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Efficacy of Theory-Based Activities for Behavioral Symptoms of Dementia

Ann M. Kolanowski, PhD, RN, FAAN

Associate Professor of Nursing

School of Nursing

The Pennsylvania State University, University Park, PA

Mark Litaker, PhD

Associate Professor

Office of Biostatistics and Bioinformatics

Medical College of Georgia, Augusta, GA

Linda Buettner, PhD, CTRS

Associate Professor Health Science and Director Interdisciplinary Center for Positive Aging

Florida Gulf Coast University, Fort Myers, FL

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Background: Agitation and passivity are behavioral symptoms exhibited by 90% of nursing home residents with dementia and account for many poor health outcomes, caregiver burden, and increased costs of long-term care.

Objectives: This study tested the efficacy of recreational activities derived from the Need-driven Dementia-compromised Behavior (NDB) Model: activities matched to skill level only; activities matched to style of interest only; and a combination of both (NDB-derived) for responding to the behavioral symptoms of dementia.

Methods: Thirty subjects were randomly assigned to 1 of 6 possible order-of-condition presentations in this crossover experimental design with repeated measures of dependent variables. Trained research assistants, blind to condition match, implemented each condition for 12 consecutive days. Measures of engagement (time on task and participation), affect, and behavioral symptoms (agitation and passivity) were taken from video recordings of each session. Mood was measured in real time. The primary analysis method was mixed-model ANOVA.

Results: Findings indicated significantly more time on task, greater participation, more positive affect, and less passivity under NDB-derived and matched to interest only treatments compared to the matched to skill level only treatment or baseline. Agitation and negative affect improved under all treatments compared to baseline. There was no significant change in mood.

Conclusions: NDB-derived activities are tailored to meet individual needs and improve behavioral symptoms associated with dementia. These findings help to elucidate the factors that produce behavioral symptoms and the mechanisms that underlie their successful treatment.

Key Words: behavioral symptoms—dementia—activity interventions

Agitation and passivity are behavioral symptoms exhibited by 90% of nursing home residents with dementia and account for many poor health outcomes including decline in physical functioning, social isolation, and increased risk of abuse (Cohen-Mansfield, Marx, & Rosenthal, 1989; Dyer, Pavlik, Murphy, & Hyman, 2000; Galynker, Roane, Miner, Feinberg, & Watts, 1995; Harwood, Barker, Ownby, & Ducra, 2000). These symptoms contribute significantly to long-term care costs and are a major source of caregiver burden (Donaldson, Tarrier, & Burns, 1997; Murman et al., 2002). As dementia progresses many individuals exhibit *both* agitated *and* passive behaviors (Rubin, Morris, & Berg, 1987). This makes their pharmacological treatment difficult because the sedative effects of drugs used to treat agitation may increase passivity. Non-pharmacological interventions are recommended as the first line of treatment for the behavioral symptoms of dementia (Teri et al., 2002).

One reason nursing science has few effective interventions for responding to the behavioral symptoms of dementia is because, historically, it has lacked a comprehensive theoretical base that considers their root cause. Theory-based interventions help to target treatments effectively. The purpose of this study was to test the efficacy of recreational activities derived from the Need-driven Dementia-compromised Behavior (NDB) model for responding to the behavioral symptoms of agitation and passivity in nursing home residents with dementia.

Agitation is defined as inappropriate verbal, vocal, or motor activity that may be abusive or aggressive toward self or others, is performed with inappropriate frequency, or is inappropriate according to social standards for the specific situation (Cohen-Mansfield et al., 1989). Passivity is characterized by a lessening of mental processes, a decrease in ability to experience or respond to human emotions, fewer interactions with others or the environment, and a decrease in activity

(Colling, 2000). Agitation and passivity seem to be opposites, but their causes may be similar: lack of appropriate stimulation from the physical and social environment. Nursing home residents spend much of their time "doing nothing," and it is during periods of unoccupied time that both agitation and passivity are exhibited (Cohen-Mansfield, Werner, & Marx, 1992; Logsdon, 2000; MacRae, Schnelle, Simmons, & Ouslander, 1996; Perrin, 1997). Recreational activities show promise as management strategies for behavioral symptoms because they fill unoccupied time, but studies of their efficacy have shown modest results (Beck et al., 2002; Opie, Rosewarne, & O'Connor, 1999). A limitation of these studies is that many lacked a theoretical basis for activity prescription.

The Need-driven Dementia-compromised Behavior (NDB) model is a mid-range theory that provides an understanding of the behavioral symptoms of dementia. A description of the model has been published elsewhere (Algase et al., 1996). The NDB model changes the pejorative view of behavioral symptoms as "disruptive" to a perspective that conceptualizes these behaviors as indicating unmet needs that, if responded to appropriately, will enhance quality of life. In the model, behavioral symptoms reflect the interaction of relatively stable background factors with more changeable proximal factors (Figure 1).

Using the NDB model, recreational activities are tailored so they enrich the physical and social environment (proximal factors) by matching to background factors. First, NDB-derived activities match the resident's current cognitive and physical functioning ability so they are appropriate for his/her level of skill. Skill appropriate activities not only facilitate engagement, but studies have shown that when people are absorbed in activities that match their ability, they experience positive emotions (Csikszentmihalyi & LeFevre, 1989). Second, NDB-derived activities match interests. The identification of recreational interests in the cognitively impaired is difficult and imprecise, and often done in a trial-and-error fashion. Using the NDB model, the identification of interests is accomplished by a systematic evaluation of premorbid personality, a background factor that can identify style of interest, a life-long preference for certain types of activities.

Style of interest is defined by the personality traits of extraversion and openness (Costa, McCrae, & Holland, 1984; Holland, 1999). Extraversion reflects the amount of social stimulation preferred by the individual. Persons high on this trait are outgoing and enjoy socializing with others, while persons low on this trait prefer more solitary activities. Openness evaluates the individual's tolerance for the unfamiliar. Persons high on this trait enjoy new activities and like to explore their environment, while persons low on this trait prefer more conventional activities. Traits remain relatively stable in adulthood (Hooker & McAdams, 2003), and there is evidence that facets of extraversion and the trait of openness maintain both rank order and mean level stability in dementia (Chatterjee, Strauss, Smyth, & Whitehouse, 1992; Siegler et al., 1991; Strauss, Lee, & Di Filippo, 1997). These long-standing tendencies have been used to identify activity interests in persons with dementia, and improved prescriptive precision over current approaches (Kolanowski, Buettner, Costa, & Litaker, 2001). Personality-based activities are designed to meet individual needs and preferences and thereby reduce behavioral symptoms.

The causal model that underlies the treatment effect is illustrated in Figure 2. It is hypothesized that under implementation of NDB-derived recreational activities, nursing home residents with dementia will:

1. exhibit greater engagement
2. exhibit more positive affect and less negative affect
3. report more positive mood

4. exhibit less agitation and less passivity

To test these hypotheses we compared time on task and participation (engagement), affect, mood and behavioral symptoms (agitation and passivity) during implementation of NDB-derived activities to these same variables during baseline and two active control treatments: activities matched to skill level only and activities matched to style of interest only.

Methods

This study used a crossover experimental design with repeated measures of the dependent variables. Measures of engagement, affect and behavioral symptoms were taken from videotapes using a standard video recording protocol. Measures of mood were obtained in real time by subject interview. The study examined components of the NDB-derived treatment (skill level match and interest match) that were hypothesized to result in therapeutic outcomes. Thirty subjects served as their own control and were randomly assigned to one of 6 possible order-of-condition presentations. Using a balanced design, 5 subjects were assigned to each order of presentation. Subjects received each activity condition for up to 20 minutes per day for 12 consecutive days with a 2-day washout period between conditions.

Subjects and Setting

Effect size estimates were calculated from a pilot study that had a similar design and dependent variables as this study. The power estimates were based on two-sided testing at alpha = .05, with a sample size of 30 subjects. Estimated power to detect a medium effect size, expressed as a percentage, for dependent variables were: time on task (83%); participation (99%); positive affect (99%); negative affect (40%); mood (66%); and agitation (96%).

The University Institutional Review Board approved the study protocol. Elderly residents were recruited from 4 nursing homes located in northeast and central Pennsylvania. We obtained written consent from each subject's responsible party and assent from the subject. Subjects met the following inclusion criteria: they were English speaking; had a diagnosis of dementia that met DSM-IV criteria; had a Mini-Mental State Exam (MMSE) (Folstein, Folstein, & McHugh, 1975) score of 24 or less; had a willing informant who knew the subject well and who provided personality and other data; had a stable dose of any psychoactive drug from pre-baseline through final observation; and exhibited behavioral symptoms as reported by staff and documented in the subject's Minimum Data Set. Exclusion criteria included: having a history of psychiatric problems, alcoholism, diagnosis of Parkinson's disease, or stroke; having a Hachinski score above 4 to rule out vascular dementia; having an average score for *both* Extraversion and Openness on the NEO Five-Factor Inventory (Costa & McCrae, 1992) because these persons cannot be accurately classified on style of interest; having received a new psychoactive medication within the past 30 days; and having an acute illness.

Fifty-five subjects met initial eligibility; that is, they were identified by the nursing home as having Alzheimer's disease and behavioral symptoms. The responsible parties for 16 of these subjects did not meet eligibility as knowledgeable informants or could not be contacted for consent. Six of the 39 consenting subjects did not meet all eligibility criteria. Three subjects were lost to follow up. Two died and one was dropped because the presence of the video camera was upsetting to him. The final sample (N = 30) was primarily female (77%), white (100%) and widowed (71%), with a mean age of 82.3 (SD = 7.5) years, a mean educational level of 10.9 (SD = 2.5) years, and a mean mental status score (MMSE) of 8.6 (SD = 7.2).

Intervention

The recreational activities that were tested in this study are from the third author's (LB) clinical practice and research (Buettner, 1999). These activities are age and disease-stage appropriate activities designed for nursing home residents with dementia. An earlier project (Kolanowski et al., 2001) describes in detail how activities were classified by style of interest so that their selection matched subjects' long-standing preference for social stimulation (extraversion) and novelty (openness). Descriptors for the traits of extraversion and openness were used to classify personality appropriate activities in one of 4 style of interest categories developed by Costa and McCrae (1998). The trait of extraversion was used to prescribe the context of the activity (small group vs. one-on-one), and the trait of openness was used to prescribe the content of the activity (artistic pursuits, expression of feelings and curiosity vs. the more prosaic, familiar and conventional). Several examples of recreational items by style of interest category are presented in Table 1.

Instruments

Each subject's cognitive ability, physical functioning, and style of interest were assessed, and these data were used for activity prescription. A trained master's-prepared geriatric CNS/NP collected these data.

Cognitive ability was assessed using the Folstein Mini-Mental State Exam (MMSE) (Folstein et al., 1975), a brief standardized cognitive screen that includes items on orientation, registration, memory, attention and concentration. The score is the sum of correct responses and ranges from 0 to 30. Scores below 24 indicate global cognitive impairment.

Physical functioning was assessed using the physical capacity subscale of the Psychogeriatric Dependency Rating Scale (PGDRS) (Wilkinson & Graham-White, 1980). Seven items on hearing, vision, speech, mobility, dressing, personal hygiene and toileting are rated on a Likert-type scale. Scores range from 0 to 34 with higher scores indicating greater dependency.

Style of interest was assessed using the NEO Five-Factor Inventory (NEO-FFI) (Costa & McCrae, 1992), a 60-item Likert-type self-report adapted for informant use. The NEO-FFI assesses adult personality in 5 domains: neuroticism, extraversion, openness, agreeableness and conscientiousness. Taken from the longer 240-item NEO Personality Inventory (NEO-PI), the shorter version reduces respondent burden and correlates with the longer version with coefficient alphas ranging from .75 to .89. When rating the subject, the informant was asked to think of the subject as he/she was 10 years prior to the onset of dementia. This allowed a reasonable “outer limit” of a subject’s onset of dementia and a more accurate assessment of traits (Richman, 1989). The subject’s scores on extraversion and openness were converted to *t*-scores ($\overline{X}$ = 50: SD = 10) and used to identify style of interest. Scores of 50 and above were considered high and those below 50 were considered low.

Dependent measures were taken from videotapes by trained research assistants (RAs) blind to condition match:

Engagement was the time in minutes and seconds (time on task) that the subject participated in each activity session and the intensity of participation. Time on task was measured using a stopwatch starting from the initiation of engagement in activity and ending at 20 minutes or when the subject disengaged from the activity. Raters followed decision rules for identifying when the subject was “engaged” and when “disengaged.” Intensity of participation was measured using a method developed by Kovatch and Magliocco (1998). Participation was rated on a scale of 0 to 3 (0 = dozing; 3 = actively engaged). The scale has descriptors for each numerical rating. Interrater reliabilities (ICC) of .99 for time on task and .83 for participation were obtained.

Affect was measured using the Philadelphia Geriatric Center Affect Rating Scale (ARS) (Lawton, Van Haitsma, & Klapper, 1996). The observational scale has descriptive indicators for 6 affective states: pleasure, anger, anxiety, depression, interest and contentment. The rater was instructed to estimate for what portion of a 20-minute behavior stream any of these affects were evidenced. Scores were obtained for both positive and negative affect with higher scores indicating more of either affect. Interrater reliability for the ARS was found to be .93.

Mood was measured in real time using the Dementia Mood Picture Test (DMPT) (Tappen & Barry, 1995), an instrument that measures both positive and negative moods from the perspective of the cognitively impaired subject. Measures were taken immediately before and immediately after each observation period. The dependent variable for change in mood was the difference between the post- and pre-measurements of DMPT (total) within each day. The subject was shown 6 “faces” and asked to indicate if the drawing represents how he/she feels. The subject received a total score between 0–12 with higher scores representing the more positive mood. The instrument has demonstrated high interrater reliability (95%-100%).

Behavioral symptoms were measured using the Cohen-Mansfield Agitation Inventory (CMAI) (Cohen-Mansfield et al., 1989) and the Passivity in Dementia Scale (PDS) (Colling, 2000). The CMAI is a caregiver-rating questionnaire that consists of 29 agitated behaviors that are rated on a 7-point scale of frequency. The CMAI, modified for direct observation, was used to rate agitation during observation periods (Chrisman, Tabar, Whall, & Booth, 1991). The rater indicated which of the 29 dementia behaviors occurred in 5-minute blocks of time. A sum score was obtained. Interrater reliabilities for the CMAI have ranged from .92 to .95; the scale has reported convergent validity.

The PDS is an observer rating scale of 42 behaviors: 12 passive behavior items scored in the negative and 30 active behavior items scored in the positive. Lower scores indicate greater passivity. Five subscale scores were obtained: cognition, emotions, interaction with the environment, interaction with persons and psychomotor activity. The rater indicated which of the 42 behaviors occurred in 5-minute blocks of time. A sum score was obtained. We obtained internal consistencies (Cronbach's alphas) of .71 to .94 for the subscales and interrater reliability of .80 for the total scale.

Procedure

Pre-baseline: consented subjects who met enrollment criteria were observed hourly from 7a.m. to 7p.m. for 5 consecutive days using the CMAI and PDS. This was done to determine the type of behavior exhibited and the time of day when these behaviors were most likely to peak.

Baseline: For 12 consecutive days each subject was observed and videotaped for 20 minutes each day at the time point when he/she exhibited peak behavioral symptoms as determined in pre-baseline. If a subject exhibited behaviors at a constant rate across the 7 a.m. – 7 p.m. time frame, or they exhibited several peak times, or they exhibited both agitation and passivity, we randomly selected one of these times/behaviors for observation. Measures of affect and behavioral symptoms (agitation and passivity) were taken from videotapes of each observational session. Mood was measured in real time at the beginning and completion of each observational session by subject interview.

Treatments: The first and third authors prescribed activities based on each subject's cognitive abilities, physical functioning and style of interest. Activities were matched to skill level only (treatment A), style of interest only (treatment B), and skill level *and* style of interest (treatment C). For treatment A, subjects received activities matched to their cognitive and physical functioning (skill) level, but opposite their identified style of interest (i.e. from the style of interest category diagonal to their identified style of interest category. See Table 1). For example, a subject who scored low on extraversion and low on openness (E-O-) would receive skill appropriate activities that appealed to artistic interests in a small group (E+O+) for his/her treatment A. For treatment B, subjects received activities that matched their style of interest, but not their skill level. For treatment C, subjects received activities that were matched to both skill level and style of interest. Trained interventionists blind to condition match implemented treatments for up to 20 minutes at each session. Each treatment was given for 12 consecutive days at peak behavior time. To ensure treatment fidelity, random manipulation checks were preformed by the PI on at least 20% of sessions for each condition.

Statistical Methods

Sample distributions were examined for each variable, within subject and treatment. Measured values were plotted by day of treatment for each subject in order to evaluate possible trends across the days of observation for each treatment condition. Distributions of residual values were examined for the normal-distribution-based statistical models in order to ensure that the assumptions of the analytic methods were met. The primary analysis method was mixed-model analysis of variance (ANOVA) using subject as the random effect and treatment as a fixed effect. Post hoc pairwise comparison of treatment means was performed using Tukey's test and was based on least-squares means in order to account for unequal replication due to missing values. Comparison of each treatment mean versus the mean for the baseline condition was performed regardless of the results of the overall test for differences among treatment means. Since these were pre-planned pairwise comparisons, each was performed at the 95% confidence level. The analysis was done in two steps. First, separate ANOVA analyses were performed for each of the treatments in order to evaluate change across days for time on task, positive affect, negative affect, mood, agitation, and passivity. The analysis of participation scores was analogous, but used generalized estimating equation analysis with a multinomial model for the 4 possible values of the participation score (0, 1, 2, 3). Following this analysis, each subject's scores were averaged across days within treatments in order to address large differences in within-subject variability, and mixed-model ANOVA was then used to compare mean scores among the treatments.

Results

The means and standard deviations for the dependent variables are listed in Table 2. No significant trend across days of treatment was found for any of the dependent variables. There was a significant difference in mean time on task among the treatments ($p = .0011$). The least squares means for treatment C was significantly higher than for treatment A ($p = .0009$), but not significantly different from treatment B ($p = .3710$). Treatment B was significantly higher than treatment A ($p = .0404$). There was a significant difference in mean participation among the treatments ($p < .0001$). The least squares means for treatment C was significantly higher than that for treatment A ($p < .0001$) or treatment B ($p = .0025$). Treatments A and B were not significantly different ($p = .4418$).

There was a significant difference in positive affect among the treatment means ($p < .0001$). Positive affect was significantly lower for baseline than treatments B ($p = .0092$) or C ($p < .0001$), but not treatment A ($p = .1237$). Positive affect was significantly higher for treatment C than treatment A (p = > .0212), but not treatment B ($p = .2187$). Treatments A and B were not significantly different ($p = .7476$). There was not a significant difference among the treatment means for negative affect, although the p-value was very close to the .05 cut point ($p = .0562$), suggesting there may be some treatment effect. The pre-planned comparisons with baseline do show significant differences for baseline vs. treatment A ($p = .0457$), baseline vs. treatment B ($p = .0111$), and baseline vs. treatment C ($p = .0423$). There was less negative affect under all three treatments compared to baseline.

There was no significant difference in mood change score (post- pre) among treatments ($p = .8604$) and none of the treatments were different from baseline ($p = .5419$ for treatment A, $p = .9966$ for treatment B, $p = .8309$ for treatment C).

For agitation, subjects showed little variability in CMAI scores across days within treatments. There was a significant difference in mean score among the treatments ($p = .0004$). Under treatments A, B, and C there was significantly less agitation than during baseline ($p = .0073$ for treatment A, $p = .0011$ for treatment B, $p = .0017$ for treatment C). There were no significant differences among treatments A, B, and C (all $p > .9400$).

For each subscale of passivity, all 3 active treatments significantly reduced passivity compared to baseline, with the exception of emotions, where treatment A did not differ from baseline. The treatment comparisons indicated that for each subscale, treatment C resulted in significantly less passivity compared to treatment A, but not treatment B, and treatments A and B did not differ. Significance levels for each subscale are as follows. For thinking there was a significant difference between treatment means (p < .0001). Treatments A, B, and C were significantly different from baseline (p = .0259 for treatment A, p = .0020 for treatment B, and p <.0001 for treatment C). Treatment C differed significantly from treatment A (p = .0330), but not treatment B (p = .2204). Treatments A and B were not different (p = .8334). For emotions, there was a significant difference between treatment means (p < .0001). Baseline was significantly different from treatments B (p = .0467) and C (p < .0001), but not from treatment A (p = .1029). Treatments A and C differed significantly (p = .0433), but there was no difference between treatments A and B (p = .9871) or B and C (p = .0963). For interacting with the environment there was a significant difference among treatments (p < .0001). All treatment means differed significantly from baseline (p = .0008 for treatment A, p < .0001 for treatment B, and p < .0001 for treatment C). Treatment C differed from treatment A (p = .0013), but not B (p = .1352). Treatments A and B were not different (p = .3486). For interacting with persons there was a significant difference among treatments (p < .0001). Baseline was significantly different from treatments A (p < .0001), B (p < .0001), and C (p < .0001). Treatment C was different from treatment A (p = .0160) but not B (p = .2249). Treatments A and B did not differ (p = .6787). For psychomotor activity there was a significant difference among treatments (p < .0001). Baseline was significantly different from treatments A (p < .0001), B (p < .0001), and C (p < .0001). Treatment C was different from treatment A (p = .0459), but not B (p = .3052). Treatments A and B did not differ (p = .8022).

Discussion

In this treatment efficacy study we hypothesized that subjects would exhibit improved outcomes under implementation of NDB-derived recreational activities that were matched to their skill (cognitive and physical functioning) level *and* style of interest as compared to recreational activities matched to only one of those treatment components or baseline. We found that agitation and passivity responded best to different treatments, but that NDB-derived activities were efficacious for a broader spectrum of behavioral outcomes than either of the other conditions.

Subjects spent more time on task when the activity captured their interests; that is, it was tailored to either their interests *and* skills (NDB-derived) or interests alone, and thus was consistent with their personality. However, subjects were scored (timed) as being "on task" when they were both actively and passively engaged. Participation was the measure that differentiated levels of engagement, and subjects participated more actively when the activity was tailored to *both* interests and skill level (NDB-derived). Interest match may be a key treatment component for maintaining attention, but subjects cannot fully participate in activities that require skills they have lost. Grant and Potthoff (1997) found that use of skill-appropriate activities improved participation in their study of nursing home residents with dementia. We improved participation over either treatment component alone by matching activities to both skill level and interests.

We were able to improve positive affect over baseline and activities matched to skill level only, when we implemented activities matched to interests only or matched to both interest *and* skill level (NDB-derived). Like time on task, positive affect responded best when the subject's interests were identified and used in the prescription of activities. On the other hand, we found a weak treatment effect for negative affect. Our pre-planned comparison indicated that any type of activity improved negative affect over baseline. We noted that negative affect was not frequently observed in our subjects. Additionally, we only had a power of 40% to detect a treatment effect for negative affect. These issues most likely contributed to the lack of significant findings for negative affect. Our findings are similar to Beck et al. (2002) who found significantly more positive affect, but no reduction in negative affect or agitation, following implementation of tailored behavioral interventions for nursing home residents with dementia. They too found little negative affect, and concluded that their non-targeted interventions need to be more precisely designed to improve a broader range of behavioral outcomes. Our NDB-derived interventions were targeted to unoccupied time, but a larger sample size might have provided more definitive findings on the relationship between the intervention and negative affect.

We found no significant change in mood under any of our treatments. However, in pilot work, we found that NDB-derived activities improved mood over other active treatments when activities were given twice a day for 3 weeks, suggesting that dosage may be an important factor here (Kolanowski, Litaker, & Baumann, 2002). Our power was somewhat low for testing this hypothesis and a larger sample might yield significant results. We also acknowledge that these results may stem from a limitation of the self-report method in this population.

Like negative affect, agitation did not demonstrate a differential response to any of the active treatments. Any treatment reduced agitation compared to baseline. The diversion present in any type of activity may be sufficient for the successful treatment of agitation. However, we did not look at the impact of our interventions outside of treatment times. Work by Kovach and Wells (2002) indicates that balancing the daily activity schedule so that residents are not over or under aroused for long periods of time reduces agitation. NDB-derived activities are designed to be compatible with residents' stimulation needs and may be well-suited to maintaining arousal balance throughout the day while minimizing polypharmacy. Their efficacy needs to be evaluated within the context of longer periods of time in addition to their immediate effect during treatment. Passivity, on the other hand, responded best when activities matched interests. Passivity is reported to be particularly resistant to intervention (Everitt, Fields, Soumerai, & Avorn, 1991), and residents who display this behavior are more behaviorally activated when activities are designed to be compatible with their individual needs for social stimulation and novelty. Because passive residents are at high risk for functional decline, non-pharmacological interventions that reduce withdrawn behavior without troublesome side effects are particularly advantageous.

Taken together our results indicate that prescription of NDB-derived activities improves outcomes for a wider spectrum of behaviors compared to activities tailored to either treatment component alone or baseline. We found that any type of activity may be effective for reducing the negative behavioral symptoms associated with dementia; that is, negative affect and agitation. However, interest match either alone or in combination with skill match (NDB-derived) was the treatment component that promoted engagement (time on task) and positive affect and reduced passivity. While our interventions did not impact self-reported mood, NDB-derived activities were clearly better than other active treatments for improving participation. Our findings underscore the need for professional collaboration between nurses and recreational therapists who are prepared to adequately assess functional abilities and interests of nursing home residents with dementia for the prescription of therapeutic activities.

Behavioral interventions are recommended as a first line of treatment for the behavioral symptoms of dementia. Because they are tailored to the individual's profile, NDB-derived activities meet individual needs. Thus they have the potential to reduce behaviors that signify unmet needs and to promote behaviors that indicate improved quality of life. Future research should consider their effects outside of treatment times. Our findings support use of the NDB model as a framework for understanding the behavioral symptoms of dementia and help to elucidate the mechanisms that underlie their successful treatment.

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Table 1. *Activities by Style of Interest**

Mainstream Consumers (E+O-)	Creative Interactors (E+O+)
1. Group games: bowling or table games	1. Reminiscence group
2. Tether ball games: simple ball game with group	2. Make a mosaic with tiles in group
3. “The Price is Right”: group game	3. Feeling cube—validation therapy—roll the feeling dice and talk about the emotion that comes up in a group
4. Dancing: moving to music with a partner or in a group	4. Wandering cart: use cart to wander facility and use items in pockets to interact with others
5. Exercise to music: with others	5. Bell group: using colored bells in a small group to make music
6. Group sing-along: familiar songs with others in a group	6. Make Pleasure books: use book making kits to create theme project in a group
7. Talk on the phone: phone pal	7. Group quilting: using fabric squares to create a colorful decoration item
8. Humorous videos: watching with family or friends	8. Group photo session: bring photos of self and talk about who we are
Homebodies (E-O-)	**Introspectors (E-O+)**
1. Hang the laundry: hang socks on the line	1. Decorate beads and stringing: use an assortment of beads and findings to decorate beads and string them in a creative way
2. Make a birdhouse: using precut wood	2. Activity Apron (or Fishing Box): wear apron that has pockets filled with interesting items to examine
3. Apple peeler: make applesauce	3. Make holiday greeting cards
4. Make butter: shake heavy cream until it turns to butter	4. Mind teaser puzzle: take precut wood puzzle and use patterns to make it interesting and
5. Pet visits	
6. Sewing cards	
7. Cooking project	
8. Starting seeds indoors	

colorful

5. Go for nature walks: collect leaves, flowers, etc.

6. Look and handle wave machine

7. Listen to short story

8. Listen to poetry

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* Activities that can be done in a one-on-one context are assigned to low extraversion quadrants (E-). Activities that involve socialization with others are placed in high extraversion quadrants (E+). Activities enjoyed by the mainstream are placed in low openness quadrants (O-), while those that involve feelings, creativity, or curiosity are placed in high openness quadrants (O+).

Table 2**.** *Means & (SD) for Dependent Variables by Treatment Condition*

Variable	Baseline	(match to skill) Condition A	(match to interest) Condition B	(match to skill & interest) Condition C
Engagement				
Time on task	not measured	13.38 (4.6)	15.29 (4.7)	16.33 (4.0)
Participation	not measured	2.13 (0.6)	2.24 (0.6)	2.55 (0.6)
Affect				
Positive	11.35 (1.9)	12.06 (1.7)	12.38 (1.8)	13.00 (1.7)
Negative	3.81 (1.4)	3.45 (0.5)	3.35 (0.5)	3.44 (0.8)
Mood				
Pre	8.26 (2.6)	8.08 (2.4)	8.03 (2.5)	8.32 (2.5)
Post	8.37 (2.6)	8.07 (2.5)	8.09 (2.6)	8.48 (2.7)
Difference	0.04 (0.8)	-0.09 (0.8)	0.05 (0.7)	0.10 (0.9)
Behavior				
CMAI	2.85 (3.4)	1.35 (1.8)	1.09 (1.5)	1.14 (1.9)
PDS				
–Thinking	3.84 (2.8)	6.88 (5.9)	7.77 (6.7)	9.82 (7.9)
–Emotion	4.87 (7.2)	7.58 (4.9)	7.97 (5.5)	10.71 (7.2)
–Int environment	5.51 (2.4)	8.66 (3.7)	9.97 (4.4)	11.70 (4.8)
–Int people	7.70 (5.6)	12.12 (3.8)	13.11 (4.7)	14.83 (4.7)
–Activities	-3.10 (3.7)	1.46 (3.0)	2.02 (3.9)	3.10 (4.1)

Figure 1.

NDB Model

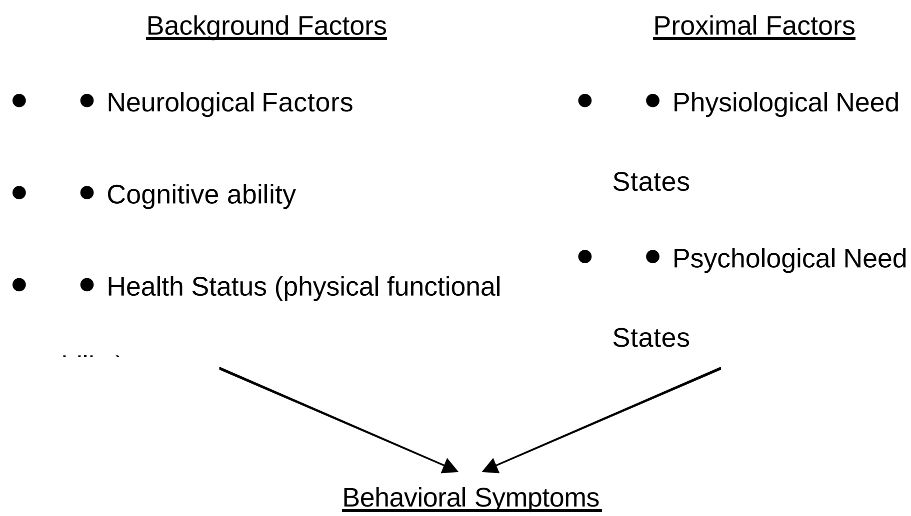

Figure 2

Causal Model