A Randomized Clinical Trial of Theory-Based Activities for the Behavioral Symptoms of Dementia in Nursing Home Residents

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OBJECTIVES: To test the main and interactive effects of activities derived from the Need-Driven Dementia-Compromised Behavior model for responding to behavioral symptoms in nursing home residents.

DESIGN: Randomized double-blind clinical trial.

SETTING: Nine community-based nursing homes.

PARTICIPANTS: One hundred twenty-eight cognitively impaired residents randomly assigned to activities adjusted to functional level (FL) (n = 32), personality style of interest (PSI) (n = 33), functional level and personality style of interest (FL + PSI) (n = 31), or active control (AC) (n = 32).

INTERVENTION: Three weeks of activities provided twice daily.

MEASUREMENTS: Agitation, passivity, engagement, affect, and mood assessed from video recordings and real-time observations during baseline, intervention, random times outside of intervention, and 1 week after intervention.

RESULTS: All treatments improved outcomes during intervention except mood, which worsened under AC. During intervention the PSI group demonstrated greater engagement, alertness, and attention than the other groups; the FL + PSI group demonstrated greater pleasure. During random times, engagement returned to baseline levels except in the FL group in which it decreased. There was also less agitation and passivity in groups with a component adjusted to PSI. One week after the intervention, mood, anxiety, and passivity improved over baseline; significantly less pleasure was displayed after withdrawal of treatment.

CONCLUSION: The hypothesis that activities adjusted to FL + PSI would improve behavioral outcomes to a greater extent than partially adjusted or nonadjusted activities was partially supported. PSI is a critical component of individualized activity prescription. J Am Geriatr Soc 59:1032–1041, 2011.

Key words: behavioral symptoms; dementia; nursing home; activity intervention; personality style of interest.
them. Residents are often excluded from activities because of their behavioral symptoms and as a result are unoccupied for long periods of time. Agitation and passivity both occur under these circumstances. Because life in the nursing home often lacks appropriate stimulation, almost any type of personal attention provides some relief of behavioral symptoms. Unknown are the individual components of treatments that are most responsible for effects and the duration of those effects. This study aimed to fill that gap.

Methods to identify activities that engage residents, such as the Pleasant Events Schedule or use of self-identity roles, have been developed. In general, they rely on an informant report of activities or roles enjoyed in the past, but it can be difficult to identify meaningful activities for residents who never participated in leisure pursuits or who lost the functional ability to engage in activities they once enjoyed. Qualitative data suggest that residents with dementia, staff, and family caregivers have different views about what is meaningful activity for the residents. Given the vast differences in preference for activity, “one size will not fit all.” Background factors in the NDB model may help to individualize activities for this population.

Activities are meaningful when they meet needs related to personality style of interest (an individual’s long-standing disposition to gratify activity needs in a particular manner). In the Five-Factor Model (FFM), personality traits are hierarchically organized within the five major domains of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness at the top level; below that are the more-important, narrower traits, or facets, that define each domain. In the FFM, which is currently the leading framework for the study of personality, the domains of extraversion and openness define personality style of interest and are associated with preference for leisure activities. The NDB model, which considers personality style of interest and functional abilities, offers an alternative framework for assessment of activity preferences in nursing home residents with dementia.

The purpose of this double-blind randomized clinical trial (RCT) was to test the efficacy of activities derived from the NDB model for reducing agitation and passivity and improving engagement, affect, and mood in nursing home residents with dementia. NDB-derived activities were customized to residents’ functional level (FL; cognitive and physical) and personality style of interest (PSI). The main and interactive effects of these treatment components were investigated. Repeated measures of behavioral outcomes were obtained during treatment, at random times outside of treatment, and 1 week after treatment to assess duration of effect. It was hypothesized that activities customized to FLI and PSI would improve behavioral outcomes more than activities customized to FL only, PSI only, or active control (AC). These activities were designed to enhance precision of prescription by meeting needs originating from premorbid personality and cognitive and physical functioning—all risk factors for behavioral symptoms identified in the NDB model.

METHODS

Study Setting and Participants

The university institutional review board approved the protocol for this RCT (ClinicalTrials.gov NCT00388544), which had a Data Safety and Monitoring Committee that convened annually. Residents of nine community-based nursing homes in Pennsylvania were approached for the study. The nursing homes provided the investigators with contact information for the legally authorized representatives of residents who agreed to have the investigators contact them.

Consented residents underwent screening to determine eligibility by a research nurse and the project director (JM), a certified recreational therapist. Inclusion criteria were English speaking; aged 65 and older; diagnosis of dementia according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, criteria; a Mini-Mental State Examination (MMSE) score between 8 and 24; no new psychoactive drugs prescribed from prebaseline through final observation as verified by a weekly chart review; and presence of behavioral symptoms as reported by staff and documented in the Minimum Data Set (MDS). Exclusion criteria were delirium; a progressive, unstable medical, metabolic, or neurological illness; 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 were assessed for physical function using the physical capacity subscale of the Psychogeriatric Dependency Rating Scale (PGDRS), a 7-item Likert-type scale that includes items on hearing, vision, mobility, dressing, toileting, speech, and hygiene. A knowledgeable informant (usually a spouse or adult child) provided personality data. Form R of the Revised NEO Personality Inventory (NEO-PI-R), a 240-item Likert-type scale adapted for observer ratings, was used. 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 constitute each domain. Observers were considered “knowledgeable informants” if they had monthly contact with the subject for at least 3 years during the subject’s adult life. Coefficient alphas for observer ratings on the domain scales ranged from 0.89 to 0.96. Studies using samples from the general population, as well as samples with dementia, give evidence that close acquaintances are accurate raters of an individual’s personality.

Sample Size

Estimates of means for treatment and control conditions were available from a previous study. Based on those results, power of the proposed study was calculated for a two-way analysis of variance (ANOVA), assuming a medium effect size. A very conservative approach to power analysis was used, in which the subject was considered as the unit of analysis, with no contribution of information from the multiple observations per subject that were to be obtained in the actual study. The analysis approach, based on mixed models and least-squares adjustment of means, allowed incorporation of all available information for each subject, regardless of whether complete data were available. A total sample size of 128 subjects, or 32 per group, provided 80% power.

PROCEDURE

The study had three phases: baseline (1 week), intervention (3 weeks), and postintervention (1 week). Measures of
outcomes were made during all phases. The time for observation and intervention during these phases was individually selected for each participant based on staff report of high behavioral symptom time and a prebaseline observation period during which subjects were observed every hour for 5 minutes (7:00 a.m. to 7:00 p.m.) for 3 days using the Cohen-Mansfield Agitation Inventory (CMAI) and the Passivity in Dementia Scale (PDS). Each subject’s high behavioral symptom time was identified by visually inspecting these data. One daily observation or intervention session was scheduled within 2 hours of that time, and the second daily session was scheduled 4 hours before or after that point so that all sessions occurred between the hours of 9:00 a.m. and 5:00 p.m. to accommodate morning care and meal times. During the intervention phase, measures of outcomes were also made at random times outside of treatment to capture duration of effect throughout the day.

Baseline, intervention, and postintervention sessions were video recorded to improve the reliability of measures.

Participants were recruited and enrolled and the protocol completed in one nursing home at a time. Figure 1 depicts the flow of participants through the course of the study. Participants were randomized into one of four groups: activities adjusted to FL (n = 32), activities adjusted to PSI (n = 33), activities adjusted to FL and PSI (FL+PSI) (n = 31), and AC (n = 32). The statistician (ML) determined participants’ group assignment using a random number generator with random block sizes to ensure equal assignment across the four groups at the completion of the study and approximately equal assignments throughout the study to control for unknown temporal effects. Group assignment was concealed until after all screening data were collected. The project director (JM) obtained the assignment from a secure central location after verifying that the

Figure 1. Flow diagram of recruitment, enrollment, intervention delivery, and number of participants who contributed data to the analysis.
Participants in the FL group were prescribed activities that were specifically adjusted to their skill level but opposite their PSI. The selection of activities was determined according to their physical and cognitive capabilities and the scores they received on the NEO-PI-R for certain facets that constitute the domains of extraversion (gregariousness, assertiveness, activity, excitement seeking) and openness (fantasy, aesthetics, feelings, ideas). The facets that were most prominent (low or high) were focused on because they reveal the individual's distinct pattern within each domain and allow specificity in prescription. For example, if a participant was capable of fine motor activity but scored low on gregariousness and aesthetics, he or she might be prescribed an arts or crafts activity in a small group setting. This activity is easily within their functional ability but not consistent with their style of interest.

Participants in the PSI group were prescribed activities specifically adjusted to their PSI and deliberately selected to be functionally challenging for them. For example, if a participant had limited range of motion in his or her upper body and scored high on excitement seeking and gregariousness, he or she might be prescribed a competitive tether ball game with two or three other individuals, an activity consistent with his or her style of interest but difficult given his or her limited range of motion.

Participants in the FL+PSI group were prescribed activities that were specifically adjusted to their FL and PSI. For example, if a participant had intact speech and scored low on activity and high on feelings he or she might be
prescribed a one-on-one feeling cube activity, which requires no physical activity.

Participants in the AC group were prescribed activities that were functionally challenging and opposite their PSI. For example, if a participant had difficulty with orientation and scored low on fantasy, he or she might be prescribed the game of “Where Am I?”

Participants received their assigned activity for up to 20 minutes twice per day (morning and afternoon) 5 days each week for 3 consecutive weeks. The intervention schedule and dosage were based on the results of preliminary work. In that study agitation, anxiety, and mood did not improve with a once-daily activity schedule; the schedule was increased to twice daily for the RCT in an attempt to improve these outcomes.

An important component of implementation was to address potential confounding precipitating factors such as pain, thirst, or poor environmental conditions before each activity session. Resident reports of discomfort were brought to the attention of the nursing staff, who were asked to intervene before the activity session. Research assistants addressed poor environmental conditions, such as glare and noise, by turning off loud televisions and adjusting lighting levels. A treatment fidelity plan was developed to help ensure reliability in the field. Treatment fidelity checks were conducted on 10% of all intervention sessions. Retraining took place if the intervention was not implemented according to protocol. There was only one protocol deviation; this high rate of fidelity was attributed to the close supervision provided to interventionists in the field.

Major Outcome Measures

During the baseline and intervention phases, trained video raters obtained measures of agitation, passivity, and affect from video recordings of each session; engagement and mood were measured at each session in real time through direct observation by trained data collectors. To assess the duration of treatment effect, measures of agitation, passivity, and engagement were taken in real time on two randomly selected days per week of intervention. Two 20-minute observational points were randomly selected for each of these days at times other than treatment (one each from the available a.m. and p.m. hours). To further assess for duration of effect, measures of agitation, passivity, and affect were taken from video recordings, and measures of engagement were taken in real time during two daily 20-minute observational points on two randomly selected days 1 week after the intervention. Interrater reliability was determined on 10% of all video and real-time measures; retraining was instituted when reliability fell below 0.80. Agitation was measured using the Cohen-Mansfield Agitation Inventory (CMAI), a questionnaire that addresses 29 behaviors, modified for direct observation. Higher scores indicate greater agitation. Interrater reliabilities (intraclass correlation coefficients (ICCs)) ranged from 0.64 for measures taken from video recordings to 0.99 for those obtained in real time.

Passivity was measured using the Passivity in Dementia Scale (PDS), an observational scale consisting of 40 behaviors: 11 passive items scored in the negative and 29 active items scored in the positive. Lower scores indicate greater passivity. Interrater reliabilities (ICCs) ranged from 0.79 for measures taken from video recordings to 0.98 for those taken in real time.

Engagement during intervention encompassed two measures: time in minutes and seconds that the subject participated in an activity (time on task) and intensity of participation. A stopwatch was used for measurement, and a percentage agreement of 93.6 and a weighted kappa of 0.91 were obtained for time on task. Intensity of participation was measured using a previously developed scale and was rated from 0 to 3, with higher scores indicating greater participation. A percentage agreement of 98.2 and a weighted kappa of 0.96 were obtained for level of participation.

Engagement during baseline, random times outside of treatment and after the intervention was measured by direct observation using a modified version of Nolan, Grant, and Nolan’s molar coding scheme. The instrument has descriptors for behaviors that depict time use: asleep, doing nothing, and activity (formal and informal). The one behavior exhibited by the participant that predominated over the observation period (occurred for more than 50% of the time) was selected. Percentage agreements ranging from 0.92 to 0.97 and weighted kappas ranging from 0.94 to 0.97 were obtained for this measure of engagement.

Affect was measured using the Philadelphia Geriatric Center Affect Rating Scale (ARS), an observational scale with descriptive indicators for six affective states: pleasure, anger, anxiety, depression or sadness, alertness, and contentment. Higher scores on each subscale indicate greater display of that affect. Interrater reliability (ICCs) for the subscales were 0.60 for pleasure, 0.58 for anxiety, 0.88 for alert, and 0.94 for attends. Data for anger and depression were not used because of inability to obtain adequate reliability for the measure of these affects.

Mood was measured using the Dementia Mood Picture Test (DMPT), 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 to 2 in intensity, with higher scores representing a more positive mood. Mood was measured immediately after each observation and intervention session. Interrater reliability (ICC) was 0.99.

Analysis

Intention-to-treat analysis was used. Measures from direct observation and video recordings were used in the analysis. Sample distributions of all dependent measures were evaluated, and statistical models appropriate to the observed distributions were implemented. ANOVA was used for dependent variables that were approximately normally distributed. Categorical outcome variables were analyzed using multinomial models implemented with generalized estimating equations.

Demographic variables of the study groups were compared using one-way ANOVA for continuous variables and the chi-square test for categorical variables. Baseline measurements of the four treatment groups were compared using one-way mixed-model ANOVA. Mixed-model analyses
Participants randomized to PSI activities demonstrated less passivity (LSM = 1.81, 95% CI = 1.2–2.4 vs LSM = 2.46, 95% CI = 1.7–3.2; \( P = .007 \)), and participants randomized to FL + PSI activities demonstrated less passivity (LSM = 18.42, 95% CI = 15.8–21.1 vs LSM = 16.29, 95% CI = 12.9–19.6, \( P = .02 \)) than at baseline, indicating some extended benefits of these activities throughout the day. There was greater agitation in the AC (LSM = 2.57, 95% CI = 1.9, 3.2 vs LSM = 1.88, 95% CI = 1.1–2.6, \( P = .046 \)) and FL + PSI (LSM = 2.55, 95% CI = 1.9–3.2 vs LSM = 1.86, 95% CI = 1.1–2.6, \( P = .003 \)) groups. No other significant changes were observed.

Most outcomes returned to baseline levels 1 week after the intervention, with a few exceptions; mood improved in the FL + PSI group (LSM = 9.78, 95% CI = 9.0–10.6 vs LSM = 9.56, 95% CI = 8.9–10.2, \( P = .017 \)) and anxiety improved in the PSI group (LSM = 1.91, 95% CI = 1.5–2.3 vs LSM = 2.21, 95% CI = 1.9–2.6, \( P = .02 \)). Greater passivity was noted in the FL group (LSM = 11.82, 95% CI = 8.4–15.2 vs LSM = 16.68, 95% CI = 13.4–19.9, \( P < .001 \)), and there was a significant decrease in pleasure in the FL (LSM = 1.84, 95% CI = 1.6–2.1 vs LSM = 2.23, 95% CI = 1.9–2.5, \( P < .001 \)) and PSI (LSM = 1.92, 95% CI = 1.7–2.4 vs LSM = 2.20, 95% CI = 1.9–2.5 \( P = .001 \)) groups.

**RESULTS**

Recruitment began in August 2005 and follow-up ended in November 2008. Figure 1 shows the flow of participants through the study. The mean age of the participants was 86, and they were predominately Caucasian and female (Table 1). Overall, they had moderate to severe cognitive and physical impairments. At baseline, participants displayed little affect, approximately two agitated behaviors, and more passive than active behavior over 20-minute behavior streams. No adverse events related to the protocol were experienced.

Participants varied in the dose of intervention they received, with total dose ranging from 4.9 to 1,800 units. There were no significant differences in mean total dose between the groups (\( P = .12 \)).

A within-person comparison of the major outcomes at intervention with those at baseline was done. All outcomes demonstrated improvement during intervention regardless of group assignment (data not shown) with the exception of mood, which became more negative in AC (LSM = 9.80, 95% CI = 9.1–10.5 vs LSM = 9.52, 95% CI = 8.8–10.2; \( P = .04 \)).

Table 2 lists the major outcomes according to treatment group during intervention. Participants randomized to PSI or FL + PSI activities demonstrated greater engagement (time on task and intensity of participation), more alertness, and more attention than participants randomized to FL or AC activities. Pleasure was observed statistically more often in participants randomized to FL + PSI activities. Agitation (full scale score), passivity, anxiety and self-reported mood did not differ according to group.

To assess duration of effect, within-person comparisons of outcomes were conducted at random times during the intervention phase and 1 week after the intervention with those at baseline. During random times, engagement returned to baseline except in the FL group, in which participants became less engaged (LSM = 2.15, 95% CI = 2.0–2.3 vs LSM = 2.30, 95% CI = 2.1–2.5; \( P = .009 \)). Participants randomized to PSI activities demonstrated less agitation (LSM = 1.81, 95% CI = 1.2–2.4 vs LSM = 2.46, 95% CI = 1.7–3.2; \( P = .007 \)).

**DISCUSSION**

Many factors cause behavioral symptoms, including several it was not possible to control for in this study, such as staff turnover and quality of care. The intervention phase was 3 weeks, and it is unclear whether a longer treatment period may have demonstrated greater, more-durable effects. The hypothesis that activities customized to FL + PSI would have greater benefit than PSI activities or FL-customized activities or noncustomized activities was not confirmed, although NDB-derived activities resulted in statistically significant improvements in several behavioral symptoms associated with dementia during intervention; duration of effect varied according to outcome. Negative outcomes were also observed when activities were not individualized and when withdrawn after the intervention. Some of the observed improvements were small but, unlike with pharmacological interventions, which also show modest clinical effects, no adverse effects were experienced. These findings underscore the clinical utility of activities as a first line of treatment for the behavioral symptoms of dementia.

Any type of activity improved outcomes over baseline; others have reported this finding, which was not unexpected. Passivity and attention were notably improved over baseline, demonstrating that simple activities can promote resident engagement in the nursing home. The only exception to improvement over baseline was mood, which worsened when activities were not customized on either treatment component. These data demonstrate the importance of individualizing activities to prevent possible negative outcomes of poorly selected activities. Recreational therapists are important members of the interdisciplinary team who can individualize activities to achieve therapeutic benefits for the resident.

The components of treatment that were responsible for effects during intervention were investigated, which is an identified research priority in support of evidence-based
<table>
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<th>Outcome</th>
<th>FL</th>
<th>PSI</th>
<th>FL + PSI</th>
<th>Active Control</th>
<th>Two-Factor Analysis of Variance</th>
<th>P-Value</th>
<th>Interest Adjustment</th>
<th>Function</th>
<th>Adjustment</th>
<th>Interaction</th>
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<td>FL</td>
<td>PSI</td>
<td>FL + PSI</td>
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<tr>
<td>Pleasure</td>
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<td>Anxiety or fear</td>
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<td>10.1</td>
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<td>.69</td>
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<td>.69</td>
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*Model accounts for Mini-Mental State Examination (MMSE), Psychogeriatric Dependency Rating Scale (PGDRS), and years of education.
†Range 0–20 minutes.
‡Range 0–3, higher score indicates more-active engagement.
§Range 1–5, higher score indicates greater display of the affect.
¶Range 0–12, higher score indicates more-positive mood.
∥Models account for MMSE, PGDRS, years of education, and total intervention dose.
**Range 0–29, higher score indicates greater agitation.
††Range −16 to 40, higher score indicates less passivity.

FL = activities adjusted to functional level; PSI = activities adjusted to personality style of interest; FL + PSI = activities adjusted to functional level and personality style of interest; AC = active control.
practice. It was found that PSI was the activity component that produced the most efficacious results for improving engagement, capturing attention, and increasing resident alertness during treatment itself. This was in spite of a lack of customizing to FL. There was no further gain in any other outcome by customizing to both treatment components as was initially hypothesized, except pleasure. Data that indicate that, when residents are engaged in skill-appropriate activities, they experience positive emotions support this latter finding. The overall findings during intervention were similar to those obtained in preliminary work, and the work of others, who found an advantage in customizing interventions to personal characteristics of the resident, support them. This study adds to that literature by indicating that individualizing activities on PSI provides an advantage for engaging nursing home residents with dementia. Activities that individuals find personally interesting supply intrinsic motivation, and motivation may explain the findings. Cognitively impaired residents can be difficult to engage and consequently are at high risk for functional decline. The clinical benefits of improving engagement, attention, and alertness on a daily basis could be substantial over time and may help slow the cognitive and physical decline associated with dementia. To the knowledge of the authors, this is the first study to demonstrate the effects of unique components of activities on behavioral symptoms.

No treatment component demonstrated an advantage for reducing the negative affects of agitation or anxiety or improving mood and passivity during intervention. Disease progression may affect negative emotions to a greater extent than positive emotions, which may explain why psychosocial interventions that improved positive affect had no effect on negative affect. The sample had moderate to severe cognitive impairments, which may explain why the fully adjusted (FL+PSI) activity improved pleasure but could not reduce negative affect.

Extended benefits of activities outside of treatment times were found. Less passivity was noted throughout the day in the FL+PSI group. These activities provide opportunity for greater involvement and may be needed to sustain activation throughout the day. Agitation decreased in the PSI group but increased in AC, possibly reflecting frustration with unappealing activities. Agitation also increased, surprisingly, in the FL+PSI group. This last finding cannot be fully explained; it may be due to unmeasured confounders. Overall, the findings indicate that activities customized to include a PSI component may help reduce agitation and passivity throughout the day and not just during treatment.

Most outcomes returned to baseline during the postintervention phase, with the exception of mood and anxiety, which improved; pleasure, which declined; and passivity, which increased in different groups. Mood and anxiety are enduring affects requiring more-intense treatment and may not show improvement until after several weeks of activities that include a component customized to PSI, as was found here. When successfully treated, mood and anxiety may show improvement for some time. The withdrawal of activities had a negative effect on the expression of pleasure, a less-enduring affect, in the groups customized to FL and PSI. Greater passivity was also observed in the FL group. Residents may come to expect the stimulation that activities provide and suffer poor outcomes when these activities are no longer provided. In this regard, daily programming may contribute to quality of life by improving pleasure and reducing poor mood, anxiety, and passive behavior.

Across treatment phases, PSI was the activity component responsible for most of the demonstrated behavioral benefits. These findings lend support to the importance of personality as a background factor in the NDB model and give direction for the prescription of activities in the nursing home. The selection of activities based on PSI has the potential to complement other methods of individualizing activities, with the goal of improving quality of life in the nursing home.

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Author Contributions: Kolanowski: Led the study concept and design, obtained funding, collaborated in the analysis and interpretation of data, and drafted the manuscript. M. Litaker: Collaborated on the study design, conducted the data analysis, contributed to the interpretation of data, and had critical input to the manuscript. L. Buettner: Collaborated on the activity intervention, contributed to the interpretation of data, and had input to the manuscript. J. Moeller: Collaborated on the conduct of the study and the activity intervention, acquired the data, contributed to the interpretation of data, and had input to the manuscript. Paul T. Costa: Collaborated on the PSI classification of activities and had input to the manuscript.

Sponsor’s Role: The funding organization had no role in the design and conduct of the study; analysis and interpretation of data; or preparation, review, and approval of the manuscript.

REFERENCES
29. Wilkinson IM, Graham-White J. Psychogeriatric dependency rating scales
28. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": A practical
27. American Psychiatric Association. Diagnostic and Statistical Manual of Men-
26. Piedmont R. The Revised NEO Personality Inventory: Clinical and Research
25. Holland J. Why interest interventions are also personality inventories. In: Vo-
24. Digmon J. Personality structure: Emergence of the five-factor model. Annu
22. Tinsley H, Eldredge B. Psychological benefits of leisure participation: A tax-
### Openness Facet

<table>
<thead>
<tr>
<th>Score</th>
<th>Need Expressed</th>
<th>Activity</th>
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<tr>
<td>High</td>
<td>Need interesting inner world</td>
<td>Guided imagery; relaxation tapes; creative writing; water color painting</td>
</tr>
<tr>
<td>Low</td>
<td>Need to keep mind on task</td>
<td>Sewing; baking; building a birdhouse; practicing the piano</td>
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<td><strong>Aesthetics</strong></td>
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</tr>
<tr>
<td>High</td>
<td>Need for art &amp; beauty</td>
<td>Arts and crafts; flower arranging; gourmet cooking; poetry reading</td>
</tr>
<tr>
<td>Low</td>
<td>No sensitivity to art or beauty</td>
<td>Avoid arts and crafts; play dart game or toss activity; Price is Right Game</td>
</tr>
<tr>
<td><strong>Feelings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need to express inner feelings</td>
<td>Feeling cube; poetry; reminiscence; pet therapy</td>
</tr>
<tr>
<td>Low</td>
<td>Feeling states not important</td>
<td>Bowling; cognitive games (identify old movie stars); building projects or woodworking</td>
</tr>
<tr>
<td><strong>Open to action</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need for variety</td>
<td>Learn new dance steps; offer new games, activities on a regular basis</td>
</tr>
<tr>
<td>Low</td>
<td>Need for tried-and-true</td>
<td>Keep to familiar activities; hang the laundry; table ball game</td>
</tr>
<tr>
<td><strong>Open to ideas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need to explore new areas</td>
<td>Look-inside purse or fishing box; scavenger hunt; brain teaser</td>
</tr>
<tr>
<td>Low</td>
<td>No need for exploration</td>
<td>Avoid new or unconventional activities; use traditional home type activities</td>
</tr>
</tbody>
</table>

### Extraversion Facet

<table>
<thead>
<tr>
<th>Score</th>
<th>Need Expressed</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gregariousness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need for greater social stimulation</td>
<td>Use small-group activity with interaction; cooking club; parties; team activities</td>
</tr>
<tr>
<td>Low</td>
<td>Need for less social stimulation</td>
<td>Use one-on-one or independent activity; listen to radio; solitary art or craft activity</td>
</tr>
<tr>
<td><strong>Assertiveness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need to lead and be dominant</td>
<td>Whack-a-mole; war card game; or put person in charge of activity</td>
</tr>
<tr>
<td>Low</td>
<td>Need to stay in background</td>
<td>Avoid putting in spotlight or putting in charge of activity</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need for physical movement</td>
<td>Exercise to music; dancing; tetherball</td>
</tr>
<tr>
<td>Low</td>
<td>Need for more leisurely pace</td>
<td>Leisurely walk; table games; discussion</td>
</tr>
<tr>
<td><strong>Excitement seeking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Need for stimulation, bright colors, sounds</td>
<td>Betting on horse races; wheelchair biking; snoezelen (a form of sensory stimulation); sensory stimulation with vivid colors and sounds; watch exciting competitive sports games</td>
</tr>
<tr>
<td>Low</td>
<td>No need for thrills</td>
<td>Use even-tempo games; reading or listening to books on tape or music</td>
</tr>
</tbody>
</table>
