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Association between environmental stimulation and apathy in nursing home residents with dementia

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Abstract

Objectives: Prior research and theories established the link between care environments and apathy. Yet, empirical evidence on how environmental stimulation impacts apathy is lacking. This study examined the association between environmental stimulation and apathy in nursing home residents with dementia.

Design: This repeated-measure study analyzed 104 video observations of staff caregiver–resident interactions.

Setting: 12 nursing homes.

Participants: 63 unique staff caregiver–resident dyads that involved 42 caregivers and 44 residents with moderate to severe dementia.

Measurements: Second-by-second behavioral coding using Noldus Observer software was conducted to assess apathy and environmental stimulation, using the Person-Environment Apathy Rating scale. The environment subscale includes six items: stimulation clarity, stimulation strength, stimulation specificity, interaction involvement, physical accessibility, and environmental feedback. The apathy subscale includes six items: facial expression, eye contact, physical engagement, purposeful activity, verbal tone, and verbal expression. Multilevel linear models were used for analysis.

Results: Results showed that apathy was not associated with the overall quality of environmental stimulation but was significantly associated with stimulation specificity (coefficient = − 2.23, p = 0.049). However, the association was not significant after controlling for resident characteristics (p

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Description of authors' roles

All authors have made a substantial contribution to this paper. Specifically, Y.-L. Jao designed this study, supervised the study procedures, and wrote the manuscript. W. Liu designed and carried out the statistical analysis of this study and wrote the manuscript. K. Williams was the primary investigator of the parent study (CHAT study). She designed the parent study, supervised the study procedures, and wrote the manuscript. H. Chaudhury assisted with data interpretation and revised this manuscript with critical inputs. J. Parajuli assisted with data analysis and writing this manuscript.

Conflict of interest declaration

The authors report no conflicts of interest.

= 0.082). In addition, higher levels of environmental feedback were associated with lower apathy levels (coefficient = − 2.14, *p* = 0.001). The association remained significant after controlling for resident characteristics (coefficient = − 1.65, *p* = 0.014).

Conclusion: Findings reveal that when environmental stimulation is individually tailored and prompts engagement, residents are less apathetic. This study highlights the effect of environmental stimulation on apathy. Future research should explore interventions that modify environmental stimulation to reduce apathy and improve dementia care.

Keywords

Alzheimer's disease; behavioral and psychological symptoms of dementia (BPSD); long-term care; problem behaviors

Introduction

Background of apathy

Apathy is a prevalent symptom of dementia and affects 21%–84% of individuals with dementia (Hölttä *et al.*, 2012; Lyketsos *et al.*, 2000; Mega *et al.*, 1996; Wood *et al.*, 2000). Apathy is more prevalent in people with severe dementia (Ishii *et al.*, 2009). In nursing homes (NHs) specifically, up to 84% of residents with dementia are affected by apathy (Wood *et al.*, 2000). Apathy is characterized as a deficit of motivation, reduced goal-directed behaviors and responsiveness to environmental stimulation, and a flat mood (Robert *et al.*, 2009). The literature reveals that apathy is linked to accelerated cognitive and functional decline (Starkstein *et al.*, 2006; van Reekum *et al.*, 2005), lower quality of life (Mjørud *et al.*, 2014; Samus *et al.*, 2005; van Reekum *et al.*, 2005), and greater need for care supports (Bakker *et al.*, 2013). Recent evidence shows that apathy predicts higher mortality in NH residents with dementia as compared to those without apathy (Nijsten *et al.*, 2017).

Despite these negative outcomes, apathy is often overlooked in NHs (Leone *et al.*, 2013), likely because it is a seemingly innocuous symptom that does not seem to disrupt care. Evidence-based treatment options for apathy are currently limited (Cipriani *et al.*, 2014). A systematic review of 24 pharmacological trials revealed no gold standard medications for apathy (Harrison *et al.*, 2016). Similarly, a systematic review of 56 studies of non-pharmacologic interventions showed no single intervention to be significantly effective for apathy with strong evidence support (Brodaty and Burns, 2012). Thus, research is needed to identify factors that influence apathy as a basis for new intervention development.

Association between personal factors and apathy in dementia

The association between personal factors and apathy has been explored in dementia research. Evidence of the association of age and gender with apathy is mixed. Some studies show that there is no significant difference in ages of people with and without apathy (Clarke *et al.*, 2008; Starkstein *et al.*, 2005), while one study shows that people with apathy are slightly older than those without apathy (Vilalta-Franch *et al.*, 2013). Similarly, some studies show that gender is not related to apathy (Clarke *et al.*, 2008; Proitsi *et al.*, 2011; Starkstein *et al.*, 2005), whereas one study reports that people with apathy are more often

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male (Vilalta-Franch *et al.*, 2013). Evidence from multiple studies show that people with apathy have more severe cognitive impairment than those without apathy (Kolanowski *et al.*, 2017; Starkstein *et al.*, 2005; Vilalta-Franch *et al.*, 2013). Research provides evidence that people with apathy are also more likely to have poorer physical function compared to those without apathy (Clarke *et al.*, 2008; Vilalta-Franch *et al.*, 2013). People with apathy are also more likely to demonstrate depression than those without apathy (Clarke *et al.*, 2008; Starkstein *et al.*, 2005).

Association between environmental factors and apathy and other behavioral symptoms in dementia

There is evidence about the link between environmental factors and behavior symptoms in people with dementia. A review of 103 studies revealed that environmental features in long-term care substantially impact behaviors of residents with dementia (Chaudhury *et al.*, 2017). Key environmental features include unit size, spatial layout, sensory stimulation, homelike character, and social spaces. For example, small-scale institutions and homelike environments promote social connection and activity engagement, whereas increased noise levels are linked to less social interaction and more behavioral symptoms in dementia (Chaudhury *et al.*, 2017). Many environmental features, such as low noise level, bright room light, comfortable temperature, proper crowding, and homelike decoration, are relatively easy to adapt. Environment includes both physical and social dimensions (Wahl and Lang, 2003; Weisman, 2001). Environment extends beyond physical environment to include how people "experience the environment," encompassing social climate, stimulation, and interactions (Kaplan and Kaplan, 1936). For example, person-centered communication is associated with fewer behavioral symptoms (Williams *et al.*, 2005) and social interaction predicts pleasure for people with dementia (Jao *et al.*, 2018). Even though substantial evidence supports the influence of physical and social environments on behavioral symptoms of dementia, research in this area is primarily small-scale with homogeneous samples.

One major criteria for a diagnosis of apathy is a lack of response to environmental stimulation (Robert *et al.*, 2009), suggesting the important effect of environmental stimulation on apathy. Theoretical models identify sociophysical environments as precursors of apathy in dementia and that changing the environment can reduce apathy. The goal-directed behavior model explains how goal-directed behaviors occur based on internal or external antecedents, intention, planning, carrying-out actions, and outcome evaluation. Any dysfunction during this process can result in apathy (Levy and Dubois, 2005). Based on this model, environment is a key external antecedent that can trigger the cycle of goal-directed behaviors and impacts an individual's planning, actions, and outcome evaluation. Within this framework, apathy can be reversed by external stimulation. Thus, adapting environments is a promising approach to apathy. Marin (1996) suggests that environmental events that lead to a loss of incentive or control are a precursor to apathy. Thus, institutionalization itself places NH residents with dementia at risk for apathy, and providing residents with meaningful stimulation, incentive, and control in the NH environment may reduce apathy. However, little attention has been paid to testing the role of environmental stimulation on apathy.

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To fill this gap, we developed the Person-Environment Apathy Rating (PEAR) to assess apathy and environmental stimulation (Jao *et al.*, 2016). Using the PEAR scale, our prior research revealed that NH residents were less apathetic with clear and substantial environmental stimulation. Specifically, when the environments contain stimulation that is clearly guided and well organized without overwhelming background noise, NH residents showed less apathy than those in environments that contain chaotic stimulation. When environmental stimulation was detectable, consistent, and interesting, residents demonstrated less apathy than when environments had no detectable stimulation. This is a pioneer study examining the association between environmental stimulation and apathy.

The competence and environmental press model

The current study was guided by Lawton's Competence and Environmental Press Model (Lawton and Nahemow, 1973), also recognized as the Person–Environment Fit model. This model depicts individuals' relationships with the environment and emphasizes the importance of person–environment fit on individuals' affect and behaviors. When environmental demand corresponds to the individual's competence, positive affect and adaptive behaviors occur. However, maladaptive behaviors and affect (e.g., apathy) occur when demands exceed or fall below an individual's competency level. Environments that fit the individual's competence are especially important for this population because people with dementia have lower stress tolerance (Hall and Buckwalter, 1987), and people with apathy have impaired motivation and initiative in adapting to the environment (Robert *et al.*, 2009). Lawton's model supports the need to identify and address apathy-related environmental features to improve person–environment fit to reduce apathy. While these theories identify the critical role of social and physical environments in apathy, specific apathy-related features remain unexplored, and empirical evidence for the environmental determinants of apathy is lacking. This topic is critical for dementia care because many environmental features are easy to adapt, e.g. lighting fixtures, noise level, furniture arrangement, meaningful objects, homelike decoration, crowding, and opportunities for social interaction (Chaudhury *et al.*, 2017; Williams *et al.*, 2005).

Purpose of the study

The purpose of this study was to examine the association between environmental stimulation and apathy in NH residents with dementia. We also examined age, gender, cognitive function, physical function, and depression as covariates.

Methods

Design

This was a repeated measures secondary analysis of 104 video observations of caregiver–resident interactions. The videos were baseline videos from the Changing Talk (CHAT) randomized controlled trial (PI: Kristine Williams, R01NR011455) that used video observations to examine the effect of an educational intervention to improve NH care-giver communication with residents with dementia that reduced resident resistiveness to care (Williams *et al.*, 2016).

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Sample and setting

In the parent study, participants included staff care-giver and resident dyads that were recruited from 12 NHs, selected by convenience in Kansas, U.S.A. Resident participant inclusion criteria were (1) diagnosis of dementia based on chart review and (2) restiveness to care based on staff report. Staff care-giver inclusion criteria were (1) NH employment as a caregiving staff, (2) English speaking, (3) age 18 or older, and (4) providing direct care for a participating resident at least twice a week over the past month (Williams *et al.*, 2016).

Measurements and data collection

The parent study recorded two videos at baseline for each dyad. The videos captured staff caregiver–resident interactions during routine care activities, including bathing, eating, dressing, oral care, transferring, toileting, and other activities of daily living (ADL). To reduce participant reactivity to camera and researcher presence, prior to the first video recording, a sham recording session was conducted.

This secondary analysis analyzed all the baseline videos of quality adequate to observe the environment and the resident participant's facial expression. Among the 110 baseline videos, 104 videos were included in this analysis and 6 were excluded due to poor video quality for coding. Each video ranged from 28 seconds to 10 minutes, depending on the interaction.

The key variables examined were environmental stimulation and apathy, measured by behavioral coding of videos based on the PEAR scale (Jao *et al.*, 2016). The PEAR scale and coding scheme have been established by the lead author Jao and pilot tested. The development and psychometrics of PEAR have been established and published elsewhere (Jao *et al.*, 2016). The videos were coded using a second-by-second behavioral coding method using Noldus Observer®10 software (Noldus Information Technology Inc., Leesburg, VA, U.S.A).

Apathy

Apathy was measured using a validated observational coding scheme established using the apathy subscale of the PEAR scale (PEAR-Apathy). Apathy levels were coded on six variables: (1) facial expression, (2) eye contact, (3) physical engagement, (4) purposeful activity, (5) verbal tone, and (6) verbal expression. Each item was rated on a 1–4 scale. The total score of PEAR-Apathy ranges from 6–24; a higher score indicates a higher apathy level. The PEAR-Apathy demonstrated good convergent validity with a correlation of ρ = 0.71 and ρ = 0.81 with the Neuropsychiatric Inventory (NPI) (Cummings *et al.*, 1994) and Passivity in Dementia Scale (Colling, 1999). It also has good internal consistency (Cronbach's α = 0.85) and moderate to excellent inter-rater and intra-rater reliability (weighted kappa 0.47–0.86 and 0.74–0.89, respectively) in the coding of long-term care video data (Jao *et al.*, 2016).

Environmental stimulation

The coding scheme was developed based on the environment subscales of PEAR (PEAR-Environment) (Table 1). Each subscale consists of six items, rated on a 1–4 scale. In this scale, environmental stimulation is defined as any external stimulation that is present in the

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participant's visual field or in the room with the participant and triggers individual's affective responses or motivates physical actions (Jao *et al.*, 2016). Environmental stimulation can be from the physical environment, such as books, TV shows, and food, and influenced by the size, furniture arrangement, decoration, and noise levels of the room. It can also be from the social environment, such as the people, activities, and conversations surrounding the resident. The total score of PEAR-Apathy ranges from 6 to 24; a higher score indicates more desirable environmental stimulation. The subscale had good internal consistency (Cron-bach's α = 0.84), inter-rater reliability (weighted kappa = 0.49–0.94), and intra-rater reliability (weighted kappa = 0.63–0.94) among long-term care residents with dementia (Jao *et al.*, 2016). The subscale consists of six items as described below. The environment subscale includes six items: (1) stimulation clarity, (2) stimulation strength, (3) stimulation specificity, (4) interaction involvement, (5) physical accessibility, and (6) environmental feedback. Each item is described as follows.

To minimize bias, apathy and environmental stimulation were coded by different research team members. Nursing students were trained to code the videos until 90% inter-rater agreement was reached on practice videos.

After the second-by-second coding of apathy and environmental stimulation was complete, we calculated a weighted average for each scale item in each video. For example, for a 4-minute video, if the stimulation clarity was rated as 2 for 2 minutes and 4 for 2 minutes, the weighted average rating of stimulation clarity for that video would be 3 ($2^*2/4 + 4^*2/4 = 3$). The weighted rating for each item ranged from 1 to 4.

Participant characteristics

Resident demographic data included age, gender, race, NH residence, dementia stage, physical function for ADL, and depression levels. The Functional Assessment Staging (FAST) scale (Reisberg, 1988; Sclan and Reisberg, 1992) was used to evaluate the stage of dementia based on functional disability, and data were extracted from Minimum Data Set (MDS)3.0 and medical records in the parent study. The FAST classifies people with dementia into 16 stages, rating from 1–8, with higher ratings indicating more advanced stage. Resident ADL function was extracted from the MDS 3.0, G110 ADL assistance, and G120 bathing. ADL assistance includes 10 items: (1) bed mobility, (2) transfer, (3) walk in room,(4) walk in corridor, (5) locomotion on unit, (6) locomotion off unit, (7) dressing, (8) eating, (9) toilet, and (10) personal hygiene. The G120 contains one item: bathing. Each item was rated on a 0–3 rating (0 = no help from staff, 1 = setup help only, 2 = one-person physical assistance, and 3 = two or more physical assistance). The total score of the 11 items ranges from 0 to 33; higher scores indicate higher needs for assistance and less independent ADL function. Depression was measured using Patient Health Questionnaire (PHQ-9) ratings extracted from the MDS 3.0 in the parent study (Saliba *et al.*, 2012) The PHQ-9 rating scale includes nine items, and each item is rated on a 0–3 scale to indicate symptom frequency (0 = never or 1 day, 1 = 2–6 days, 2 = 7–11 days, and 3 = 12–14 days). The total scores range from 0–27 (Saliba *et al.*, 2012). Based on the PHQ-9 rating, depression levels were categorized into five levels (1 = none, 2 = mild, 3 = moderate, 4 = moderately severe, 5

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= severe). Staff caregivers' demographic data included age, gender, race, education levels, clinical role, and years of clinical experience.

Statistical analysis

Descriptive statistics were used to describe participant characteristics using the Statistical Package for the Social Sciences (SPSS 25) (IBM Corporation, 2013). Multilevel linear models (MLMs) were used to examine the relationship between apathy and environmental stimulation using Stata software version 13.0 (StataCorp, College Station, TX, U.S.A.). Clustering effects within each facility and dyad were adjusted for to demonstrate the independent effects of environmental stimulation on apathy. The intraclass correlation coefficient (ICC) of each model indicated variance in apathy that was accounted for by clustering effects at facility and dyad levels. The null model that only included the NH site and unique staff caregiver–resident dyad indicated that 43% (ICC = 0.43) of variance in apathy was accounted for by the clustering effects at facility and dyad levels, indicating the need to adjust for the clustering effects to examine the association between apathy and environmental stimulation.

Two analyses were conducted to examine:

1. Association between apathy and overall quality of environmental stimulation (PEAR-Environment total rating)

2. Association between apathy and six environmental stimulation characteristics (PEAR-Environment individual items)

Each analysis began with the null model and then added (1) the environmental stimulation (total rating or ratings for six individual items [Model 1]); and (2) resident age, gender, dementia stage, ADL function, and depression level (Model 2). Coefficients with 95% confidence intervals (CI) for fixed effects of all covariates and the intercept and the log likelihood ratio were reported. The likelihood ratio difference was computed to compare model fit when the models used the same sample. The level of significance was 0.05 for all analyses.

Results

Participant characteristics

The 104 video observations included 63 unique staff caregiver–resident dyads that involved 42 caregivers and 44 residents with dementia. Each dyad had one or two observations.

Residents averaged 86 years of age and were primarily Caucasian females. Most (over 70%) of the residents did not have depression. Average FAST score was 6.84, indicating a moderately severe stage of dementia. The ratings ranged from6.4 (required assistance in bathing) to 7.4 (unable to ambulate). Participant ADL function was 26.88 on average, indicating a high level of needs for ADL assistance (Table 2).

Staff caregivers were 36 years old on average and were primarily Caucasian females. Only two were registered nurses (RNs); the majority of them were either certified nursing

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assistants (CNAs) or certified medication aides (CMAs). Half of caregiver participants had high school degrees, and the other half had college degrees. They had approximately 11 years of clinical experiences on average, ranging widely from 1 to 46 years (Table 2).

Resident participant apathy level was 15.02 on average and ranged from 8.90 to 19.42 (Table 3). The overall environmental stimulation was 20.86 on average and ranged from 15.07–22.53, indicating a moderate to high level of environmental stimulation (Table 3). As for characteristics of environmental stimulation, environmental stimulation was of high quality in physical accessibility (M = 3.91) and stimulation clarity (M = 3.90), followed by interaction involvement (M = 3.69) and environmental feedback (M = 3.49). The quality of stimulation specificity (M = 2.94) and stimulation strength (M = 2.93) were relatively lower. The variance of the overall environment stimulation (SD = 1.26) and individual stimulation characteristics (SD =0.15–0.39) were small. This is likely because the parent study focused on caregiver–resident communication, and the videos were recorded during caregiver–resident interaction.

Association between overall quality of environmental stimulation and apathy

The association between the overall quality of environmental stimulation and apathy is shown in Table 4. Model 1 did not fit significantly better than the null model: $\chi^2(df) = 0.37$ (1), $p = 0.54$. Environmental stimulation was not associated with apathy before or after controlling for resident characteristics (Model 1, coefficient = 0.10, p = 0.54, 95%CI = − 0.22, 0.41; Model 2, coefficient = 0.18, $p = 0.42$, 95%CI = − 0.17, 0.053). Apathy was significantly associated with resident age, gender, and ADL function. Specifically, residents who were younger (coefficient = − 0.07, $p = 0.031$, 95%CI = − 0.12, − 0.01) and male (coefficient = − 1.0, $p = 0.038$, 95%CI = − 1.95, − 0.06) had higher levels of apathy (coefficient = 0.081, $p = 0.019$, 95%CI = 0.013,0.148). In addition, residents with poorer ADL function had the higher levels of apathy (coefficient = 0.08, $p = 0.017$, 95%CI = 0.01, 0.14). Dementia stage and depression were not associated with apathy. The variance accounted for at facility and dyad levels decreased from 43% to 22%, after adding environmental stimulation and resident characteristics, indicating that around 21% variance in apathy was explained by these variables.

Association between environmental stimulation characteristics and apathy

The association between the six individual environmental stimulation characteristics and apathy is shown in Table 5. The Model 1 fits significantly better than the null model based on the likelihood ratio difference test: $\chi^2(df) = 21.92$ (6), $p = 0.0013$. In Model 1, stimulation specificity and environmental feedback were significantly associated with apathy. Specifically, higher stimulation specificity was associated with lower apathy levels (coefficient = − 2.23, $p = 0.049$, 95%CI = − 4.44, − 0.01), but the association was not significant after controlling for resident characteristics ($p = 0.082$). Additionally, higher levels of environmental feedback were associated with lower apathy levels before controlling for resident characteristics (coefficient = − 2.14, $p = 0.001$, 95%CI = − 3.36, − 0.91). The association remained significant after controlling for resident characteristics (coefficient = − 1.65, $p = 0.014$, 95% CI = − 2.97, − 0.33). The other four environmental stimulation characteristics were not associated with apathy. Gender and ADL function were significantly associated with apathy. Male gender was associated with higher apathy (coefficient = − 0.97, $p = 0.033$, 95%CI = − 1.86, − 0.08). Poorer ADL function was associated with higher apathy levels (coefficient = 0.06, p = 0.038, 95%CI = 0.003, 0.13). Dementia stage and depression were not associated with apathy. Similarly, the variance accounted for at facility and dyad levels decreased from 43% to 22%, after adding six environmental stimulation characteristics and resident characteristics, indicating that 21% variance in apathy was explained by these variables.

Discussion

Findings reveal that environmental stimulation that is tailored to the individual and prompts engagement is associated with lower levels of apathy among NH residents with dementia. This study highlights the importance of the effect of environmental stimulation on apathy.

Association between environmental stimulation and apathy

Findings revealed that the overall quality of environmental stimulation is not associated with apathy either before or after controlling for resident characteristics. For individual characteristics of environmental stimulation, only stimulation specificity and environmental feedback were associated with apathy; the other four characteristics were not. This finding is different from our previous study that revealed that stimulation clarity and strength were associated with apathy but not the other environmental stimulation features (Jao *et al.*, 2015). This may be in part explained by the lack of variance in environmental stimulation in both studies. Both studies were secondary analyses of data collected in homogeneous environmental contexts. For this present analysis, the CHAT study focused on care-giver communication during care for ADL, and the environmental stimulation contained clear and strong stimulation with one or two caregivers interacting with the resident regarding caregiving activities mostly at the resident's bedroom. There was limited background noise, and none of the videos contained the lowest level of environmental stimulation.

In this study, when stimulation specificity decreased one rating, apathy levels decreased 2.23 on a 6–24 rating scale. However, when controlling for resident characteristics, the association was no longer statistically significant. Stimulation specificity refers to the extent that the stimuli is delivered and tailored to the particular resident. Highly specific environmental stimulation refers to stimuli that is not only specifically delivered to the individual resident but also is tailored based on the resident's background, needs, or preference, such as reading the resident's favorite book, playing their favorite music, or serving their favorite food. The social environment can also be tailored to the individual's preference and needs. For example, when providing meals to the resident, the staff caregiver addresses the resident's name and says, "Mr. Smith, this is your beef burger and this is the ketchup. I know you always like to put ketchup on your hamburger. If you need anything else, please let me know." In contrast, non-specific environmental stimulation refers to when there is no environmental stimulation or only stimulation that is delivered toward the residents in general, not toward the resident as a unique individual. For example, two staff caregivers talk to each other or merely place the meal on the table without addressing individuals' preferences or needs.

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Similarly, when the environmental feedback decreased one unit, residents' apathy level decreased by 2.14, and the relationship remained significant after controlling for individual resident characteristics. A high level of environmental feedback refers to environmental stimulation that prompts the resident's expression or engagement. For example, a staff caregiver actively greets the resident and encourages the resident to participate in the conversation or the caregiving activities. In contrast, a low level of environmental feedback refers to restrictive environmental stimulation that prohibits the resident's engagement or expression. For example, when the resident expresses that he or she is not feeling right, the staff caregiver ignores it, changes the subject, or simply says, "You will be fine." Another example is that when the resident tries to stand up to talk to another resident, and the staff caregiver says, "Sit down."

Association between participant characteristics and apathy

This study revealed that younger age, male gender, and lower ADL independence predicted higher levels of apathy. This finding adds evidence to support the association of male gender and poor physical function with apathy as reflected in the literature (Clarke *et al.*, 2008; Vilalta-Franch *et al.*, 2013). Our findings about the relationship between age and apathy contradict existing literature. While most studies report no relationships between age and apathy (Clarke *et al.*, 2008; Starkstein *et al.*, 2005) and one study found older age was associated with apathy (Vilalta-Franch *et al.*, 2013), in our study younger residents demonstrated more apathy. This finding is interesting and should be further explored in future research.

Notably, while strong evidence suggests that people with apathy tend to have severe cognitive impairment, our study did not find a significant relationship between the dementia stage and apathy. This may be because of the method we used to measure dementia severity. Most studies that examined the relationship between cognitive impairment and apathy used either the Mini Mental State Examination (MMSE) (Folstein *et al.*, 1975) or the Clinical Dementia Rating (CDR) (Morris, 1997) that primarily measures cognitive function (Kolanowski *et al.*, 2017). Our study used the FAST scale to measure the dementia stage based on resident functional performance. This should be reevaluated in future research.

Implications for clinical practice

Our findings related to apathy-related personal characteristics may help to identify older adults who are at high risk for apathy who can benefit from interventions to reduce apathy. The apathy-related environmental factors identified in this study can guide intervention development that modifies physical and social environments to improve environmental stimulation and minimize apathy.

In particular, environmental stimulation that is specifically delivered and tailored to residents and prompt the resident's self-expression and engagement have high potential to reduce apathy in dementia care. Possible interventions include personalizing each resident's room with family photos and furniture from their home. Physical environment needs should also be addressed, such as ensuring that walking aids, glasses, and hearing aides are readily accessible. Stimulation specificity can also be improved with social environments that

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feature effective and person-directed communication strategies. Educating staff about communication strategies to improve stimulation specificity can include addressing the resident by name, including the resident in the conversation when providing care and incorporating personalized information into the conversation, such as talking about the family photos.

For environmental feedback, the use of any physical devices or pharmacological treatments that restrict the resident's engagement should be minimized. It is important to greet the resident with a friendly tone and respond to the resident's conversation, needs, or concerns. Residents should also be encouraged to express themselves and engage in conversation or activities. These may be accomplished by training staff caregivers.

To promote translation to practice, it is critical that family members, staff caregivers, and administrators understand the impact of environment on apathy. Family members have close relationships with residents and thus are familiar with their individual background and preferences. For environmental feedback, the use of any physical devices or pharmacological treatments that restrict the resident's engagement should be minimized. Staff care-givers have the most social interaction with residents and thus play a key role in NH social environments. Administrators are the major gatekeepers for modifying the physical environments and reinforcing the use of social interaction skills by staff caregivers. These approaches to improve environmental stimulation can be extended to other care settings and are applicable for community-dwelling older adults as well to improve home environments and communication between family members and individuals with dementia.

Strengths and limitations

This is one of a few studies that has examined the impact of environmental stimulation and apathy. Noteworthy, this study used innovative approaches to examine the relationship between environmental stimulation and apathy. This was a pioneer study that used second-by-second behavioral coding of videos to measure environmental stimulation and apathy. This approach allows precise capture of the dynamic changes in environmental stimulation in NHs and related apathy in residents with dementia. This approach supports identification of immediate influences of environmental stimulation on apathy. In addition, this study used a repeated measures approach, making it possible to control for both NH site and staff caregiver–resident dyad in the analysis.

A limitation of this secondary analysis was use of data collected in a study focused on staff caregiver and resident communication during care activities; the level of environmental stimulation captured was relatively homogeneous and the environmental stimulation in the videos tended to be high quality. First, this was reflected on the high PEAR-Environment ratings and lack of variance with the average ranges from 2.93–3.91 on a 1–4 rating scale (SD = 0.15–0.39). The small variance limits the statistical power to detect significance. Second, we were unable to use a more rigorous prospective approach to diagnose apathy and to differentiate apathy from depression. In this study, we used the PEAR-Apathy scale, a well-validated apathy observational scale, to assess apathy levels. Additionally, we were unable to comprehensively evaluate environmental factors, e.g. NH environmental design,

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cultures, staffing level, administrative support, and social density and caregiver characteristics (e.g. depression levels and caregiver–resident relationship). In addition, this study focused on the immediate influence of environmental stimulation on apathy. The impact of environmental stimulation on apathy over time was not studied.

Directions for future research

To further understand the relationships between environmental stimulation and apathy, a large-scale research study that captures a full range of the quality of environmental stimulation is needed. This will allow more precise analysis to evaluate the impact of all environmental stimulation features on apathy. In addition, the impact of other aspects of environmental stimulation, such as the types of environmental stimulation (e.g. music, television shows, books, people, or food), presence of familiar objects in the environments, and whether the environmental stimulation is individualized, should also be explored.

Moreover, it is necessary to explore how other physical and social environmental features impact apathy. Examples of physical environment features include facility size, spatial layout, furniture arrangement, sounds, lighting, and odor. Examples of social environment features include crowding; the type, quality, and frequency of social interactions; staff caregiver communication approaches; the topic of communication; and social contact with family. Future research should explore interventions that modify environmental stimulation to reduce apathy. Better understanding of the impact of environments on apathy will help identify strategies to improve dementia care environments and reduce apathy in residents with dementia in long-term care.

To improve NH care environments, it is important to understand clinicians' perspectives. It is critical to examine staff caregivers' understanding of the impact of environmental stimulation on apathy. It is also necessary to identify the barriers and facilitators to changing physical and social environments from both providers and administrators' perspectives. This is a key step to support the development of a clinically feasible, evidence-based intervention to create care environments that minimize apathy in dementia.

Conclusions

In summary, this study supports the impact of environmental stimulation on apathy and thus moves forward the science of apathy in dementia. Environmental stimulation can influence apathy and should be individually tailored for resident life history, cognitive level, and functional capacity. Positive stimulation needs to be incorporated, whereas negative stimulation needs to be regulated or modified for residents with dementia, especially those with apathy. Preventing apathy will reduce functional decline, cognitive decline, and mortality in dementia and enhance care quality and efficiency for dementia care in long-term care settings and beyond.

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Table 1.

Description of individual items of the PEAR environment scale

PEAR-ENVIRONMENT ITEM	DESCRIPTION OF EACH ITEM
1) Stimulation clarity	The extent that the stimulation is discernible and straightforward.
2) Stimulation strength	The extent that the stimulation is strong and unique.
3) Stimulation specificity	The extent that the stimulation is specifically delivered and tailored to the participant.
4) Interaction involvement	The extent that the stimulation involves interaction with the participant.
5) Physical accessibility	The extent that the stimulation is present at an accessible distance.
6) Environmental feedback	The extent that the stimulation intends to prompt or encourage the participant's reaction.

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Table 2.

Participant characteristics

CHARACTERISTIC	MEAN / *N*	SD (RANGE) / %
Residents (*N* = 44)		
Age	86.32	7.20 (63–98)
Gender, female	30	68.18%
Race, Caucasian	44	100%
Dementia stage (FAST rating)	6.84	0.26 (6.4–7.4)
ADL function (*N* = 42)	26.88	7.55 (12–41)
Depression stage (*N* =41)		
None	30	73.17%
Mild	5	12.20%
Moderate	5	12.20%
Moderately severe	1	2.44%
Caregivers (*N* = 42)		
Age (*N* = 41)	36.87	12.63 (19.00–69.89)
Gender, female	35	83.33%
Race		
Caucasian	33	78.57%
African American	7	16.67%
Asian	1	2.38%
Native American	1	2.38%
Education levels (*N* = 40)		
College	20	50.00%
High school	20	50.00%
Clinical roles		
CAN/CMA	40	95.24%
RN	2	4.76%
Clinical experience (years, *N*= 40)	10.94	9.92 (1.00–46.00)

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Table 3.

Descriptive data on apathy and environmental stimulation (*N* = 104 videos)

ITEM	MEAN	SD (RANGE)
Apathy total	15.02	2.18 (8.90–19.42)
1) Facial expression	2.61	0.49 (1.00–3.38)
2) Eye contact	1.79	0.61 (1.00–4.00)
3) Physical engagement	2.27	0.52 (1.00–3.72)
4) Purposeful activity	1.87	0.32 (1.00–3.34)
5) Verbal tone	3.27	0.59 (1.09–4.00)
6) Verbal expression	3.21	0.64 (1.29–4.00)
Environment stimulation total	20.86	1.26 (15.07–22.53)
1) Stimulation clarity	3.90	0.22 (2.86–4.00)
2) Stimulation strength	2.93	0.15 (2.34–3.00)
3) Stimulation specificity	2.94	0.27 (1.86–3.54)
4) Interaction involvement	3.69	0.39 (2.15–4.00)
5) Physical accessibility	3.91	0.21 (2.86–4.00)
6) Environmental feedback	3.49	0.36 (2.39–4.00)

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Table 4.

Multilevel linear models of variables of overall quality of environmental stimulation predicting apathy in dementia

VARIABLES (MEASURE OR REFERENCE)	**MODEL 1 (N = 104)**	**MODEL 2(N =99)**
	COEFFICIENT (95% CI)	
Environmental stimulation	0.10 (− 0.22, 0.41)	0.18 (− 0.17, 0.53)
Resident age		− 0.07* (− 0.12, − 0.01)
Resident gender		− 1.00* (− 1.95, − 0.06)
Dementia stage		0.34 (− 1.77, 2.45)
Depression (PHQ-9)		0.55 (− 0.04, 1.15)
ADL function		0.08* (0.01, 0.14)
Constant	13.00*** (6.42, 19.58)	13.66 (− 2.83, 30.15)
ICC at facility level	0.23	0.03
ICC at facility/dyad levels	0.44	0.22
Log likelihood ratio	− 222.59	− 203.93**
Likelihood ratio difference, x^2 (*df*)	0.37(1)[a]	

*** $p < 0.001$,

** $p < 0.01$,

* $p < 0.05$.

ICC = intraclass correlation coefficient.

[a]Comparison of null model and Model 1.

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Table 5.

Multilevel linear models of variables of individual characteristics of environmental stimulation predicting apathy in dementia

VARIABLES (MEASURE OR REFERENCE)	MODEL 1 (N = 104)	MODEL 2 (N =99)
	COEFFICIENT (95% CI)	
Stimulation clarity	− 1.46 (− 8.10, 5.17)	0.35 (− 7.89, 8.61)
Stimulation strength	9.11 (− 0.43, 18.66)	6.64 (− 5.60, 18.89)
Stimulation specificity	− 2.23* (− 4.44, - 0.01)	− 1.94 (− 4.18, 0.30)
Interaction involvement	0.17 (− 0.13, 2.47)	0.69 (− 0.62, 2.00)
Physical accessibility	− 0.36 (− 2.84, 2.12)	0.33 (− 2.49, 3.16)
Environmental feedback	− 2.14** (− 3.36, − 0.91)	− 1.65** (− 2.97, − 0.33)
Resident age (years)		− 0.05 (− 0.10, 0.011)
Resident gender		− 0.97* (− 1.86, − 0.08)
Dementia stage		− 0.69 (− 2.72, 1.32)
Depression		0.52 (− 0.03, 1.06)
ADL function		0.06* (0.003, 0.13)
Constant	5.07 (− 3.03, 13.16)	9.81 (− 6.15, 25.77)
ICC at facility level	0.19	0.08
ICC at facility/dyad levels	0.37	0.22
Log likelihood ratio	− 211.82***	− 196.20***
Likelihood ratio difference, x^2 (df)	21.92(6)**[a]	

*** $p < 0.001$,

** $p < 0.01$,

* $p < 0.05$.

ICC = intraclass correlation coefficient.

[a] Comparison of null model and Model 1.