice this mindfulness exercise until you can use it wherever you are and whenever you feel rising anger or when an incident occurs that may otherwise lead to you being verbally or physically aggressive.
10. Remember that once you are calm, you can walk away from the incident or situation with a smile on your face because you controlled your anger. Alternatively, if you need to, you can respond to the incident or situation with a calm and clear mind without verbal threats or physical aggression.

Adapted from Singh et al. (2011).

Table 2. Baseline, training and the SoF intervention statistics including mean, range, and Φ -Coefficient

Aggression	Dave		Jim		Joseph		Total	
	Physical	Verbal	Physical	Verbal	Physical	Verbal	Physical	Verbal
Baseline mean per week	20.67	34.00	17.00	36.80	22.75	48.00	20.14	39.60
Baseline range	15-25	21-47	6-31	23-52	2-43	7-89	2-52	7-89
Training mean per week	5.50	9.00	15.25	19.75	16.00	26.25	12.25	18.33
Training range	5-20	11-32	9-26	9-33	10-27	17-44	5-27	9-44
Intervention mean per week	4.76	5.95	2.28	4.38	2.97	4.89	3.34	5.07
Intervention range	0-19	0-23	0-15	0-21	0-26	0-37	0-26	0-37
Φ – Coefficient (PAND)	0.86*	0.92*	0.89*	1.00*	0.77*	0.86*	0.85*	0.94*

Note: * $p < .001$; Φ -coefficients in blue computed after removing the data of the last 6 weeks

Table 3. Social validity ratings by the spouses, caregivers, and participants

Items	Dave	Spouse	Caregiver	Jim	Spouse	Caregiver	Joseph	Spouse	Caregiver
1. Compared to other treatments, I found the SoF practice to be very acceptable	3	4	4	4	5	4	3	4	5
2. The SoF practice was effective	5	4	4	4	4	4	4	4	5
3. I did not see any unintended effects of using the SoF practice	5	5	5	5	5	5	5	5	5
4. The SoF practice was easy to use	2	3	3	3	3	3	2	2	4
5. I would recommend the SoF practice to others	5	5	5	5	5	5	5	5	5

Note: 1 = strongly disagree; 3 = neutral; 5 = strongly agree

Figure Captions

Figure 1. Mean frequency of physical aggression incidents per week by the participants during baseline, training and the Soles of the Feet (SoF) intervention. Bold line signifies excluded data.

Figure 2. Mean frequency of verbal aggression incidents per week by the participants during baseline, training, and the Soles of the Feet (SoF) intervention. Bold line signifies excluded data.

Figure 3. Pretest and Posttest ratings on the PSS-10 by participants, spouses, and caregivers

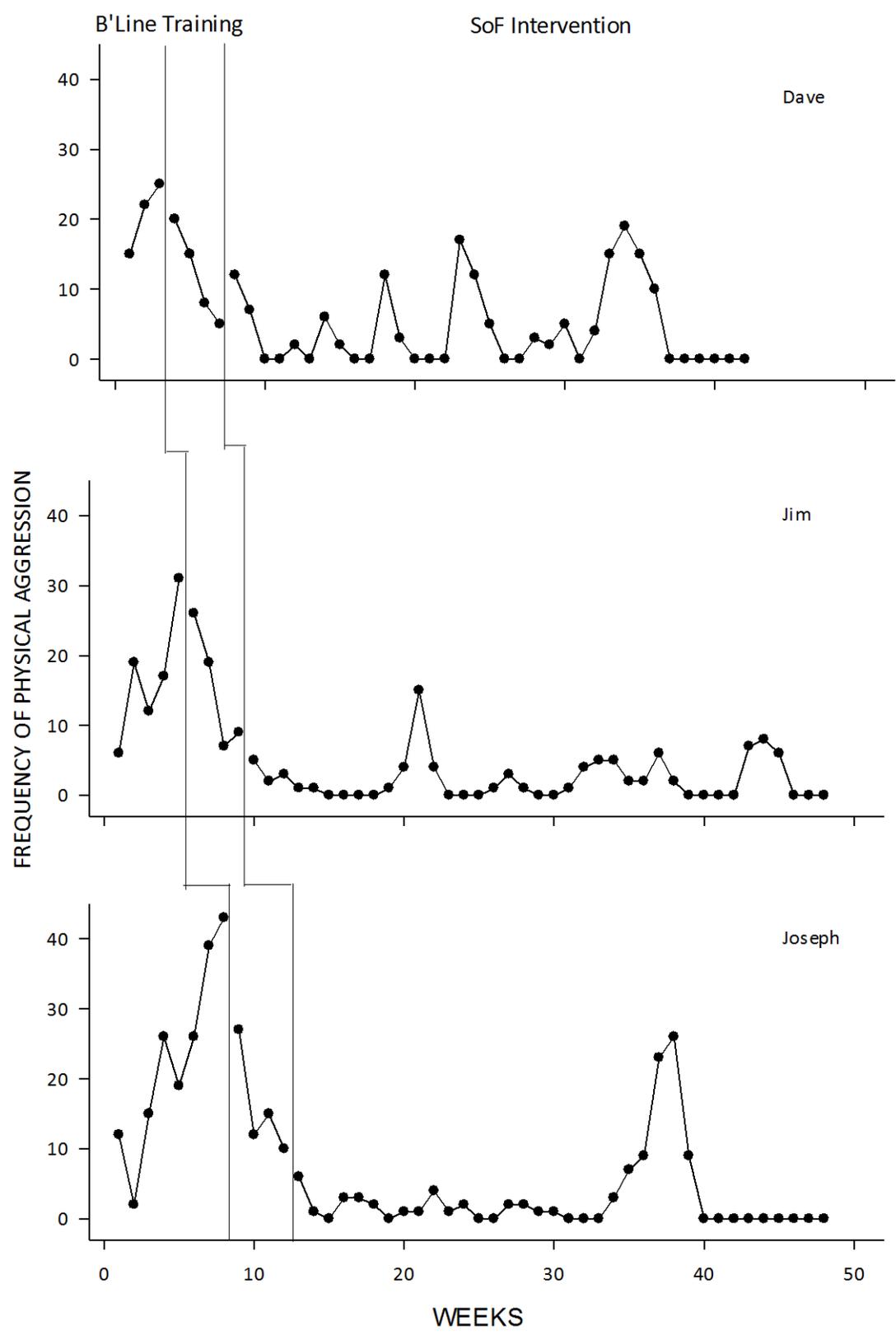


Figure 1

