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Does a Wander Garden Influence Inappropriate Behaviors in Dementia Residents?

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Background: The effect on resident behaviors of adding a wander garden to an existing dementia facility was investigated. *Methods:* 34 male residents were observed for 12 months before and after opening the garden. Behaviors were assessed using the Cohen-Mansfield Agitation Inventory Short Form (CMAI), incident reports, as needed medications (pro re nata [PRN]), and surveys of staff and residents' family members as indices of affect. *Results:* Final CMAI scores and total PRNs employed were lower than baseline values with a trend for residents who used the garden more often to have less agitated behavior. Verbal inappropriate behaviors did not change significantly whereas physical incidents increased. Staff and family members felt that the wander garden decreased inappropriate behaviors and improved mood and quality of life of the dementia residents. *Conclusions:* Study design characteristics and garden management may have affected behaviors both positively and negatively. Additional studies are needed to explore the benefits of wander gardens for dementia residents.

Keywords: dementia; agitation; inappropriate behaviors; medications; wander garden

Introduction

Entering a dementia unit is usually the last chapter in the life of the elderly. Most cognitively impaired dementia unit residents have little possibility of returning to a less restrictive environment. These residents are often dependent and confined to a safe custodial environment with limited exposure to natural settings. McMinn and Hinton[1] reported that the mandatory indoor confinement of dementia residents can result in increased verbal and physical agitation and increased use of psychotropic medications. One approach to decreasing inappropriate behaviors is to increase opportunities for residents to leave the dementia unit to enjoy a natural setting.

Quality of Life

Constructing environments, such as gardens, that encourage autonomy and sensory stimulation is a nonpharmacological strategy for improving the quality of life for dementia patients.[2,3] The wander garden offers residents the choice of leaving the locked unit for a natural setting designed to promote exercise and stimulate all the senses, with a secondary aim of promoting positive reminiscences.[4] In addition, several studies have reported that having free access to an outdoor area may reduce some agitated behaviors in dementia residents.[1-5]

Inappropriate Behaviors

Studies have shown that being a patient in a modern medical center with reduced sight of or access to nature can increase vital signs with concomitant

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anxiety and fear.[6] Anxiety and fear contribute to inappropriate behaviors and are a daily concern, particularly for residents on long-term care units.[7] Dementia unit residents may resent being confined to a locked environment and may express this frustration through aggressive behavior.[1-5] Cohen-Mansfield et al[8] reported that 93% of nursing home residents had agitated behavior once or more per week during 1 shift, with a mean of 9.3 weekly reports of inappropriate behaviors. The National Nursing Homes Survey reported that 30% to 50% of late-stage dementia patients exhibit inappropriate behavior.[9] As dementia patients have a limited capacity to communicate their needs and thoughts, inappropriate behaviors may constitute an index of discontentment.[10] It has been suggested that inappropriate behaviors reflect the failure of the environment to meet the needs of the residents.[11]

Novel environmental strategies have been explored in the attempt to reduce inappropriate behaviors. Studies with a broad spectrum of ages suggest that having a daily view of a natural setting, or better, having access to flowers, gardens, and trees, may promote healing and reduce tension.[12,13] Kuo and Sullivan[14] reported that knowing there is a park or garden nearby or seeing and having activities in a natural setting might reduce intrafamilial aggression.

The Wander Garden

The design goal of the wander garden is to increase sensory stimulation by providing access to nature as often as possible for high elopement risk residents. Dementia facilities have elaborate structural and electronic restraints to protect residents from eloping, leading to possible injury or death.[15] The ideal wander garden provides a safe environment where the dementia patient can wander freely without the risk of elopement. It may also have structured spaces that reduce disorientation. It includes a variety of plants to promote visual, olfactory, and tactile stimulation and to attract birds and butterflies. Also, trees may provide shade, color, seasonal variation, and sound when the leaves rustle in the wind. Various tall grasses such as wheat can be planted to expand visual and tactile experiences. Some wander gardens include sandboxes where the residents can use their hands or simple safe tools for digging and other activities with supervision. Horticultural therapy may also be used to encourage function and cognition.[16] There are walking paths that promote movement, encourage contact with plants (all nontoxic), and lead the residents to protected areas for sitting and socializing.[17] The paths may be circular and continuous with no dead ends to encourage cardiovascular exercise.

For climates with extended periods of inclement weather, dementia wander gardens may have enclosed perimeter walkways as in the present case, with exits and entrances into both the wander garden and the dementia unit. The garden and walkway doors can be opened by the patients either from the inside or the outside. Commonly, there is a large window to allow the residents to view the full extent of the garden to both remind them of the possibility of entering the garden and to promote positive reminiscences.

Why Add a Wander Garden to a Dementia Unit?

What effect would a view of and access to a wander garden have on dementia residents? Several authors have explored this issue from different perspectives. In the residential setting, Namazi and Johnson[5] reported that having access to unlocked doors leading to a garden may increase autonomy and quality of life, which may in turn influence the level of inappropriate behaviors. Mather et al[18] reported that a wander garden reduced the incidence of inappropriate behaviors in a long-term dementia care facility in Canada. McMinn and Hinton[1] reported decreased inappropriate behaviors following 32 days of confinement of dementia patients when access to an outdoor area was granted. Ellis[16] found that light exercise in a dementia wander garden may reduce inappropriate behaviors.

This report explores the effect on inappropriate behaviors of adding a wander garden to an existing dementia unit. The objective of the observational study was to assess the long-term impact of the wander garden on resident-inappropriate behaviors, incidents, and as needed medications in the effort to ultimately improve their quality of life.

Methods

Participants

This study was approved by the institutional review board as an observational study for 2 consecutive years, 1 year of observation prior to opening the wander garden and 1 year of evaluation after opening the

garden to the dementia residents. The subjects were 34 selected dementia unit male residents (consent was not given for the 1 female resident) who could have access to the wander garden by ambulation, merry walker, wheelchair, or gerichair with assistance. Letters explaining the study and requesting permission for the residents to participate in the study were sent to family members with power of attorney or guardianship. Only those residents with approval from the appropriate party were included. The observational team members were not involved in the design of the wander garden or in the medication management of the residents.

Participants' ages ranged from 74 to 92 years, with a median of 80 years and a mean of 80.71 years. No participants in this sample were confined to a gerichair, 11 were in wheelchairs, 2 used merry walkers, and 21 were ambulatory. Mortality during the observation year caused the sample size to decrease from 34 to 29 by the end of the study.

Wander Garden Design and Usage

The wander garden was designed to be viewed in its entirety from the large floor-to-ceiling windows in the residence dining room that also served as the activity room. Two doors on either side of the dining room opened into the garden perimeter walkway completing a circular indoor walkway circuit. Four doors opened from the perimeter walkway into the garden. Two of the 3 exterior walls of the perimeter walkway also had large windows, and there were 3 exit doors from the walkway to nongarden areas. These doors had the standard electronic constraints to prevent residents from eloping. The third exterior wall had small glazed windows above eye level to allow lighting without a view of the external environment. The doors to the wander garden and the perimeter walkway were usually unlocked after breakfast and locked after dinner. The doors to the walkway and into the garden were locked during inclement weather. With the addition of the wander garden, changes in the residents' environment principally consisted of daily sight of the garden, unrestricted access to the heated and cooled perimeter walkway, access to doors into the wander garden, and activities in the wander garden when weather permitted.

The number of days spent in the garden perimeter walkway and in the wander garden was recorded by the recreational activity staff when possible. The length of time per visit in the enclosed walkway and the garden was not recorded due to staff limitations. A 12-month baseline and observational year were chosen due to expected seasonal use variations.[18]

Measurement of Inappropriate Behaviors

Inappropriate behaviors in this study were defined as observable disruptive behavior, including verbal and physical aggressive and nonaggressive actions.[11-19] Four measures were used to evaluate residents' behavior.

The Cohen-Mansfield Agitation Inventory Short Form (CMAI)[20] was used to measure residents' agitation levels. Aggressive behaviors are classified as having verbal, physical, or sexual characteristics. The long form was designed by Cohen-Mansfield and Billig[21] to be used by nursing staffs in the nursing home setting and requires approximately 10 to 15 minutes to complete. This original longer version employs a 7-point rating scale that assesses the frequency of 29 aggressive behaviors in dementia patients. The short form includes 14 aggressive behaviors graded on a 5-point scale. The maximum score is 70. The same team member, who saw all patients every day for multiple hours of activity, performed all the scale evaluations. A baseline CMAI was obtained for each participant prior to opening the wander garden. Once the garden was open, monthly CMAI results were recorded for 12 consecutive months.

Incident reports for each resident provided the second measure of behavior. Incidents had 4 severity levels. Level 1 involved sexually inappropriate language, verbal aggression, or vulgar language. Level 2 included inappropriate touching or grabbing, pushing, resisting, or chasing. A level 3 incident involved a resident striking out with no injury to the target. Level 4 incidents were the most serious, involving the resident striking out and causing physical harm to self or others.

The third measure of inappropriate behaviors was the use of medications on an as needed basis (pro re nata [PRN]). The number of administrations of each PRN medication was recorded for each patient for each baseline and observational month. The medication administration was single blinded as the physicians, nurse practitioners, nurses, and certified nursing assistants had no knowledgeable of which dementia residents were involved in the observational study.

The fourth evaluation of inappropriate behaviors was obtained from surveys of the dementia residents'

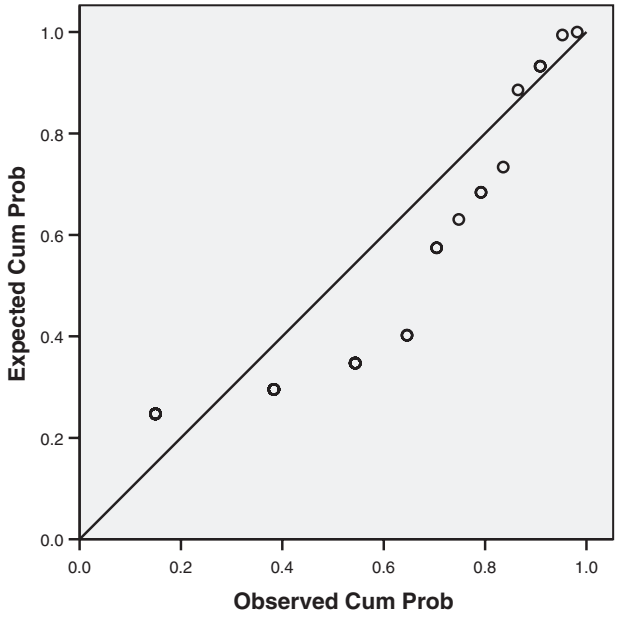

Figure 1. Normal P-P plot of total incident score for baseline year.

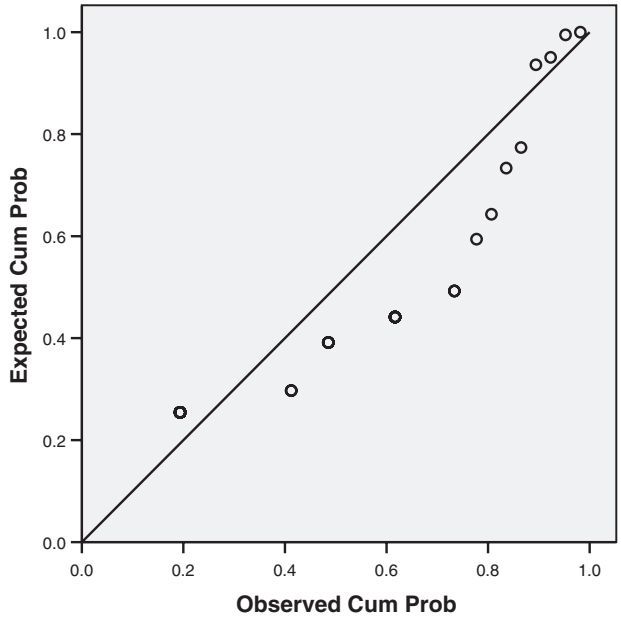

Figure 2. Normal P-P plot of total incident score for observation year.

family members and from the dementia unit staff. Included were 3 questions about the effect of the garden on the quality of life of the resident, 2 questions on the effect on the resident's mood, and 2 questions about the garden's effect on resident inappropriate behaviors. A 4-point Likert-type scale (strongly agree, agree, disagree, strongly disagree) was used.[22] In addition, the questionnaire asked about the amount of time per day the respondent spent with the resident.

Statistical Analysis

Descriptive statistics, Pearson's correlations, and regression analyses were used to examine the relationship of wander garden usage and other factors to the final CMAI scores. The number of PRNs administered was compared for the baseline year and the observation year. The mean, median, mode, standard deviation, and frequencies were obtained for final CMAI score, total wander garden visits, baseline CMAI score, PRNs for the baseline year, and PRNs for the observation year, as well as for variables pertaining to incident reports.

Bivariate Pearson correlations were computed for all the variables previously mentioned. The final CMAI score was regressed on total garden visits and number of PRNs during the observation year, first without any covariates. A second regression included baseline CMAI and baseline year PRNs as covariates.

Total incident scores were computed by multiplying the number of incidents in each category by the severity level (1, 2, 3, or 4) and summing the products. A composite score for each year was calculated by summing the annual individual scores.

Normal probability plots of the composite incident scores showed that incidents were not normally distributed for either the baseline year or the observation year (Figures 1 and 2). Therefore, a nonparametric method was used for incident analysis. Wilcoxon signed–rank tests[23] examined the difference between the total scores for the 2 years as well as between the number of incidents of each severity level for the 2 years.

Results

Cohen-Mansfield Agitation Index

Table 1 shows descriptive statistics for all the variables used in this analysis. Baseline CMAI scores had a mean of 21.88 and a standard deviation of 4.667. On average, CMAI scores declined by almost 3 points, with a final CMAI mean of 18.9 and a

Table 1. Descriptive Statistics[a]

	n	Mean	Median	Mode	Standard Deviation	Minimum	Maximum
Final CMAI score	29	18.90	17.00	14	4.593	14	29
Total wander garden days visited	34	29.85	23.50	0[a]	23.332	0	79
Baseline CMAI score	25	21.88	22.00	17[a]	4.667	15	31
Total PRNs for baseline year	28	12.71	2.00	0	17.950	0	61
Total PRNs for observation year	29	9.90	.00	0	23.064	0	106
Total incident score for baseline year	34	4.71	2.00	0	6.887	0	29
Total incident score for observation year	34	5.15	3.00	0	7.789	0	34
Before wander garden category 4 incidents	34	.12	.00	0	.409	0	2
After wander garden category 4 incidents	34	.47	.00	0	.896	0	3

Abbreviations: CMAI = Cohen-Mansfield Agitation Inventory Short Form; PRN, pro re nata.
[a] Multiple modes exist. The smallest value is shown.

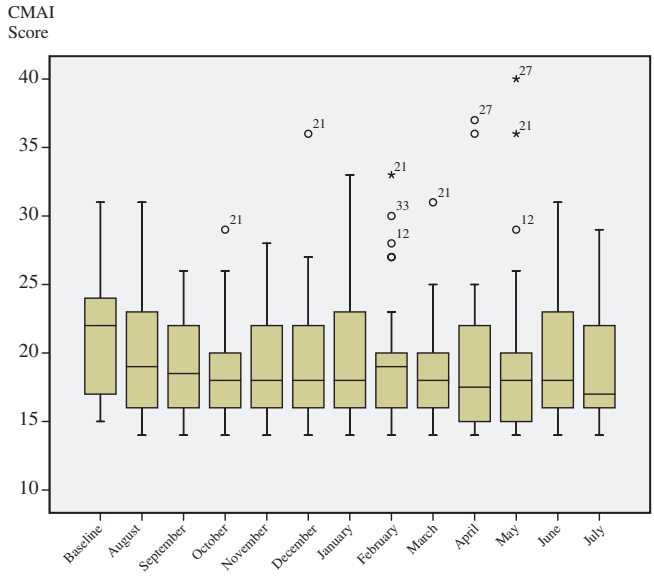

Figure 3. Boxplot of Cohen-Mansfield Agitation Inventory Short Form (CMAI) scores.

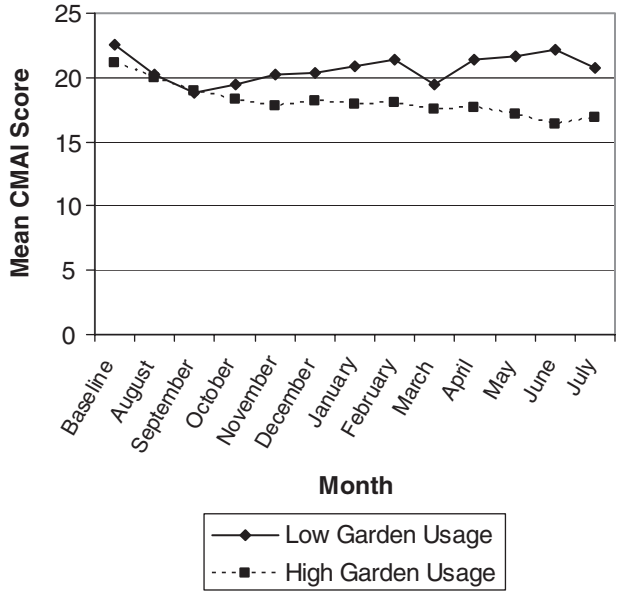

Figure 4. Comparison of mean Cohen-Mansfield Agitation Inventory Short Form (CMAI) scores for below and above median total garden visits.

standard deviation of 4.593. Score variability of scores was marginal over the course of the observation year. The median final CMAI score was 5 points lower than the median baseline score. Figure 3 shows boxplots comparing the CMAI scores for baseline and each month of the observation year. A conservative estimate of the effect size of the wander garden on CMAI scores, using the larger standard deviation in the calculation of Cohen's *d*, yielded 0.64. This result may be classified as being intermediate between medium (0.5) and large (0.8).[24] Other significant correlations include final CMAI score with total days in the wander garden ($R = -.388$; $P < .05$) and final CMAI score with baseline CMAI score ($R = .667$; $P < .01$).

To facilitate comparison of CMAI score means, residents were assigned post hoc to groups based on their total number of visits to the garden during the observation year. Group mean CMAI scores were compared for each month of the observation year. The differences between mean monthly CMAI scores for high and low garden usage groups are illustrated in Figure 4. This figure shows that residents who visited the garden more than the median number of days over the course of the year tended to have lower

Table 2. Pearson Correlations

		1	2	3	4	5	6	7	8	9
1. CMAI 0703	Correlation	1								
	Sig. (two-tailed)									
	n	29								
2. Total WG days visited	Correlation	–.388[a]	1							
	Sig. (two-tailed)	.038								
	n	29	34							
3. Baseline CMAI score	Correlation	.667[b]	–.108	1						
	Sig. (two-tailed)	.001	.606							
	n	22	25	25						
4. PRNs for baseline year	Correlation	.444[a]	.245	.545[b]	1					
	Sig. (two-tailed)	.030	.209	.006						
	n	24	28	24	28					
5. PRNs for garden year	Correlation	.088	.124	.327	.585[b]	1				
	Sig. (two-tailed)	.649	.522	.137	.003					
	n	29	29	22	24	29				
6. Baseline year incident score	Correlation	–.096	–.010	–.142	–.117	–.185	1			
	Sig. (two-tailed)	.619	.957	.499	.554	.338				
	n	29	34	25	28	29	34			
7. Garden year incident score	Correlation	–.136	–.039	–.003	–.130	–.101	.566[b]	1		
	Sig. (two-tailed)	.483	.826	.990	.510	.602	.000			
	n	29	34	25	28	29	34	34		
8. Baseline year level 4 incidents	Correlation	–.279	.072	–.094	–.169	–.112	.357[a]	.451[b]	1	
	Sig. (two-tailed)	.143	.687	.654	.389	.562	.038	.007		
	n	29	34	25	28	29	34	34	34	
9. Garden year level 4 incidents	Correlation	–.116	.112	.080	–.001	–.008	.529[b]	.859[b]	.506[b]	1
	Sig. (two-tailed)	.550	.528	.703	.995	.968	.001	.000	.002	
	n	29	34	25	28	29	34	34	34	34

Abbreviations: CMAI, Cohen-Mansfield Agitation Inventory Short Form; WG, wander garden; PRN, pro re nata.
[a] Correlation is significant at the .05 level (two-tailed).
[b] Correlation is significant at the .01 level (two-tailed).

CMAI scores than residents in the low usage group. However, both groups had improved mean CMAI scores by the end of the observation year (Figure 4).

Incidents

Pearson correlations for all the variables used in this analysis are shown in Table 2. Incident scores for both years and frequencies of severity level 4 incidents for each year have significant correlations with each other, but these variables do not have significant relationships with baseline or final CMAI scores, garden visits, or PRNs for either year.

PRNs

There was a significant correlation of total baseline year PRNs with total observation year PRNs ($R = .585$; $P < .01$). The percentage of participants not requiring any PRNs increased from 35.3% to 55.9% during the garden observation year. With the exception of 2 outliers, most patients required fewer PRNs than in the baseline year (Figure 5). Tables 3 and 4 show the actual frequencies of PRNs for the baseline and observation years, respectively. Residents who were not present in the unit for at least 11 months of either year were excluded from this analysis.

Regression Analysis

Results of the first regression for CMAI scores are shown in Tables 5 and 6. Adjusted R^2 for this model is 10.5% and the overall model with 2 predictors is not statistically significant. However, the coefficient for days spent in the garden is statistically significant ($T = -2.247$; $P < .05$) and is negative, indicating that more days in the garden predict lower CMAI scores. PRNs for the garden observation year are not a significant predictor of CMAI scores.

In the regression model using baseline CMAI scores and PRNs for the baseline year as covariates, adjusted R^2 increased from 10.5% to 49.7%. The

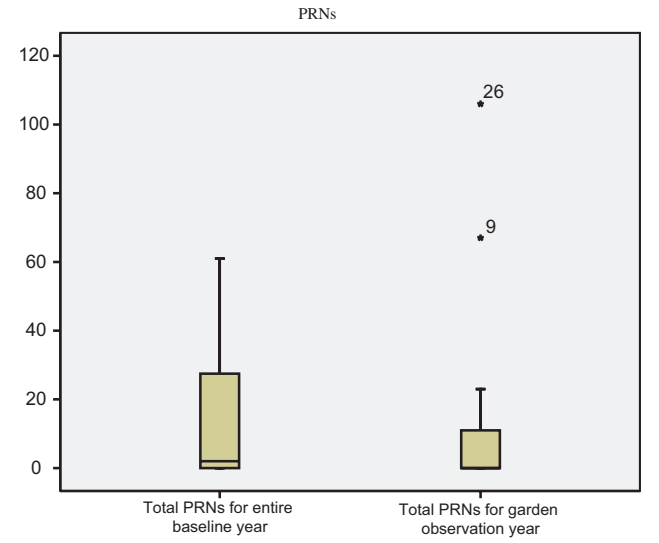

Figure 5. Boxplots comparing PRNs before and after garden opening. PRN, pro re nata.

Table 3. Total Pro re nata for Baseline Year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	12	35.3	42.9	42.9
	1	1	2.9	3.6	46.4
	2	3	8.8	10.7	57.1
	5	1	2.9	3.6	60.7
	9	1	2.9	3.6	64.3
	12	1	2.9	3.6	67.9
	17	1	2.9	3.6	71.4
	26	1	2.9	3.6	75.0
	29	2	5.9	7.1	82.1
	35	1	2.9	3.6	85.7
	37	1	2.9	3.6	89.3
	40	1	2.9	3.6	92.9
	49	1	2.9	3.6	96.4
	61	1	2.9	3.6	100.0
	Total	28	82.4	100.0	
Missing	System	6	17.6		
Total		34	100.0		

overall model is significant ($P < .01$) but the effect of days spent in the wander garden becomes marginally significant ($T = -1.979$; $P = .065$) (Tables 7 and 8).

Table 9 shows the number of incidents and the composite incident scores for each year. The total number of incidents increased slightly from the baseline year to the observation year. Increases were registered for incident levels 1 and 4 with decreases for incident levels 2 and 3. Wilcoxon signed–rank tests showed that differences between the annual

Table 4. Total Pro re nata for Garden Observation Year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	19	55.9	65.5	65.5
	2	1	2.9	3.4	69.0
	9	1	2.9	3.4	72.4
	11	2	5.9	6.9	79.3
	15	1	2.9	3.4	82.8
	20	1	2.9	3.4	86.2
	23	2	5.9	6.9	93.1
	67	1	2.9	3.4	96.6
	106	1	2.9	3.4	100.0
	Total	29	85.3	100.0	
Missing	System	5	14.7		
Total		34	100.0		

Table 5. ANOVA Table for First Regression[a]

Source	Sum of Squares	df	Mean Square	*F*	Sig.
Regression	99.870	2	49.935	2.645	.090[b]
Residual	490.820	26	18.878		
Total	590.690	28			

Abbreviation: df = degrees of freedom.
[a] Dependent variable: CMAI0703.
[b] Predictors: (constant), Total pro re nata for garden observation year, total wander garden days visited.

numbers of level 1, 2, and 3 incidents were not significant. However, the tests showed a statistically significant increase in severity level 4 incidents from the baseline to the observation year ($Z = -2.489$ based on negative ranks; $P < .05$ (Table 10). A moderate, statistically significant correlation was observed between the numbers of annual level 4 incidents ($R = .506$; $P < .01$).

The Wilcoxon signed–rank test comparing total incident scores for the 2 years showed 13 negative ranks, 14 positive ranks, and 7 ties (Table 11). Negative ranks represented individuals whose incident scores decreased from the baseline year to the observation year. Individuals with increased incident scores were indicated by positive ranks. Ties were individuals whose total incident scores did not change. The test produced a Z score of –.337 based on negative ranks ($P > .5$). Therefore, there was no significant trend in total incident scores in either direction.

Survey results showed that not all residents were visited by family members. Of the 32 surveys sent to

Table 6. Coefficients for First Regression[a]

	Unstandardized Coefficients		Standardized Coefficients β		
	B	Std. Error		*t*	Sig.
(Constant)	20.926	1.318		15.877	.000
Total WG days visited	–.077	.034	–.405	–2.247	.033
Total PRNs for garden observation year	.028	.036	.138	.768	.449

Abbreviations: WG, wander garden; PRN, pro re nata.
[a] Dependent variable: CMAI0703.

Table 7. ANOVA Table for Regression with Covariates[a]

Model		Sum of Squares	df	Mean Square	*F*	Sig.
1	Regression	145.112	2	72.556	6.798	.006[b]
	Residual	192.126	18	10.674		
	Total	337.238	20			
2	Regression	201.597	4	50.399	5.945	.004[c]
	Residual	135.641	16	8.478		
	Total	337.238	20			

Abbreviation: df, degrees of freedom; ANOVA, analysis of variance.
[a] Dependent variable: CMAI0703.
[b] Predictors: (constant), Total PRNs for entire baseline year, baseline CMAI score.
[c] Predictors: (constant), Total PRNs for entire baseline year, baseline CMAI score, total WG days visited, total PRNs for garden observation year.

families, 16 were returned. One was returned blank, and not all respondents answered all the questions. Three families did not complete the reverse side of the survey containing questions 4 through 9, and 1 family only answered questions 5 and 6 regarding improved quality of life, as the respondent was not aware that the resident visited the garden. Of the 40 surveys distributed to the staff, 26 were returned. Not all staff respondents answered all the questions.

Time spent in the wander garden with the dementia residents by dementia resident families and staff members is included in Table 12. The results in Tables 13 and 14 demonstrate that both the families of the dementia residents and the dementia unit staff either strongly agreed or agreed that the wander garden decreased resident agitation, increased resident mood, and improved the quality of life of both the residents and the dementia unit staff.

Discussion

The results of the 4 indices employed to assess inappropriate behaviors of elderly dementia residents following the addition of a wander garden gave mixed results.

Cohen-Mansfield Agitation Index

The final CMAI scores for residents during the observational 12 months when the wander garden was available were significantly improved over baseline CMAI scores. The CMAI mean and standard deviations improved over baseline values with the final CMAI median being 5 points lower than the CMAI median baseline. Also, a conservative estimate of the effect size of the wander garden on CMAI scores was calculated to be in the medium-high range. When the dementia residents were divided into high and low garden use groups based on the median number of visits for the year, there was a significant correlation of the final CMAI score with total days in the wander garden for both resident groups. However, the high garden use group had lower final CMAI scores than the low garden use group. Actual garden visits declined over the winter months (Figure 6), but residents still had an opportunity to view the garden through the windows in the dining room. During the winter months when the doors to the walkway and to the garden were closed, the mean CMAI score of the high use group plateaued whereas that of the low use group increased suggesting increased agitation (Figure 4). These findings are similar to the results of Mather et al,[18] which demonstrated that the residents with the highest wander garden use during the summer months showed the greatest benefit with less disruptive behavior.

Table 8. Coefficients for Regression With Covariates[a]

Model		Unstandardized Coefficients		Standardized Coefficients β	*t*	Sig.
		B	Std. Error			
1	(Constant)	7.417	4.090		1.813	.087
	Baseline CMAI score	.484	.192	.544	2.512	.022
	Total PRNs for baseline year	.037	.047	.170	.783	.444
2	(Constant)	12.011	4.258		2.821	.012
	Baseline CMAI score	.333	.186	.375	1.794	.092
	Total PRNs for baseline year	.115	.052	.532	2.204	.043
	Total WG days visited	–.059	.030	–.354	–1.979	.065
	Total PRNs for garden observation year	–.046	.030	–.295	–1.506	.152

Abbreviations: CMAI, Cohen-Mansfield Agitation Inventory Short Form; PRN, pro re nata; WG, wander garden.
[a] Dependent variable: CMAI0703.

Table 9. Incidents by Severity and Year

Severity Level	Number of Incidents in Baseline Year (BL)	Baseline Year Composite Incident Score	Number of Incidents in Observation Year (OB)	Observation Year Composite Incident Score	Difference in Number of Incidents (OB – BL)
1	16	16	20	20	4
2	16	32	14	28	–2
3	32	96	21	63	–11
4	4	16	16	64	12
Total	68	160	71	175	3

Table 10. Wilcoxon Signed Rank Test Results by Incident Severity Level

Severity Level	n	Sum of Ranks	Z	*P*
1				
Negative ranks	5	32.50	–.521[a]	.602
Positive ranks	7	45.50		
Ties	22			
2				
Negative ranks	6	36.00	–.272[b]	.785
Positive ranks	5	30.00		
Ties	23			
3				
Negative ranks	10	108.00	–.990[b]	.322
Positive ranks	8	63.00		
Ties	16			
4				
Negative ranks	1	4.00	–2.489[a]	.013[c]
Positive ranks	9	51.00		
Ties	24			

[a] Based on negative ranks.
[b] Based on positive ranks.
[c] Significant at $P < .05$.

Table 11. Wilcoxon Signed Ranks Test on Total Incident Score

Total Incident Score for Observation Year –Total Incident Score for Baseline Year	n	Sum of Ranks	Z	*P*
Negative ranks	13[a]	175.00		
Positive ranks	14[b]	203.00		
Ties	7[c]			
Total	34		–.337[d]	.736

[a] Total incident score for observation year < Total incident score for baseline year.
[b] Total incident score for observation year > Total incident score for baseline year.
[c] Total incident score for observation year = Total incident score for baseline year.
[d] Based on negative ranks.

On dementia units, it is not unusual to observe dementia residents wandering the ward trying to open the locked doors. Typically, the dementia resident when asked about such behavior will say that they

Table 12. Time Spent With Dementia Residents in Wander Garden on a Daily Basis

	Number	Greater Than 2 Hours	1-2 Hours	30 Minutes to 1 Hour	Less Than 15 Minutes	None
Staff	27	0	0	7 (26%)	13 (48%)	7 (26%)
Family	16	0	0	14 (88%)	1 (6%)	1 (6%)

Table 13. Staff Response to Survey Questions on Dementia Residents' Response to the Wander Garden

Questions	Strongly Agree	Agree	Disagree	Strongly Disagree
Improved quality of life of the resident (n = 52)	15 (29%)	35 (67%)	2 (4%)	0 (0%)
Q1: Wander garden improved quality of life of residents	8	18	0	0
Q5: Wander garden and walkways improved quality of life of residents	7	17	2	0
Improved quality of life of the staff (n = 24)	9 (37.5%)	10 (41.5%)	3 (13%)	2 (8%)
Q6: Wander garden and walkways are important to improving quality of life of staff	9	10	3	2
Improved resident mood (n = 50)	16 (32%)	32 (64%)	2 (4%)	0 (0%)
Q2: Resident seemed happier	10	16	0	0
Q7: Resident enjoys being in wander garden	6	16	2	0
Decreased agitation (n = 48)	7 (15%)	35 (73%)	6 (12%)	0 (0%)
Q3: Resident seemed calmer	4	16	3	0
Q4: Resident seemed less agitated	3	19	3	0

Table 14. Family Response to Survey Questions on Dementia Residents' Response to the Wander Garden

Questions	Strongly Agree	Agree	Disagree	Strongly Disagree
Improved quality of life of the residents	5 (17%)	20 (71%)	3 (12%)	0 (0%)
Q1: Wander garden improved quality of life of residents	3	10	1	0
Q5: Wander garden and walkways improved quality of life of residents	2	10	2	0
Improved quality of life of the staff	2 (14%)	10 (72%)	2 (14%)	0 (0%)
Q6: Wander garden and walkways are important to improving quality of life of staff	2	10	2	0
Improved resident mood	7 (29%)	13 (54%)	4 (17%)	0 (0%)
Q2: Resident seemed happier	1	7	3	0
Q7: Resident enjoys being in wander garden	6	6	1	0
Decreased agitation	9 (38%)	15 (62%)	0 (0%)	0 (0%)
Q3: Resident seemed calmer	6	6	0	0
Q4: Resident seemed less agitated	3	9	0	0

wish to "return home" or "go to work" or that they wish to escape from the dementia ward that they may perceive as a hostile environment. The controlled dementia unit with a structured environment and minimum opportunity for decision making and without an exit to an outdoor area may increase feelings of helplessness accompanied by increased inappropriate behaviors.[1,25] It could be expected that locking of the doors to both the garden itself and to the enclosed perimeter walkway would increase inappropriate behaviors as reported by Namazi and Johnson.[5] In this case, it may be that the high use group had improved tolerance to finding the locked doors than did the low use group.

One of the variables that may have prevented most of the low use group mean CMAI scores from returning to the baseline score was the daily exposure of the residents to the sight of the wander garden through the large window in the dining/activity room while eating and while participating in ward

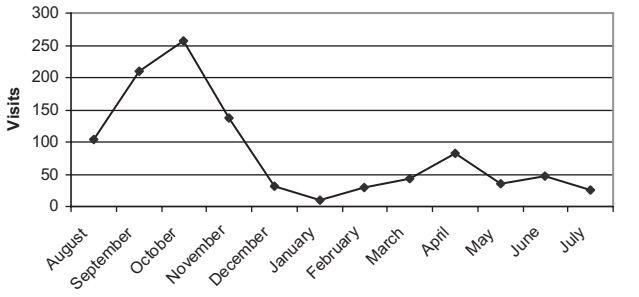

Figure 6. Total garden visits.

recreational activities. Mather et al[18] noted the tendency of dementia residents to spend more time looking out of the window during the winter months when they had no access to the wander garden. The floor to ceiling windows extending the length of the wall, from one wander garden entrance to the other, may diminish the perceived separation of the resident from the garden itself, in turn reducing the agitation of confinement.

Incidents

The effect on resident incidents of adding the wander garden to the dementia unit is not clear. High baseline level 4 scores predicted high observation level 4 scores. A moderate, statistically significant correlation was observed between the numbers of annual level 4 incidents suggesting that some individuals who experience level 4 incidents tend to have them whether or not a garden is available. Level 1 scores also increased during the observational year; however, there was no significant difference for the annual numbers of incidents of levels 1 through 3, suggesting that exposure to the garden did not influence these 3 levels. The increase in level 4 incidents may have been influenced by patient variables (eg, change in disease course, medical complications) or by environmental variables (eg, locked wander garden doors, heavy doors). However, if present, these variables did not seem to be associated with changes in the other 3 incident levels. Regression analysis showed no significant relationship with baseline or final CMAI scores, garden visits, or PRNs for either year. The relationship of a wander garden to resident incidents would benefit from reexamination by using a control group and perhaps other indices.

PRNs

There was a significant correlation of total baseline year PRNs with total observation year PRNs. The percentage of participants not requiring any PRNs increased from 35.3% to 55.9% during the wander garden observation year. With the exception of 2 outliers, most patients required fewer PRNs than in the baseline year. Alzheimer's disease and related dementias (ADRDs) is the third most costly disease group in the United States with direct and indirect costs estimated to be greater than US$ 100 billion.[26,27] Antidementia therapy is an important and costly element in managing the cognitive, functional, and behavioral aspects of ADRDs.[28] In the moderate and advanced stages of ADRDs, at least 50% of patients will present with agitation and 70% will exhibit psychosis during the first 6 or 7 years of ADRDs.[29,30] Although currently there are no Food and Drug Administration approved medications to treat agitation in ADRDs, multiple types of scheduled and PRN medications are used on a daily basis.[7] Reduced PRN use may have long-term benefits in reduced medication costs, reduced risk of polypharmacy, and, if associated with decreased level 4 incidents, reduced costs for emergency room visits and related long-term medical consequences of these incidents to both the residents and dementia unit staff.

Survey

The majority of family members (88%) spent 30 minutes to 1 hour in the garden with residents when they visited. Only 1 family (6%) did not spend any time in the garden with their resident. Staff members spent even less time with the residents in the garden, with 26% spending 30 to 60 minutes, 48% less than 15 minutes, and 26% never going into the garden.

The differences in time spent with the residents in the wander garden on a daily basis between the family members and staff is not as striking as it may seem at first glance. The family members may visit daily or weekly, but the majority of residents have monthly family visits at best. Thus, when looking at the results, 22% of the staff spent up to 5 hours per week based on a 5-day workweek. Forty-eight percent of the staff spent up to 75 minutes per week in the wander garden. The 26% who spent no time in the garden were largely night shift personnel who had no chance to use the wander garden as the doors were locked for all the night shifts for the 12-month study

period. Despite this, many of the comments of the night shift staff strongly supported the wander garden as a positive adjunct to the dementia unit.

Differences in staff and family perceptions of effects of the wander garden on residents' behaviors may reflect the varied amounts of time, frequency of contact, and longitudinal perspective that the 2 groups had with the dementia residents. The families (88% of respondents) saw their dementia resident for 30 to 60 minutes in the wander garden per visit compared with 26% of the staff respondents. These longer family wander garden visits afforded the advantage of more interpersonal communication opportunities, such as personal conversation and more positive reminiscences because of the interaction with long familiar family members. They were less involved with nursing concerns. Unlike the staff, the family perspective was based on infrequent serial visits with the longitudinal perspective of having known the resident prior to institutionalization and prior to having access to the wander garden.

The staff perspective differed in several respects from that of family members. On the survey, 12% of the staff responses disagreed that the wander garden reduced agitation whereas all family responses strongly agreed or agreed that the garden reduced agitation. Most of the dementia unit staff spent less than 15 minutes with the residents in the wander garden. However, they cared for the residents 8 to 12 hours per work day. The staff usually went into the wander garden to bring a resident in out of the rain, to pick up a resident who had fallen, or to get a wheel chair bound patient back onto the garden path whose wheel chair had fallen off the path and become trapped in the garden mulch. In such cases, the mood of the residents was probably negatively influenced by their fall, by having their wheel chair or geriwalker caught in the garden mulch, or by being removed from the garden to have a change of clothes. As there was no camera in the garden itself, the staff was aware that when the garden was open a patient could fall and not be noticed. The potential problems of having unsupervised dementia patients in the wander garden invoke a strong incentive to restrict garden use for the nursing and supervisory staffs, particularly when the staff is not at its full strength. Such events disrupted the nursing routine, as the resident may require a medical evaluation, a change of clothes, and either a fall or incident report.

Namazi and Johnson[5] suggested that decreased inappropriate behaviors expressed within 30 minutes of finding an unlocked door suggested that a sense of freedom may improve the residents' quality of life. The duration of this effect depends on the stage of dementia. In later stages, there is no permanent learning and long-term changes in agitation responses, but continued access to an unlocked door into the garden may bring about repeated temporary reductions in agitation. As the monthly CMAI scales were done at random times during each month and not within 30 minutes of the resident finding a locked or unlocked wander garden door, it is unclear whether the autonomy of having the choice of exiting to the wander garden was a factor in the improved CMAI score results and the decreased need for PRNs. The difference in assessing inappropriate behaviors in wander gardens by the 4 different indexes employed (CMAI, incident reports, PRNs, survey) raises the question of whether each assessment modality measured different subsets of inappropriate behavior.

Dementia unit staff and resident family members both overwhelmingly strongly agreed or agreed (96% and 83%, respectively) that the dementia wander garden improved the resident's mood. Environmental interventions for altering mood and behavior can be either passive or active.[31] Studies have shown that merely viewing natural scenes can have therapeutic benefits.[32,33] In 1 study, viewing a natural setting in videos resulted in more rapid stress recovery, defined by muscle tension, skin conductance, and pulse transit time, when compared with viewing videos of urban traffic or pedestrian malls. The survey results also suggested that most staff and family members strongly agreed or agreed that the addition of the wander garden both increased the quality of life of the residents (96% and 88%, respectively) and of the staff (79% and 86%, respectively). The studies of Kaplan et al[34] and Kuo and Sullivan[14] have demonstrated the psychological benefits of having a garden or natural area in or near the work site and also the value of having a garden site visible most of the day. Staff quality of life at work, as indexed by decreased patient aggression, is an important economic variable as it may reduce staff burn out and staff turnover.[35] Improved staff morale may aid in maintaining staff investment in their work, increasing the possibility of providing optimal quality of care to the dementia residents.[36]

Limitations and Barriers

There were methodological and wander garden design barriers to this study. Although the wander garden was

associated with positive quantitative results (improved CMAI final scores, reduced need for PRNs), quantitative scales were not employed to verify mood and quality of life. The method of recording time spent in the garden consisted of "yes" or "no" for each day. It was not possible to accurately record how much time the residents spent in the garden in terms of visits per day, length of stays, time of visits, or which part of the garden they visited (perimeter enclosed walkway or outdoor area). The recreation staff had multiple responsibilities that prevented a complete account of the resident visits. Moreover, there were reductions in the recreational staff that decreased the opportunities to assist getting residents into the wander garden. This may have contributed to the decline in resident wander garden visits during the observation year. Rather than having the dementia residents serve as their own controls, a control group without a wander garden would be of benefit.

As noted in the study of Mather et al,[18] weather can be a significant barrier to wander garden use depending on the local climate. From mid-October to mid-March, ice, snow, and subfreezing weather made it necessary to lock both the perimeter walkway and the doors to the garden as fire codes would not allow doors to the walkway to be open if the doors to the garden were closed. The wander garden was also locked for 2 weeks in April because of administrative difficulties. From April to June, the doors to the garden walkway and to the garden were locked at 4:30 PM. In June, the doors were locked at dusk (8:00 PM). However, with the outdoor lights on, there was the stimulus for the residents to try to find the garden doors. It has been noted that the level of inappropriate behaviors may vary with changes in environment.[37] Thus, leaving the garden lights on with the doors closed may have increased sun downing in selected residents and worsened the outcome. In the spring, rain and thunderstorms resulted in closed doors, as wet residents required more work for the nursing staff and an increased risk of falls. During the summer months, the garden itself was often too hot during the day (June to August) to have staff or residents out from noon until 4:00 or 5:00 PM. Garden temperatures were often in the high 90s or above as there was a greenhouse effect resulting from the garden being surrounded by the perimeter walkway as well as having no shaded areas. In addition, the bright sunlight and the glare from the white concrete walkways throughout the outdoor garden were barriers for residents who had cataracts and other sight impairments. Thus, from June to August, these factors contributed to reduced garden use. However, residents and staff were able to walk in the air-conditioned perimeter walkway during these times.

There were other physical barriers that may have limited use of the wander garden by the dementia residents, staff, and resident families during the observational year. At the opening of the garden, there were no benches in the walkways to allow repose for residents with impaired ambulation or physical deconditioning. Access to the garden, when the doors were unlocked, was difficult. The doors to the garden from the walkways were too heavy to open for many staff members managing wheelchair patients, for many of the ambulating but debilitated patients, for some elderly visiting caretakers, for patients with merry walkers, and for solo residents in wheelchairs. Another design barrier that made nursing staff reluctant to allow residents to use the garden was the lack of cameras to monitor the garden (perimeter walkway did have monitoring cameras). Therefore, the garden was often closed due to the increased fear of having a fallen resident be left in the garden for prolonged intervals before being found when there was not sufficient nursing staff to visually monitor residents in the garden.

Conclusion

Nonpharmacological interventions are one of the first interventions to be tried for dementia patients with inappropriate behaviors. Reducing agitation in dementia patient may positively affect the quality of life of both the patient and the caretaker. Dementia wander gardens allow the dementia unit resident the freedom to remain inside or to exit into the garden, a choice that may positively influence inappropriate behaviors.

In this study, the design characteristics and management of the dementia wander garden offered both positive and negative triggers for inappropriate behaviors that may have contributed to the mixed results. The dementia wander garden design for a temperate environment, with rain and snow in season, included a heated and cooled perimeter walkway with multiple doors. These multiple doors were subject to an unpredictable schedule of having the doors locked or unlocked. Once the resident was able to reach the garden, the resident was met by a variety of pleasurable (bright colors, good weather, plants, paths) or

nonpleasurable (rain, snow, high temperatures, low temperatures, sidewalk glare) conditions and physical barriers (heavy doors, locked doors, angled paths promoting falls, wheelchairs, and merry walkers getting stuck). Despite these limitations and barriers, this observational study showed a medium-high effect of the wander garden on CMAI scores and a reduced need for PRNs. Results of a survey of both resident family members and dementia unit staff regarding the influence of the wander garden on resident agitation, mood, and quality of life were positive. The staff also agreed that the wander garden improved their quality of life. The wander garden effect on incident reports was inconclusive. It is anticipated that correction of many of the design and methodological barriers may provide a better understanding of the effect of a wander garden on inappropriate behaviors in dementia patients.

References

1. McMinn BG, Hinton L. Confined to barracks: the effects of indoor confinement on aggressive behavior among inpatients of an acute psychogeriatric unit. *Am J Alzheimers Dis Other Demen.* 2000;15:36-41.
2. Marlowe RA. Effects of environment on elderly state hospital relocates. Paper presented at: The 44th Annual Meeting of the Pacific Sociological Association; 1973; Scottsdale, AZ.
3. Lieberman MA. Relocation research and social policy. *Gerontologist.* 1974:14:494-500.
4. Epstein M, Hansen V, Hazen T. Therapeutic gardens: plant centered activities meet sensory, physical and psychosocial needs. *Oreg J Aging*. 1991;9:8-14.
5. Namazi KH, Johnson BDN. Pertinent autonomy for residents with dementias: Modification of the physical environment to enhance independence. *Am J Alzheimers Dis Other Demen.* 1992;7:16-21.
6. Malkin J. *Hospital Interior Architecture*. New York, NY: Van Nostrand, Reinhold; 1992:13-37.
7. Tariot PN, Ryan JM, Porsteinsson AP, Loy R, Schneider LS. Pharmacologic therapy for behavioral symptoms of Alzheimer's disease. *Clin Geriatr Med.* 2001;17:359-376.
8. Cohen-Mansfield J, Marx MS, Rosenthal AS. A description of agitation in a nursing home. *J Gerontol*. 1989;44: M77-M84.
9. National Center for Health Statistics. *The National Home Survey;* Series 13, #97. Hyattsville, MD: DDHS, USPHS, #89-1758; 1989.
10. Patel V, Hope RA. A rating scale for aggressive behavior in the elderly—the RAGE. *Psychol Med.* 1992;22:211-221.
11. Cohen-Mansfield J. Nonpharmacologic interventions for inappropriate behaviors in dementia. *Am J Geriatr Psychiatry.* 2001;9:361-381.
12. Kaplan R, Kaplan S. *The Experience of Nature: A Psychological Perspective*. Ann Arbor, MI: Ulrich's; 1996.
13. Ulrich RS, Parsons R. Influence of passive experiences with plants on individual well being and health. In Relf D, ed. *The Role of Horticulture in Human Well-being and Social Development*. Portland, OR: Timber Press; 1992:93-105.
14. Kuo FE, Sullivan WC. Environment and crime in the inner city: does vegetation reduce crime? *Environ Behav.* 2001;33:343-367.
15. Laben JK. Wandering: a current problem, nursing's responsibility for effective management. *J Nurs Law.* 1997; 4:65-71.
16. Ellis DJ. Gardens for Alzheimer's patients. *Am Horticulturist.* 1995;74:6.
17. Weisman GD, Cohen U, Ray K, Day K. Architectural planning and design for dementia care units. In: Coons DH, ed. *Specialized Dementia Care Units*. Baltimore, MD: Johns Hopkins University Press; 1991:93-98.
18. Mather JA, Nemecek D, Oliver K. The effect of a walled garden on behavior of individuals with Alzheimer's. *Am J Alzheimers Dis Other Demen*. 1997;12:252-257.
19. Cohen-Mansfield J, Werner P, Watson V, Pasis S. Agitation among elderly persons at adult day-care centers: the experiences of relatives and staff members. *Int Psychogeriatr.* 1995;7:447-458.
20. Cohen-Mansfield J. Assessment of agitation. *Int Psychogeriatr*. 1996;8:233-245.
21. Cohen-Mansfield J, Billig N. Agitated behaviors in the elderly: a conceptual review. *J Am Geriatr Soc*. 1986; 34:711-721.
22. Meyers LS, Guarino A, Gamst G. *Applied Multivariate Research: Design and Interpretation*. Thousand Oaks, CA: Sage; 2005:20.
23. Ott RL, Longnecker M. *An Introduction to Statistical Methods and Data Analysis*. 5th ed. Pacific Grove, CA: Duxbury; 2001.
24. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988.
25. Segal S, Moyles E. Management style and institutional dependency in sheltered care. *Soc Psychiatry.* 1979;14: 159-165.
26. Ernst RL, Hay JW. The US economic and social costs of Alzheimer's disease revisited. *Am J Public Health*. 1994; 84:1261-1264.
27. Fillit H, Hill J. Economics of dementia and pharmacoeconomics of dementia therapy. *Am J Geriatr Pharmacother*. 2005;3:39-49.
28. Doody RS. Current treatments for Alzheimer's disease: cholinesterase inhibitors. *J Clin Psychiatry*. 2003:64 (suppl 9):11-17.
29. Sunderland T. Treatment of the elderly suffering from psychosis and dementia. *J Clin Psychiatry*. 1996;57 (suppl 9):53-56.
30. Sunderland T. Treatment of the elderly suffering from dementia. *J Clin Psychiatry Monogr*. 1995;15:31-33.

31. Aldridge J, Sempik J. Social and therapeutic horticulture: evidence and messages form research. Centre for Child and Family Research 2002, Evidence Issue 6. http://www.growingtogether.org.uk.
32. Ulrich RS. View through a window may influence recovery from surgery. *Science*. 1984;224:420-421.
33. Coulter AH. Healing gardens: when nature is therapy. *Altern Complement Ther*. 1999;5:64-73.
34. Kaplan R, Bardwell LV, Ford HA, Kaplan S. The corporate back-40: employee benefits of wildlife enhancement efforts on corporate land. *Hum Dimens Wildl*. 1996;1:1-13.
35. Colenda CC, Hamer RM. Antecedents and interventions for aggressive behavior of patients at a geropsychiatric state hospital. *Hosp Community Psychiatry*. 1991;42:287-292.
36. Robertson A, Gilloran A, McGlew T, McKee K. Nurses' job satisfaction and the quality of care received in psychogeriatric wards. *Int J Psychiatry*. 1995;10:575-584.
37. Rosen J, Burgio L, Kollar M, et al. The Pittsburgh Agitation Scale: a user-friendly instrument for rating agitation in dementia patients. *Am J Geriatr Psychiatry*. 1994;2:52-59.