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Factors Associated with Sustained Attention During an Activity Intervention in Persons with Dementia

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Abstract

Background/Aims—Are the non-cognitive factors of self-reported mood and personality related to sustained attention in nursing home residents with dementia during an activity intervention?

Methods—Intervention data from a randomized clinical trial were used to address the aim of this project. Subjects were 128 nursing home residents who were assessed for mood, personality, behavioral indicators of attention, time on task and number of disengagements during an activity intervention.

Results—More positive self-reported mood was associated with greater behavioral displays of attention during activities, greater time spent engaged in the activities and less disengagement.

Conclusion—To our knowledge this is the first study to report on the association of mood, personality and sustained attention in nursing home residents with dementia. While the findings are preliminary, they can be used to inform the design of future research.

Keywords

Attention; dementia; nursing homes; non-pharmacological intervention

Introduction

Recreational activities are an essential component of quality care in the nursing home [1]. Engagement in activities that are tailored to the individual resident's needs can facilitate cognitive and physical functioning, and may prevent the downward spiral that often accompanies institutionalization [2]. Unfortunately, not all residents can be successfully

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engaged in recreational activities. While some disengagement may be due to lack of interest or poorly selected activities, impaired attention may also be a factor. This is especially true for residents with dementia because attention is a cognitive domain affected in these disorders. [3]

Attention involves the cognitive states and operations needed to detect stimuli, select stimuli over 'noise,' and manage resources for the detection and processing of competing stimuli. Three subtypes of attention have been identified: selective, sustained, and divided attention [4]. Selective attention is the ability to focus on a stimulus to the exclusion of others, while divided attention allows sharing of attention resources, and sustained attention capacity is the maintenance of focus over time [5]. In both Alzheimer's Disease (AD) and Vascular dementia (VaD), selective and divided attention are most vulnerable while sustained attention is relatively preserved until later stages of the disease [6–8]. Impaired attention can result in slowed processing and reduced concentration, and negatively impact other aspects of cognitive and physical functioning [9]. For example, impairment in attention has been shown to adversely affect memory performance [10], loco-motor function [11], and way-finding ability [12]. Given the rather pervasive influence of attention on overall function, impairment in sustained attention is likely to affect the ability to engage in non-pharmacological interventions such as recreational activities, the focus of the current study.

Non-pharmacological interventions are recommended as a first line of treatment for a number of behavioral and psychological symptoms of dementia [13]. Characteristically, many require some degree of sustained attention to exert their effect. We are just beginning to identify factors that may influence sustained attention in nursing home residents with dementia. Cohen-Mansfield and colleagues tested a process model of engagement and found that higher engagement (operationalized as duration, attention, attitude and refusal) in activities was predicted by longer duration of modeling the activity, the presence of people in the environment, better cognitive status, better ability to carry out activities of daily living, and clarity of speech [14]. Their findings illustrate the importance of better functional abilities and a supportive environment for improving attention. In a randomized clinical trial, our group found that behavioral displays of attention, time on task and level of participation, were significantly improved when activities were tailored to personality style of interest [15]. This finding illustrates the interface between emotion and attention in that greater cognitive processing (attention) is directed toward aspects of the world that carry a higher degree of emotional significance (interest) [16].

The factors associated with attention in persons with dementia that have been identified to date can be used to improve prescription of activities so they promote sustained attention, but significant unexplained variance remains. Addressing this gap could make a significant contribution to health outcomes for nursing home residents in at least two ways. First, modifiable factors that improve sustained attention during activity interventions can be adjusted for improved outcomes. Secondly, factors that do not lend themselves to modification may be used to target interventions with increased precision to those individuals who are most receptive to recreational activity interventions.

In this study we were interested in examining sustained attention within the context of a non-pharmacological activity intervention that aimed to improve the behavioral outcomes of agitation and passivity in nursing home residents with dementia. Mood and personality are two factors that have demonstrated an association with attention in healthy populations [17, 18], but they have not been fully examined in clinical populations. The current study was guided by this research question: Are the non-cognitive factors of self-reported mood and personality related to sustained attention in nursing home residents with dementia during an activity intervention?

Review of Literature

Mood and Attention in Dementia

Mood is a relatively enduring emotional state that has more permanence than an immediate emotional response evoked by a stimulus, such as fear or pleasure, but is not as pervasive, enduring or consistent as personality. Mood is generally thought of as having two dominant dimensions, positive and negative, but these dimensions are only modestly correlated [19, 20].

Negative mood is known to adversely impact divided attention in addition to information processing speed, motor functioning, and cognitive flexibility [21, 22]. In addition, when depression is superimposed on dementia, there is a higher risk of adverse physical outcomes such as decreased functional status and physical health as well as increased mortality [23]. In persons with dementia, negative mood might be expected to attenuate the ability to engage in activities that require sustained attention.

In contrast, positive mood generally has an enhanced influence on cognition, specifically attention and executive function. Support for the impact of mood on cognition is based on the notion that positive mood stimulates increased dopamine levels in the brain resulting in better cognitive performance in some domains [24]. Positive mood state has demonstrated an enhanced influence on the ability to attend to task [18], on memory [25], on creativity [24, 26], on the ability to respond appropriately by inhibiting unchecked impulse responses [17], and on cognitive flexibility, including task switching [24, 26]. Episodic memory formation and retrieval of information is enhanced if the present mood state is congruent with the mood one is attempting to recall [27].

Not all evidence is in support of a relationship between positive mood and positive cognitive outcomes. For example, Cabeza and Nyberg (2000) [28] found that attention was diminished when positive mood-related memories intruded a cognitive task. Similar findings were reported for deductive reasoning and planning [17, 29].

Personality and Attention in Dementia

Personality refers to an individual’s relatively stable and unique intrinsic structure of thinking, feeling, and behaving [30]. The predominant framework for the study of personality is the Five Factor Model which consists of five broad personality domains: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness [31, 32].

Changes in personality have been reported as preclinical symptoms of AD [33, 34]. A recent systematic review determined that across studies, a consistent pattern of personality change is evident as dementia progresses: increased neuroticism, decreased extraversion, and decreased conscientiousness [35]. Although changes in personality may occur, individuals tend to demonstrate rank-order consistency regarding their overall personality profile, particularly in the earlier stages [36–40]. Two personality traits that may exert a behavioral effect on sustained attention in persons with dementia are conscientiousness and neuroticism.

Conscientiousness assesses the degree of organization, persistence, and motivation an individual possesses and influences both the ability to control impulses as well as to be goal directed [41]. As the cognitive systems responsible for attention begin to deteriorate, the ability to retain goal-directed behavior may be compromised [42]. Among individuals already low in conscientiousness, dementia-related impairments may manifest as attentional problems earlier or to a greater extent than in those who are highly conscientious. Indeed,

healthy older adults high in conscientiousness were less likely to develop AD compared to those low in conscientiousness [43]. Highly conscientious individuals, in spite of dementia progression, may be better able to remain focused on an activity in comparison to those who have been less conscientious during adult life [18].

Neuroticism is generally described as the chronic experience of distressing emotions as well as the inability to control impulses and react to stress in an adaptive manner [41, 44]. High neuroticism is associated with many psychopathological disorders such as anxiety, mood, and personality disorders [45–47]. Neuroticism is a biologically based predisposition which affects cognitive processing, in part, through attentional processes, leading to adverse effects in the controlled evaluation and correction of problematic cognitive and behavioral responses [48]. It has also been found that individuals with certain psychopathologic personality traits (e.g., social dominance, callousness) exhibited diminished selective attention, perhaps due to difficulty in screening out irrelevant stimuli [49].

A recent study by Tse et al.(2010) [18] confirmed earlier results by examining differences in attention between healthy older adults and individuals with mild AD as well as the association of these differences with personality traits. Across three attention tasks (measuring attentional control, selective attention, and attention switching), individuals with mild AD displayed decreased attention compared to healthy older adults. Furthermore, the differences in attention were associated with both higher neuroticism and lower conscientiousness.

Methods and Materials

Intervention data from a randomized clinical trial that tested the efficacy of a tailored activity intervention for responding to behavioral symptoms in nursing home residents with dementia were used to address the aim of this project. The trial received approval from the Pennsylvania State University Institutional Review Board. The methods and procedures used in that study were previously published [15]. The following is a brief summary of the protocol.

Subjects and Setting

One hundred and twenty eight participants were recruited from nine nursing homes in Pennsylvania and were those who: had a diagnosis of dementia according to DSM IV criteria; a score of 8 or greater but less than 24 on the Mini-mental State Exam (MMSE; [50]); were English speaking; 65 years of age or older; had no new psychoactive drugs prescribed from baseline through final observation; no delirium or progressive, unstable medical, metabolic, or neurological illness; and no history of Parkinson’s disease, Huntington’s disease, seizure disorder, stroke, alcoholism, drug abuse, head trauma with loss of consciousness, or psychiatric illness preceding the onset of memory loss. Participants who met enrollment criteria and whose legally authorized representative consented to participation were enrolled in the trial. The 128 study participants were primarily female (77%), Caucasian (88%), with a mean age of 86.11 (± 6.0) years, 12.26 (±3.1) years of education, and a MMSE score of 14.25 (±4.5).

Procedure

Following enrollment, participants were randomized into one of four activity conditions. A detailed description of the activity intervention has been published [15] . Briefly, each condition involved simple games and activities that were developed for nursing home residents [51], but were individually tailored to each participant’s functional level, personality style of interest, both factors, or neither factor. Examples of these activities

include tether ball game, look inside purse, and bingo. The Project Director assessed each participant's functional level using the MMSE and the Psychogeriatric Dependency Rating Scale (PGDRS; [52]) and interviewed a knowledgeable family member to obtain a measure of personality style of interest using the NEO- Personality Inventory [41]. The personality traits of extraversion and openness define style of interest and are associated with preference for vocational as well as leisure activities. These data and the functional data were used in the prescription of activities. Based on prior theoretical [53] and preliminary work [54], it was hypothesized that activities tailored to both functional level and personality style of interest would result in less agitation and passivity and greater engagement because they meet individual needs related to function and interest.

Trained research assistants implemented participants' prescribed activities for up to 20 minutes, twice a day for three weeks. Participants were allowed to disengage four times over the 20 minute session; at the fourth disengagement the activity was stopped. Immediately before each activity session these same research assistants interviewed participants and assessed their self-rated mood using the Dementia Mood Picture Test (DMPT; [55]). At the end of each session, the research assistant recorded each participant's time on task, level of participation, and count of the number of times the participant disengaged during the session. All activity sessions were videotaped to improve the reliability of behavioral outcome measures. Blinded research assistants then rated these tapes using standard instruments.

Measures

To capture a broad assessment of sustained attention during the activity session, several proxy measures were used: observation of pre-specified behavioral displays of attention; the time each participant spent in activities (time on task); and the number of times the participant disengaged during the activity session. The observational assessment of attention behaviors was taken from video recordings of the activity sessions using the Affective Rating Scale [56]. This observational scale has descriptive indicators for six affective states, including attention. Attention was operationalized as: looks at, reaches for, touches, points at, nods, verbally responds, asks questions about activity, moves or verbally responds to music. Scores range from 1 to 5; higher scores indicate greater display of attention. Inter-rater reliability (ICC) for the attention subscale was .94.

A stopwatch was used for measurement of time on task (possible score range: 0 to 20 minutes). A percentage agreement of 93.6 and a weighted Kappa of .91 was obtained for time on task.

Disengagement was measured as a count of the number of times (0 to 4) that the participant displayed any disengaging behaviors during the activity session. These behaviors included: dozing, negative remarks about the activity, turning away from the interventionist/activity, asking to leave, leaving or attempting to leave the area.

Mood was measured immediately before the activity intervention using the Dementia Mood Picture Test (DMPT; [55]), an instrument that measures self-reported positive and negative moods (bad, good, angry, sad, happy, worried). Each mood can receive a potential score of 0–2, in intensity with higher scores representing more positive mood. Correlation with the Montgomery-Asberg Dementia Rating Scale on which higher scores indicate greater depression is reported at -.51. We obtained an inter-rater reliability (ICC) of .99 when using this instrument.

Personality was measured using Form R of the Revised NEO Personality Inventory (NEO-PI-R), a 240-item Likert-type scale adapted for observer ratings [41]. The NEO-PI-R allows

a comprehensive assessment of adult personality in the five domains of neuroticism, extraversion, openness, agreeableness, and conscientiousness and the six more specific facets that comprise each domain. Coefficient alphas for observer ratings on the domain scales range from .86 to .91. A knowledgeable informant (usually a spouse or adult child) provided personality data during baseline assessment.

Analysis

Intervention period mood and the personality domains of neuroticism and conscientiousness were evaluated as predictors of behavioral displays of attention, time on task and number of times the subject disengaged during the activity session. Data were analyzed using a general linear models approach, controlling for age, mental status and treatment assignment. Observations were averaged within subjects, due to very low within-subject variability for a large portion of the sample. The values of the dependent variables were rank-transformed, due to non-normality of the sample distributions of the raw data. Initial univariate analyses were conducted with separate regression analyses for each of the independent variables. We then entered both predictor variables (mood and personality) into the model.

Results

In univariate analyses, greater behavioral displays of attention were positively associated with more positive mood ($p<0.0001$) and greater conscientiousness ($p< 0.0001$), and negatively associated with greater neuroticism ($p= 0.0025$). The number of times disengagement occurred over the 20 minute activity session was negatively associated with more positive mood ($p<0.0001$) and greater conscientiousness ($p= 0.0237$), such that as mood and conscientiousness decreased, participants disengaged more often during the activity session. The total time participants spent engaged in the activity session was positively associated with more positive mood ($p<0.0001$) and greater conscientiousness ($p=0.0003$) and negatively associated with greater neuroticism ($p=0.0008$).

Table 1 displays the results of the multivariate analyses. More positive mood was positively associated with greater displays of attention and greater time on task, and negatively associated with greater number of disengagements during activities. There were no significant relationships between neuroticism or conscientiousness and any of the dependent measures in the multivariate analyses.

Discussion

In this study we explored whether mood or the personality traits of conscientiousness and neuroticism had an effect on sustained attention in a group of nursing home residents with dementia. Having a more positive self-reported mood was associated with greater behavioral displays of attention during activities, greater time spent engaged in the activities and less disengagement, when we controlled for age, mental status and treatment assignment. Previous studies have demonstrated an effect of mood on attention. For instance, Rowe and colleagues [57] (2007) found that positive mood impaired selective visual attention. It has also been suggested that negative mood improves alerting efficiency during the completion of the Attention Network Test [58]. However, no study to our knowledge has explored the relationship between mood and sustained attention in nursing home residents with dementia. The current study aimed to fill this gap in the literature and found that positive mood can exert a positive effect on sustained attention in nursing home residents with dementia. One possible mechanism for this effect is that release of dopamine has been found to be stimulated by positive, but not negative, mood [59, 60]. This release enhances motivation which may help sustain attention.

In order to explore the association between personality traits and sustained attention a univariate analysis was conducted and we found that having a tendency toward depression, anger and fear (i.e., greater neuroticism) was associated with fewer displays of attention and less time on task during activities, while being more conscientious was associated with greater displays of attention, greater time on task and fewer disengagements during activities. These relationships make both theoretical and intuitive sense. High neuroticism is associated with psychological distress and maladaptive coping [61], which may contribute to decreased functional abilities in older adults [62]. It is likely that tendencies toward negative affective states may also influence activity participation. Additionally, stress-prone older adults are generally less motivated to perform [63] and more likely to display detrimental behaviors such as non- adherence to treatment [64]. Alternatively, high conscientiousness is associated with health-promoting behaviors and treatment success [65] which is thought to be influenced by improved adaptation to stressors and maintenance of everyday functional abilities [62].

Although univariate analyses supported the influence of personality on activity engagement, in multivariate analyses these relationships were no longer significant. We found no associations of either neuroticism or conscientiousness with any of our measures of attention in those models. In later stages of dementia, mood and mental status may be more important determinants of sustained attention than personality, an intrinsic structure that influences mood. Several theoretical frameworks [53, 66] speak to the importance of proximal factors, such as mood, and qualities of the physical and social environment in determining behavior in later stages of dementia. Personality, which continues to have some influence on behavior, may be less salient for predicting attentional ability in later stages of dementia as we found in this study.

Consistent with previous studies [67], we found a significant relationship between our control variable, mental status, and scores on attention outcomes (data not shown). This suggests that residents with dementia, despite their mood state, might have increased difficulty engaging in non-pharmacological interventions that require sustained attention as the disease progresses. From a clinical perspective, behavioral interventions may need to be implemented for shorter periods of time but at more frequent intervals for these individuals. In fact, research is needed to determine the dose of non-pharmacological interventions that produces positive outcomes across the dementia trajectory.

There are several limitations to this study owing to the fact that this was a secondary analysis of an existing dataset. First, the sample was composed of nursing home residents and reflected the predominately female population in those settings. While this is an important group who frequently has problems with attention, the findings may not be generalizable to males or community-dwelling older adults. Furthermore we explored the association of mood and personality with sustained attention in residents for whom we did not differentiate types of dementia. Different types of dementia may affect sustained attention in different ways and we were unable to determine that effect.

Despite these limitations, the findings indicate that personality traits may not exert a significant influence on sustained attention in residents with dementia. Better self-reported mood and higher mental status were positively associated with sustained attention during a non-pharmacological intervention. Helping nursing home residents engage in pleasant activities has been shown to promote quality of life in the nursing home by reducing the need for psychotropic drugs [68, 69], and future research should address factors that help these residents sustain their attention during these activities. While many personal and environmental factors likely influence attention, future research should also explore the

neural mechanisms underlying the relationship between mood and sustained attention in persons with varying types of dementia.

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Table 1

Outcomes by terms used in each model, estimates for terms and p-values

Attends		
Independent Variable	Estimate (±S E)	P -Value
Mood	3.26 (1.6)	.0475
Neuroticism	−0.09 (0.3)	.7550
Conscientiousness	0.37 (0.3)	.2422
Time on Task		
Independent Variable	Estimate (±S E)	P -Value
Mood	4.26 (1.7)	.0129
Neuroticism	0.05 (0.3)	.8797
Conscientiousness	0.26 (0.3)	.4247
Number of Disengagements		
Independent Variable	Estimate (±S E)	P -Value
Mood	−4.26 (1.7)	.0042
Neuroticism	−0.21 (0.3)	.4991
Conscientiousness	−0.11 (0.3)	.7100

All Models account for age, treatment assignment and mental status
Mood= score on DMPT
Neuroticism= score on NEO-PI
Conscientiousness= score on NEO-PI