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Effects of a Motor and Multisensory-Based Approach on Residents with Moderate-to-Severe Dementia

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Abstract

Involving institutionalized people with dementia in their routines may be challenging, particularly in advanced stages of the disease. Motor and multisensory stimulation may help to maintain or improve residents' remaining abilities such as communication and self-care. This study examines the effects of a motor and multisensory-based approach on the behavior of 6 residents with moderate-to-severe dementia. A single-group, pre- and post test design was conducted. Motor and multisensory stimulation strategies were implemented in residents' morning care routines by staff, after the provision of training and assistance. Twelve video recordings of morning care (6 pre- and 6 post interventions) were coded for the type of residents' behavior. Results showed a tendency toward improvements in residents' levels of caregiver-direct gaze, laughing and engagement, and a reduction of closed eyes, during morning care. The introduction of a motor and multisensory-based approach in care routines may improve residents' engagement and attention to the environment.

Keywords

morning care, motor stimulation, multisensory stimulation, residential care homes

Introduction

Dementia is characterized by changes in the cognitive, psychomotor, emotional, and behavioral domains.[1] As the disease progresses, older people with dementia become more dependent upon the caregiver, causing an overload to family caregivers and leading to long-term institutional care.[2] Although some symptoms are an inevitable result of the condition, other factors may contribute to an increase in behavior problems[3,4] and a loss of communication and motor skills,[5] such as: the lack of appropriate environmental, sensory and social stimulation in many long-term care homes[5]; and the induced activity deprivation and dependence on the caregiver,[6] despite resident's abilities.[7,8] Such deprivation of stimulation is even more evident in advanced stages of dementia.[5] Interventions in institutional contexts are therefore needed to provide residents with adequate stimulation,[9] encouraging the improvement and maintenance of their remaining skills.

Multisensory stimulation and motor stimulation have shown promising results in promoting communication and self-care in residents with dementia, however, studies are still scarce.[10,11] Multisensory stimulation is characterized by active stimulation of the senses with no need for higher cognitive processes,[12] and it has been found to reduce disturbed behaviors and apathy, enhance residents' attentiveness,[4] and increase resident-staff interactions.[13] Motor stimulation is characterized by specific exercises known to improve mobility[14] and delay the decline in activities of daily living of residents with dementia.[15]

In Portugal, as in other European countries, the care provided to this population is generally performed in traditional care homes[16] by staff with insufficient specialized training for providing care to residents with dementia.[17] Recent literature has highlighted the importance of care staff to encourage residents' communication and independency,[18,19] particularly during morning care when more interaction occurs.[20,21] Hence, there is a need to train staff with skills to implement motor and multisensory stimulation strategies during daily routines,[9] to stimulate their involvement in everyday activities and facilitate social engagement.[21,22] According to the findings from previous research, the implementation of these strategies by staff in dementia care routines would result in an increase in residents' rapport-building nonverbal communication (e.g., eye gaze, smiling) and positive verbal communication,[21] and an

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increase in residents' engagement in morning care routines.[3] Despite previous promising results, this topic has been poorly studied.[15,23] This study aimed to examine the effects of the implementation of a motor and multisensory-based approach to morning care, on the behavior of residents with moderate-to-severe dementia.

Methods

Design and Setting

A single-group, pre- and post test design was conducted. One traditional long-term care home for older people in the central region of Portugal was invited to participate in the study. The manager of the facility confirmed the fulfillment of the necessary requirements: willingness and agreement of the care home administration to participate in the study; no substantial organizational changes during the study period; and no simultaneous participation in similar studies. The facility included 53 licensed beds and 21 were occupied by residents with dementia. Data were collected before and immediately after the intervention.

Participants

Residents with dementia. Information about the study was first provided to the manager of the residential care home. The home care physician identified residents that (1) presented a clinical diagnosis of moderate-to-severe dementia according to *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition [*DSM-IV*]) criteria[24]; (2) were living in the care home for at least 2 months; (3) needed staff assistance during morning care; and (4) had no other psychiatric diagnosis. Thirteen residents were identified. Given the progressive decline that people with dementia experience in their capacity of fully understanding the context and the implications of their participation in the study,[25] the informed consent was obtained from proxy consent. The initial contact with the legal guardians of the eligible participants was made by the manager of the facility to ask their permission to be contacted by the researchers. Afterward, the researchers contacted each resident's legal guardian, provided them with the information about the study, and asked to sign the informed consent. The written informed consent was obtained from 8 legal guardians. Even though residents with dementia were asked to participate before the study began, and their permission was continually asked during their participation in order to obtain their assent, that is, their ongoing willingness to participate in the study.[25] One of the residents, from whom proxy's consent was obtained, was not included as she permanently refused to be assessed by video recordings. Therefore, 7 residents were recruited to participate. One resident died during the implementation of the intervention and his information was removed from the study.

Sociodemographic data of participants were obtained from the legal guardian. The Portuguese version of the Cognitive Impairment Test of the EASYcare (Elderly Assessment System)[26] was performed to confirm the cognitive impairment (score $\geq$11, moderate-to-severe impairment). According to Brooke and Bullock,[27] this is a faster and simpler test of cognition with better sensitivity and specificity than Mini-Mental State Examination. The Barthel Index[28] was also applied to characterize residents' global functional ability. Cutoff points were defined as 0 to 20 (total dependency), 21 to 60 (severe dependency), 61 to 90 (moderate dependency), and 91 to 99 (slight dependency).[29] These data were collected at baseline to describe the sample.

Table 1. Characteristics of the Residents with Dementia

Residents With Dementia (n = 6)		
Gender		
Female (n, %)	4	66.7
Male (n, %)	2	33.3
Age		
Mean, SD (years)	80.83	10.87
Minimum, maximum (years)	66	93
Clinical diagnosis		
Moderate dementia (n, %)	4	66.7
Severe dementia (n, %)	2	33.3
Cognitive impairment test of the EASYcare		
Mean, SD (points)	20.67	6.25
Barthel Index		
Total dependency (n, %)	3	50.0
Moderate dependency (n, %)	2	33.3
Slight dependency (n, %)	1	16.7

Abbreviation: SD, standard deviation; EASYcare, Elderly Assessment System.

Residents' characteristics are summarized in Table 1. Six residents with moderate-to-severe dementia (2 males) with a mean age of 80.83 (SD = 10.87) years participated in the study. The Cognitive Impairment Test scores indicated moderate-to-severe cognitive impairment.[26] Participants presented distinct levels of functional ability, 3 showed high levels of dependency, whereas the other 3 revealed moderate-to-slight dependency.

Staff members. The intervention required the participation of staff members. The home care manager identified eligible staff members who maintained direct contact with residents with dementia during daily care provision and could implement the intervention. Staff members who were only working at night were excluded. Nine staff members were identified and informed about the study. All agreed to participate and written informed consent was obtained. Prior to the start of the intervention, 3 staff participants abandoned the study (1 due to health problems, 1 for personal reasons, and 1 quit her job). Six staff members were included. The participants were all female, with a mean age of 40 (SD = 11.91) years. Their academic qualifications ranged from the elementary school (n = 1) to a higher education degree (n = 2). Half of the staff members were working in the care home for more than 3 years.

Motor and multisensory-based approach. The intervention consisted of implementing motor and multisensory stimulation strategies on residents' morning care routines by staff after the provision of group training and individualized assistance. Staff participants received eight 60-minute training sessions in the

Table 2. Contents of the Training Sessions

Session	Topic
1	Presentations of the participants and the multidisciplinary team
	What is dementia?
	Basic information about dementia
	The impact of dementia on residents' lives and the importance of the resident-staff relationship
	Multisensory stimulation strategies: Olfaction
	The senses as a way to communicate effectively with residents in advanced stages of dementia
	Adjusting the stimuli to residents' needs and preferences
	Discussion group: Practical strategies to stimulate residents' olfaction during the day: bathing, dressing, grooming, and in other occasions (eg, during meals)
2	Communication in dementia
	Verbal and nonverbal strategies to communicate effectively with residents with dementia
	Discussion group: Finding appropriate solutions for a challenging episode in which a staff member experienced difficulties in communicating with a resident with dementia
	Multisensory stimulation strategies: Contact
	Stimulating the tact: physical contact with people and objects
	Discussion group: Practical strategies to stimulate residents' tact during the day
3	Multisensory stimulation strategies: Vision
	Potential age-related and dementia-related visual changes and its impact on the resident with dementia (eg, disorientation, confusion, physical dependency)
	Types of stimulation: facial expressions, gestures, colors and light contrasts, orientation aids
	Discussion group: practical strategies to stimulate the sense of vision during the day
4	Multisensory stimulation strategies: Audition
	Balancing auditory stimulation: "good" stimulation (eg, music, nature sounds, verbal communication) vs "bad" stimulation (eg, machines working or doors slamming)
	Discussion group: how to use the different types of communication during residents' daily care
5	Multisensory stimulation strategies: Taste
	The sense of the taste as one of the most pleasurable senses for residents with dementia
	Discussion group: Practical strategies to stimulate the taste during and between meals
6	Residents' engagement: (im)possible mission?
	The functional potential of the residents with dementia: "what they can do" vs "what they do"
	Strategies to stimulate residents' participation: levels of assistance provided by caregiver, verbal and non-verbal communication, physical guidance
	Discussion group: Breaking the small steps of an activity; choosing an example of a resident to identify what steps he/she can(not) do (e.g. independent, need assistance, dependent)
7	Challenging behaviors: how to cope?
	Types of behavior (passive behaviors, agitation, anxiety-disorientation, repetitive questions, etc) and possible factors to its occurrence (organic factors associated with the condition, factors related to residents' life history, environmental factors)
	Examples of strategies to deal with challenging situations
	Discussion group: Describing a challenging situation with a resident with dementia; identifying the type of behavior; finding possible solutions to deal with the situation and to avoid it
8	For a safer environment: what can we do?
	Risk factors for falls: age-related and dementia-related intrinsic factors; extrinsic factors
	Providing a secure environment for the stimulation of residents' participation in daily activities
	Discussion group: identifying extrinsic factors and finding solutions to eliminate or limit them

care home, 1 every other week, during 16 weeks. The training sessions were developed and conducted by a multidisciplinary team, including a gerontologist, a physical therapist and a psychologist. The sessions followed a well-defined structure: the first 10 minutes were intended to clarify doubts that might have arisen between sessions (except in the first) and were followed by a brief introduction of the topic of the session. Staff members were then asked to participate in a group activity (eg, case studies, discussion group, brainstorming), where they could share ideas about the implementation of the acquired knowledge in daily care provision to residents with dementia, based on their past experiences regarding the care of the residents participating in the study. At the end of each session, a handout summarizing the most important information was given to participants. Table 2 presents the training program and provides a brief description of the contents of each session.

In the following 3 days after each session, the gerontologist and the physical therapist assisted each staff member individually during the care provision, clarifying doubts and making suggestions to help them implement the motor and multisensory stimulation strategies. Recent research has highlighted the importance of conducting training programs with both

Table 3. Description of the Motor and Multisensory-Based Strategies

Multisensory stimulation
Use a shower gel or a body lotion with a pleasant fragrance
Place aroma diffusers in the bedroom
Put his or her favorite perfume
Let the person feel the texture of the sponge bath or the warm towels
Put his or her favorite flowers in the bedroom
Provide a gentle massage while washing his or her hair
Put a relaxing music in the bedroom while dressing and grooming
Give the chance to brush the person's teeth with toothpastes of different flavors
Let him or her listen the birds or the wind near the window, just before the start of the morning care tasks
Reduce the noise created by machinery, voices, slamming doors, loud music, or other existing sounds
Balance the brightness of the different compartments to avoid shadows and glare
Promote an adequate level of luminosity to which the person can participate in the morning care tasks
Motor stimulation
Encourage the person to perform one task or a part of it (eg, wash the arms, help remove the foam from the body), by giving him or her small and simple instructions, step by step
Demonstrate how to make the task
Give physical guidance or use gestures during the completion of the task
Adapt the task to the preferences and the capabilities of the person
Avoid rushing the person during the task
Encourage the person and praise him or her after the completion of the task
Ask the person to hold an object (eg, a shampoo or a bath glove) and allow him or her to reach it (to stimulate the eye-hand coordination)
Ask the person to participate in simple tasks, introducing progressively more complex tasks
Ensure the safety of the person before asking him or her to complete a task
Remove potential hazards from the environment to ensure the safety of the person
Let the person rest during the task, if he or she feels tired

information-based sessions and additional support to help facilitate changes in staff practices.[30] The motor and multisensory stimulation occurred during the morning care which was defined as the period of time between 7 AM and 12 AM, when staff are involved with residents in activities concerning bathing, grooming, dressing, and toileting.[21,31] The implementation included, for example, the use of warm towels or providing a gentle massage while spreading a fragranced lotion. Motor stimulation strategies comprised breaking a morning task into small steps and providing the residents with simple commands, gestures, and/or physical guidance to facilitate their participation in activities, such as washing their face or reaching a towel. Table 3 provides a description of the implemented motor and multisensory-based strategies.

During the training, staff members received orientations to implement stimulation strategies according to resident's personal circumstances, such as lifestyle, preferences, residual abilities, desires, and cultural diversity, in order to adjust the stimulation to each person. To be able to accomplish this resident-oriented attitude, staff members were encouraged to obtain residents' lifestyle history and the list of stimulus-preference from their families. Moreover, they were recommended to be continually aware of residents' nonverbal behavior during the implementation of the stimulation strategies, in order to understand their preferences[32] (eg, body movement, facial expressions, increased agitation, smiling). Data Collection

The effects of the motor and multisensory-based approach on the behavior of residents with dementia were studied through the observation of video recordings of morning care performed before and immediately after the intervention (ie, after the end of the training sessions and assistance to staff). Video recordings were performed during upper-body washing, toothbrushing, dressing, and shaving. The video camera was fastened to a tripod, placed in the bathroom and turned on before the resident entered the room, to avoid affecting residents' behavior by the presence of strangers (the researchers). All staff members were recommended to inform the resident about the camera, ask their permission to record, and stop or remove the video camera if they noticed any residents' negative reaction caused by the presence of the device. Twelve video recordings were obtained (6 pre- and 6 post intervention). Several video recordings were performed prior to data collection to decrease the effect of the camera on staff and residents' behavior. Reactivity effects may be minimized as participants become accustomed to the video cameras.[33]

Outcome Measure

Residents' behaviors were studied by analyzing the frequency and duration of a list of behaviors (ethogram), derived from the existing literature[21,34] and preliminary observations of the video recordings. Caregiver-direct gaze, laughing, verbal communication, closed eyes, and task engagement (voluntary and solicited) categories composed the ethogram. The first 3 categories have been reported as a way to facilitate resident-staff interaction.[13] Closed eyes have been associated with residents' disengagement[34] and task engagement with the maintenance of residents' independency.[35] Table 4 provides a detailed description of each category.

Data Analysis

Analysis of the video recordings. Two independent observers assessed each of the 12 video recordings and rated residents' behaviors according to the ethogram, using specialized software, Noldus The Observer XT 7.0 (Noldus International Technology, Wageningen, the Netherlands). The frequency and duration of the categories were measured. The observers were previously trained to use the software and they were blinded to the phase of the intervention (pre-/post intervention). The observation began when both resident and staff member appeared on the screen and it ended when both were out of reach of the camera. The smallest duration of the video

Table 4. Categories of the Ethogram

Categories	Description
Caregiver-direct gaze	The resident looks at the caregiver
Laughing	The resident smiles and produces a sound commonly associated with the act of laughing
Verbal communication	The resident articulates words or sentences with meaning, voluntarily and purposely, in order to communicate with the caregiver. Verbal aggression is excluded
Closed eyes	The resident closes his or her eyes and keeps them closed for more than 1 second
Solicited engagement in the task	The resident moves the body or a body part in order to perform a task, or a part of it, related with the morning care activity (eg, reach the towel, clean up his or her face, wash a body part). The action is previously solicited by the staff element, through verbal commands or physical guidance
Voluntary engagement in the task	The same as the category above but the action is voluntary, that is, the resident starts to perform the task without any verbal or physical prompt

Table 5. Residents' Behavior During Morning Care Routines, Before and After the Intervention

Categories	Type	Pre test[a] Mean (SD)	Post test[b] Mean (SD)	Negative Ranks[c,d]	Positive Ranks[c,e]	*P* Value (1-Tailed)[c]
Caregiver-direct gaze	Frequency (number)	0.50 (0.84)	1.25 (1.67)	1	3	.250
	Duration (seconds)	0.67 (1.21)	4.17 (7.91)	1	3	.250
Laughing	Frequency (number)	0.00 (0.00)	0.17 (0.41)	na[f]	na[f]	na[f]
	Duration (seconds)	0.00 (0.00)	0.17 (0.41)	na[f]	na[f]	na[f]
Verbal communication	Frequency (number)	6.33 (5.29)	7.33 (6.49)	2	2	.313
	Duration (seconds)	25.83 (42.01)	20.00 (25.65)	3	2	.500
Closed eyes	Frequency (number)	2.58 (6.09)	2.50 (5.65)	2	1	.500
	Duration (seconds)	32.58 (79.32)	19.42 (44.69)	2	1	.375
Solicited engagement in the task	Frequency (number)	1.42 (1.16)	2.92 (2.92)	2	3	.156
	Duration (seconds)	10.00 (14.44)	27.58 (29.79)	2	3	.219
Voluntary engagement in the task	Frequency (number)	2.42 (2.38)	3.67 (5.06)	2	2	.500
	Duration (seconds)	31.58 (41.37)	38.17 (42.53)	0	4	.063
Total engagement in the task (solicited and voluntary)	Frequency (number)	3.83 (3.50)	6.58 (6.67)	1	3	.188
	Duration (seconds)	41.58 (51.55)	65.75 (59.23)	2	3	.156

[a] Pretest—Before the implementation of the motor and multisensory-based approach.
[b] Posttest—Immediately after implementation of the motor and multisensory-based approach.
[c] Using the Wilcoxon matched pairs signed-rank test.
[d] Negative ranks—Frequency/duration after the intervention < frequency/duration before the intervention.
[e] Positive ranks—Frequency/duration after the intervention > frequency/duration before the intervention.
[f] Not applicable—The test was not possible to perform due to the small number of occurrences in the frequency and duration of the category.

recording was 235 seconds (3 minutes and 55 seconds). Thus, the other video recordings were cut to standardize the observation time to allow comparisons.

Reliability of the observations. The interobserver reliability analysis was conducted for the frequency and duration of each behavior category in both phases. Intraclass correlation coefficient[36] equation ICC (2.1)[37] (two-way random effects model) was used to assess the relative reliability. The absolute reliability was analyzed through the Bland and Altman plots.[38] These methods have been recommended to be used simultaneously in reliability studies using continuous data.[39] The ICC values ranged between 1.00 and 0.549 for all categories except one, indicating excellent-to-moderate reliability.[36] The lower ICC value, 0.283, was found for the frequency of the category voluntary engagement in the task, before the intervention. No systematic bias was observed on Bland and Altman plots.

Effects of the motor and multisensory-based approach on residents' behavior. The descriptive and inferential analyses of the categories were conducted using the PASW Statistics (Predictive Analytics SoftWare) version 18.0 for Windows (SPSS Inc., Chicago, Illinois). The differences between pre- and postintervention were examined using the nonparametric Wilcoxon matched pairs signed-rank test and a *P* value below .05 was considered statistically significant.

Results

The effects of the motor and multisensory-based approach on residents' behavior during morning care are presented in Table 5. For the nonverbal communication, data from the video recordings indicated an increase in the frequency and duration of caregiver-direct gaze and laughing. There was also a great decrease in the duration of closed eyes (from 32.58 to 19.42 seconds); however, its frequency did not differ considerably

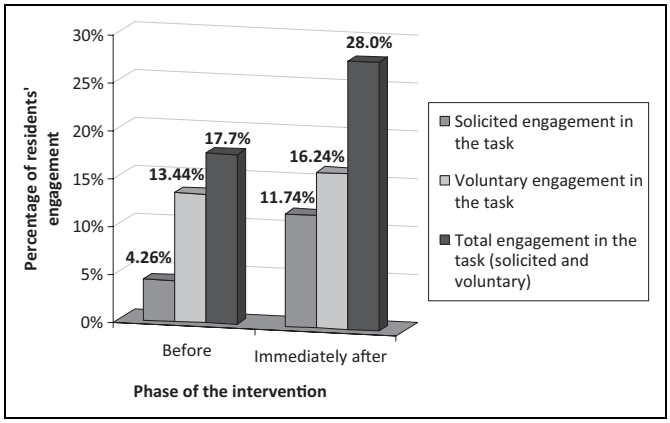

Figure 1. Percentage of residents' engagement in the task for the total amount of time.

(from 2.58 to 2.5 times). In addition, a small increase in the frequency of verbal communication (from 6.33 to 7.33) was found, whereas the duration of that contact decreased (from 25.83 to 20.0). Regarding residents' engagement, there was an increase in both solicited and voluntary engagement categories after the intervention, however, higher improvements were found in the former (1.42-2.92 times; 10.0-27.58 seconds). No statistical significant differences were found.

Figure 1 provides information about the percentage of the duration of residents' engagement in the total amount of time of each video recording (3 minutes and 55 seconds). It was found a higher improvement in the *solicited engagement in the task*, which varied from 4.26% to 11.74% of the total amount of time. With regard to residents' *voluntary engagement*, it was observed an individuals' involvement of 13.44% of the morning care time at baseline and an improvement of this number after the implementation of the motor and multisensory-based approach (16.24%). Finally, there was a 10% increase in the total amount of time that residents spent engaged during morning care, after the intervention (17.70%-27.98%).

Discussion

The results suggest a trend toward improvement in the residents' levels of communication and involvement in morning care routines, after the implementation of the motor and multisensory-based approach. The residents with dementia presented higher levels of caregiver direct-gaze, laughing, and task engagement with a reduction in the duration of closed eyes, in comparison with their baseline responses, showing less inactive behaviors during their personal care. However, the differences were not statistically significant, which could be explained by the small sample size and the reduced duration of the analyzed data (3 minutes and 55 seconds). It is also important to mention that the nonstatistically significant improvement found in the engagement during the morning care tasks may be related with the high levels of dependency presented by half of the participants. Residents' levels of dependency may not have allowed them to engage more in morning care tasks; however, given their functional abilities, the increased values found for the engagement in the task (obtained after the intervention) may represent a major improvement in these people. Therefore, by providing residents with appropriate levels of stimulation, it is likely that even people in advanced stages of dementia will show awareness and express themselves through their behavior and engagement during care,[40] thus potentially improving their well-being and quality of life.[41] Previous studies using multisensory[11,42] and motor stimulation[15,31,43] approaches, applied on a weekly basis and for short periods,[2,44] have shown benefits in people with advanced dementia. However, long-term effects were not evident[2,45] and therefore, daily implementation of multisensory and motor stimulation has been recommended.[21,46] As staff members spend most of their time with these residents, they can play a key role in implementing these interventions on a daily basis.[9] Few research studies have trained care staff with basic skills to implement multisensory[21] or motor[3] stimulation in daily care provision to residents with dementia. Therefore, this study supports the implementation of these strategies by care staff, by showing an improvement in interaction behaviors and engagement of the residents with moderate-to-severe dementia. However, these results must be carefully interpreted as they should not be exclusively attributable to the implementation of motor and multisensory stimulation strategies. Indeed, the implementation of these strategies required the need for staff to develop a resident-oriented attitude,[3,21] which was only possible by providing staff with a greater understanding of the dementia condition. This included basic knowledge and skills to deal with the symptoms (communication and coping skills to manage challenging behaviors), and making staff aware of the importance of responding to residents' needs and preferences in the interactions they establish with them, according to residents' personal experience and limitations.

Traditionally, the daily care provided to institutionalized residents with advanced dementia was mainly focused on providing them with comfort, safety,[47] and assistance, assuming that residents were helpless.[5] However, in recent years the paradigm of care has changed from the dependent-supporting model to an independence-enhancing model,[31] focused on helping these individuals to maximize and maintain their function. This study provides a contribution, although limited by the small sample, to conclude that residents' engagement in daily care routines can be improved through staff training. These findings may have important implications on dementia care practices in residential care homes. Therefore, interventions aimed to train staff to provide adequate care to people with complex needs, such as those with advanced dementia, are a proactive and inexpensive step that can be implemented by care homes to improve the quality of care provided and reduce the stress associated with care.[48]

The effects of staff training interventions on residents' behavior have presented limitations in previous studies regarding the measurement of that behavior, as data were typically collected by staff members, for example using checklists.[16,49] This introduces a bias, as staff participants may be motivated

to report improvements in residents' behaviors.[49] The present study tried to overcome this limitation using a methodology based on the observation of video recordings collected in a naturalistic approach, that is, during residents' usual routines. This methodology has been used previously in dementia research, however, aspects of residents' communication and engagement have been addressed separately.[7,21,50] Although the analysis of the video recordings with this methodology is time consuming (each video recording analysis lasted approximately 1.5 hours), it allows the researchers to obtain detailed information about residents' behavior that otherwise would not have been possible. Moreover, the high interobserver reliability obtained in the present study using the specialized software suggests that this methodology can provide reliable and objective information about residents' behavior.

The findings from this study are however limited by the inclusion of a single residential care home and the time-limited nature of data collection. The authors recommend the implementation and assessment of similar interventions for a longer time set, involving larger observational video recording periods, in a larger sample, including further residential care homes and having control groups to investigate the extent of these benefits.

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