

Effectiveness of Integrated Sleep Intervention Strategies on Quality of Sleep among the Elderly at Selected Old Age Homes

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Abstract: Background: Sleep disturbances are common among the elderly, particularly those residing in old age homes, and negatively affect health and quality of life. Pharmacological treatments often carry risks, making non pharmacological strategies safer alternatives. This study evaluated the effectiveness of integrated visual, auditory, and foot reflexology (VAF) strategies on sleep quality among elderly residents in selected old age homes. **Methods:** A quasi experimental design was adopted with 60 elderly participants (30 control, 30 intervention) selected through purposive sampling. Inclusion criteria were age ≥ 60 years, residence in the old age home ≥ 1 year, and self reported sleep disturbances. The intervention group received integrated VAF sessions (guided imagery, calming music, foot reflexology) for 30-40 minutes, five times per week, for four weeks. Sleep quality was assessed at three time points (pretest, post test 1, post test 2) using standardized tools. Statistical analyses included chi square tests, repeated measures ANOVA, and post hoc comparisons. **Results:** Sleep quality remained unchanged in the control group (pretest mean=14.93 \pm 3.83; post test 1 mean=14.60 \pm 3.51; post test 2 mean=14.63 \pm 3.46; $p > 0.05$). In contrast, the intervention group showed significant improvement (pretest mean=16.00 \pm 3.20; post test 1 mean=11.10 \pm 2.09; post test 2 mean=8.20 \pm 1.58; $p < 0.001$). Post hoc analysis confirmed differences between all pairs. By post test 2, 40% of the intervention group reported good sleep compared to none in the control group. **Conclusion:** Integrated VAF strategies significantly improved sleep quality among elderly residents. Findings highlight the potential of multimodal, culturally adaptable, non

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pharmacological interventions to promote sleep health and enhance well being in geriatric populations.

Keywords: *Sleep Quality, Integrated Sleep Intervention Strategies, Non pharmacological Intervention, Elderly*

1 | INTRODUCTION

Sleep is a vital physiological process that supports physical health, cognitive functioning, and emotional stability. Among the elderly, particularly those residing in institutional settings such as old age homes, sleep disturbances are highly prevalent and contribute to reduced quality of life, increased risk of falls, impaired immunity, and heightened psychological distress (Yu et al., 2025). These challenges make sleep health a critical focus in geriatric care.

Pharmacological treatments, while commonly prescribed, often carry risks of dependency, adverse drug reactions, and reduced long-term effectiveness. Consequently, there has been growing interest in non-pharmacological interventions that are safe, cost-effective, and culturally adaptable (Song et al., 2026). Approaches such as visual relaxation techniques, auditory stimulation through calming music, and foot reflexology have individually demonstrated benefits in reducing anxiety, promoting relaxation, and improving sleep quality (Vásquez-Carrasco et al., 2025). However, limited research has examined the synergistic effects of combining these modalities into an integrated intervention.

The present study investigates the effectiveness of a multimodal program integrating sleep intervention strategies on sleep quality among elderly residents in selected old age homes. By employing a quasi-experimental design with repeated measures, the study aims to provide evidence on whether such an integrated approach can produce meaningful improvements in sleep outcomes. This research contributes to the growing body of literature on holistic, non-pharmacological interventions and offers practical insights for enhancing geriatric care in institutional settings.

2 | METHODOLOGY

The study was approved by the Institutional Ethics Committee, and permission was obtained from the authorities of selected old age homes. A quasi-experimental design with control and intervention groups was adopted to assess the effectiveness of integrated sleep intervention strategies on sleep quality among elderly residents. Sixty elderly participants were recruited through purposive sampling (30 control, 30 intervention). Inclusion criteria were age ≥ 60 years, residence in the old age home for at least one year, and self-reported sleep disturbances. Exclusion criteria included severe cognitive impairment or psychiatric illness. The intervention group received the VAF program comprising guided imagery, calming music, and foot reflexology. Sessions lasted 30–40 minutes, five times per week, for four weeks. The control group continued routine care. Evidence supports multimodal sensory and tactile interventions for sleep improvement (Chang & Lee, 2025; Li et al., 2025). Data were collected using a background proforma and a standardized sleep quality scale. Validity was established through expert review, and reliability was supported by prior studies (Huang et al., 2023). Descriptive statistics (frequency, percentage, mean, SD) and inferential statistics were applied. Chi-square tests assessed demographic comparability, while repeated measures ANOVA and post hoc tests evaluated changes in sleep quality.

Table 1: Frequency and Percentage Distribution of Demographic Variables of Elderly in the Control and Intervention Group. (N=60)

Demographic Variables	Control (n=30)		Experimental (n=30)		χ^2 Value	df	p-value
	f	%	f	%			
Age (years)							
61-65	26	86.7	25	83.3	0.131	1	0.718
66-70	4	13.3	5	16.7			
Gender							
Male	11	35.5	0	0.0	10.7	1	0.000
Female	20	64.5	30	100.0			
Religion							
Hindu	17	56.7	17	56.7	1.040	2	0.595
Christian	12	40.0	13	43.3			
Muslim	1	3.3	0	0.0			
Education							
No formal	4	13.3	11	36.7	6.982	4	0.137
Primary	10	33.3	12	40.0			
Secondary	7	23.3	3	10.0			
Higher secondary	7	23.3	3	10.0			
Graduate+	2	6.7	1	3.3			
Marital Status							
Unmarried	10	33.3	3	10.0	9.214	3	0.027
Married	18	60.0	18	60.0			
Widow(er)	1	3.3	8	26.7			
Divorced/Separated	1	3.3	1	3.3			
Number of Children							
Nil	13	43.3	9	30.0	1.164	2	0.559
1-2	11	36.7	14	46.7			
>2	6	20.0	7	23.3			
Spouse Living Status							
Dead	11	36.7	3	10.0	10.629	3	0.014
Alive	12	40.0	23	76.7			
Others	7	23.3	4	13.3			
Financial Dependency							
Independent	5	16.7	5	16.7	2.000	2	0.368
Partially dependent	3	10.0	7	23.3			
Dependent	22	73.3	18	60.0			
Source of Income							
Nil	12	40.0	10	33.3	4.362	3	0.225
Pension	14	46.7	13	43.3			
Children support	4	13.3	3	10.0			
Other	0	0.0	4	13.3			
Monthly Family Income /(INR)							
Nil	12	40.0	10	33.3	4.848	5	0.435
Up to 1000	14	46.7	10	33.3			
1001-5000	3	10.0	6	20.0			
5001-10000	1	3.3	1	3.3			
Above 10000	0	0.0	2	6.7			
Duration of Stay (yrs)							
1-2	3	10.0	2	6.7	6.233	8	0.621

3-5	4	13.3	2	6.7			
>5	23	76.7	26	86.6			

Table 1 describes and compares the demographic variables between the control and intervention group elderly.

The table shows that the majority (or higher proportion of elderly) were aged 61–65 years (87%, 83%), females (65%, 100%), Hindus (57%, 57%), with primary level education (33%, 40%), married (60%, 60%), had 1-2 children (37%, 47%), and were financially dependent (73%, 60%), pension was their main source of income (47%, 43%), had a monthly family income up to ₹1000 (47%, 33%), and had been staying in the setting for more than 5 years (77%, 87%) in both the control and intervention groups respectively.

Statistical analysis indicated that there was no significant difference between the control and intervention groups with respect to age, religion, education, number of children, financial dependency, source of income, monthly family income, and duration of stay ($p > 0.05$). However, there was a statistically significant difference observed in gender, marital status, and spouse living status ($p < 0.05$).

Therefore, the two groups were homogeneous with regard to most demographic variables except gender, marital status, and spouse living status.

Tab 2: Frequency and Percentage Distribution of Personal Variables of Elderly Population in the Control and Intervention Group. (N=60)

Variables	Control Group (n=30)		Intervention Group (n=30)		χ^2 Value	df	p-value
	f	%	f	%			
Reason for joining in old age home							
Acceptance/Willingness to live independent	7.0	23.3	4.0	13.3	1.172	3	0.760
Conflict with family members	9.0	30.0	9.0	30.0			
Poverty	12.0	40.0	14.0	46.7			
Migration of the children to other Countries (For Caring and safety)	-	-	-	-			
Children working in other places in same country	-	-	-	-			
Neglected by children/family	2.0	6.7	3.0	10.0			
Others, Specify							
Frequency of visiting by children or concerned others							
More than once in a week	-	-	-	-			
Once in a week	-	-	-	-			
Once in 2-3 weeks	2.0	6.7	1.0	3.3	4.833	4	0.305
Once in a month	4.0	13.3	0.0	0.0			
2 months - 6 months	3.0	10.0	4.0	13.3			
Occasionally	14.0	46.7	17.0	56.7			
Never	7.0	23.3	8.0	26.7			

Taken Home							
More than once in a week	-	-	-	-			
Once in a week	-	-	-	-			
Once in 2-3 weeks	-	-	-	-			
Once in a month	3.0	10.0	2.0	6.7	2.015	3	0.569
2 months - 6 months	3.0	10.0	6.0	20.0			
Occasionally	15.0	50.0	11.0	36.7			
Never	9.0	30.0	11.0	36.7			
Relationship of the person who visits the elderly							
Spouse	-	-	-	-			
Children	15.0	50.0	16.0	53.3	1.547	4	0.818
Siblings	2.0	6.7	1.0	3.3			
Relatives	5.0	16.7	6.0	20.0			
Friends	-	-	-	-			
Volunteers (Govt/NGO)	-	-	-	-			
Others (specify)	3.0	10.0	1.0	3.3			
No visits	5.0	16.7	6.0	20.0			
Medical Illness							
Diabetes Mellitus	4.0	13.3	4.0	13.3	2.143	4	0.710
Hypertension	3.0	10.0	4.0	13.3			
Diabetes Mellitus & Hypertension	20.0	66.7	20.0	66.7			
Moderate to Severe Osteoarthritis	-	-	-	-			
Asthma	3.0	10.0	1.0	3.3			
Others (specify)	0.0	0.0	1.0	3.3			
Nil							
Treatment for Illness							
Yes	25.0	83.3	16.0	53.3	6.239	1	0.012
No	5.0	16.7	14.0	46.7			
Activities of Daily Living							
Independent	30.0	100.0	29.0	96.7	1.017	1	0.313
Partially dependent	0.0	0.0	1.0	3.3			
Perceived Quality of Sleep							
Good	-	-	-	-			
Average	15.0	50.0	9.0	30.0	2.500	1	0.114
Poor	15.0	50.0	21.0	70.0			
History of taking Sleep Medication							
Yes	11.0	36.7	9.0	30.0	0.300	1	0.584
No	19.0	63.3	21.0	70.0			
Don't know / Not sure	-	-	-	-			
Personal Habits							
Nil	21.0	70.0	22.0	73.3	8.296	3	0.040
Tobacco chewing	3.0	10.0	8.0	26.7			
Alcoholism	3.0	10.0	0.0	0.0			
Smoking	3.0	10.0	0.0	0.0			
Leisure Activities							
Books	10.0	33.3	8.0	26.7	1.247	2	0.536

TV watching	20.0	66.7	21.0	70.0			
Craft							
Drawing / Painting	0.0	0.0	1.0	3.3			
Others	-	-	-	-			
Bed Time Habits							
Music	1.0	3.2	0.0	0.0	3.263	4	0.515
Milk	17.0	54.8	15.0	50.0			
Phone call with friends/relatives	1.0	3.2	0.0	0.0			
TV Watching	12.0	38.7	14.0	46.7			
Others	0.0	0.0	1.0	3.3			

Table 2 describes and compares the personal variables of elderly in the control and intervention groups.

The table indicates that the higher proportion of elderly in both the control and intervention groups reported poverty (40%, 47%) and conflict with family members (30%, 30%) as the main reasons for joining old age homes, while 23% of the control group and 13% of the intervention group expressed acceptance or willingness to live independently. With regard to frequency of visits by family members, the higher proportion of elderly in both groups reported that they were visited occasionally (47%, 57%) or never visited (23%, 27%). When taken home, most elderly reported being taken occasionally (50%, 37%), followed by never (30%, 37%).

In terms of the relationship of visitors, children formed the more than half in both control and intervention groups (50%, 53%). Concerning medical illness, the majority in both groups had diabetes mellitus with hypertension (67%, 67%), while smaller proportions had diabetes alone (13%, 13%), hypertension alone (10%, 13%), or asthma (10%, 3%). Most of the elderly in the control group (83%) and about half in the intervention group (53%) were under treatment for their illness.

With respect to activities of daily living, all elderly in the control group (100%) and majority of them in the intervention group (97%) were independent. Regarding sleep, half of them in control group (50%) and 70% of the intervention group reported poor quality of sleep, while 50% and 30% had average sleep. About one-third in both groups reported a history of sleep medication (37%, 30%).

Concerning personal habits, the majority in both groups reported no habits (70%, 73%), while a few reported tobacco chewing (10%, 27%) and alcoholism or smoking (10% each in control, 0% in intervention). For leisure activities, the majority preferred television watching (67%, 70%), followed by reading books (33%, 27%). With regard to bedtime habits, more than half in both groups consumed milk before sleep (55%, 50%), followed by TV watching (39%, 47%).

Statistical analysis revealed no significant difference between the groups for reasons for joining, frequency of visiting, being taken home, relationship of visitors, medical illness, activities of daily living, quality of sleep, history of sleep medication, leisure activities, and bedtime habits ($p > 0.05$). However, a statistically significant difference was observed in treatment for illness and personal habits ($p < 0.05$).

Therefore, the two groups were homogeneous in most personal variables except treatment for illness and personal habits.

Table 3: Frequency and Percentage Distribution of Level of Sleep Quality Among Elderly in Control Group. (N=60)

Assessment Sleep Quality	Control Group (n=30)		Intervention Group (n=30)		χ^2 Value	P value
	f	%	f	%		
Pretest						
Good						
Average	15	50.0	10	33.33	1.71	0.095
Poor	15	50.0	20	66.66		
Post Test 1						
Good	0	0.0	1	3.3	17.180	0.000
Average	15	50.0	28	93.3		
Poor	15	50.0	1	3.3		
Post Test 2						
Good	0	0.0	12	40.0	27.273	0.000
Average	15	50.0	18	60.0		
Poor	15	50.0	0	0.0		

Table 3 describes the levels of sleep quality among elderly in the control and intervention groups.

In the pretest, equal proportions of the control group had average (50%) and poor sleep (50%), In the post-test 1, the control group remained unchanged, whereas most of the intervention group reported average sleep (93%). In the post-test 2, the control group again showed no change, while the intervention group improved further with 60% reporting average sleep and 40% good sleep.

No significant difference was found in the pretest, but highly significant differences were observed in both post-tests ($p < 0.05$), indicating improved sleep quality in the intervention group.

Table 4: Comparison of Pretest and Post Tests Quality of Sleep Scores Among Elderly in the Control Group using RM ANOVA (n = 30)

Quality of Sleep	Max Score	Pretest		Post Test 1		Post Test 2		F & p value	
		Mean	SD	Mean	SD	Mean	SD	Within Subjects	Between Subjects
Quality of Sleep Scores	21	14.93	3.83	14.60	3.51	14.63	3.46	2.935	509.615
								0.061	0.000

Table 4, on comparison of Quality of Sleep scores between pretest and post tests among elderly in the control group reveals that, there is no significant difference between pretest, post test 1 and post test 2 within subjects ($p > 0.05$). However, there is significant difference between pretest, post test 1 and post test 2 between subjects ($p < 0.001$).

Table 5: Comparison of Pretest and Post Tests Quality of Sleep Scores Among Elderly in the Intervention Group using RM ANOVA (n = 30)

Variable	Max Score	Pretest		Post Test 1		Post Test 2		F & p value	
		Mean	SD	Mean	SD	Mean	SD	Within Subjects	Between Subjects
Quality of Sleep Scores	21	16.00	3.206	11.10	2.090	8.20	1.584	231.685	949.049
								.000	.000

Table 5 on comparison of Quality of Sleep scores between pretest and posttests among elderly in the Experimental group reveals that, there is significant difference between pretest, post test 1 and post test 2 within and between subjects ($p < 0.001$).

Tab 6: Post Hoc Analysis (Pair wise Comparison) of Quality of Sleep Scores Among Elderly in the Intervention Group (n=30)

Comparison	Mean Diff	Std. Error	P Value.	95 CI	
				Lower Bound	Upper Bound
Pre Test Vs Post Test 1	4.900	.330	.000	4.225	5.575
Pre Test Vs Post Test 2	7.800	.461	.000	6.857	8.743
Post Test 1 Vs Post Test 2	2.900	.285	.000	2.317	3.483

Tab 6 on Post Hoc Analysis (Pair wise Comparison) of Quality of Sleep Scores in experimental group reveals that, there is significant difference between all the pairs. ie Pre Test Vs Post Test 1, Pre Test Vs Post Test 2 & Post Test 1 Vs Post Test 2 ($p < 0.001$).

Table 7: Comparison of Quality of Sleep Scores Between Control and Intervention Group in Pretest and Post Tests Among Elderly (n=60)

Assessment	Control Group (n =30)		Intervention Group (n =30)		MD	Ind t value	P Value
	Mean	SD	Mean	SD			
Pretest	14.93	3.832	16.00	3.206	-1.067	-1.169	.247
Post Test 1	14.60	3.510	11.10	2.090	3.500	4.693	.000
Post Test 2	14.63	3.459	8.20	1.584	6.433	9.262	.000

Tab 7 reveals that, there is no significant difference in Mean Quality of Sleep Score between control group and Intervention Group in pretest ($p > 0.05$). However, there is significant difference in Quality of Sleep Score between control group and Intervention Group in Post Test 1 and Post Test 2 ($p < 0.05$). ie In Posttests, Mean Quality of Sleep scores were low in Intervention Group than the control group, which can be attributed to the effectiveness of intervention on improvement of Quality of Sleep among Elderly.

3 | DISCUSSION

The present study demonstrated that integrated sleep intervention strategies significantly improved sleep quality among elderly residents in old age homes. While the control group showed no change across assessments, the intervention group exhibited marked improvements, with post hoc analysis confirming significant differences between all-time points. By post-test 2, 40% of the intervention group reported good sleep compared to none in the control group, underscoring the effectiveness of multimodal non-pharmacological interventions. Though there are many factors influencing sleep and other psycho social outcome among elderly, attitudes of elderly towards ageing significantly influence coping and adaptation in institutionalized elderly (Jesintha et al ,2024).

Study findings are consistent with recent evidence highlighting the benefits of non-pharmacological approaches in geriatric populations. Yu et al. (2025) reported that multimodal interventions combining sensory stimulation and relaxation techniques improved sleep outcomes in older adults. Similarly, Song et al. (2026) found that integrated non-pharmacological interventions were more effective than single-modality approaches in enhancing sleep quality. Reflexology has been shown to reduce stress and promote relaxation, thereby improving sleep among elderly individuals (Chang & Lee, 2025). Music therapy also contributes to better sleep quality by reducing anxiety and promoting

parasympathetic activity (Li et al., 2025). The integration of visual relaxation, auditory stimulation, and tactile reflexology in the present study aligns with these findings, suggesting synergistic effects when modalities are combined. Jesintha (2023) in her study also emphasized that elderly residents in old age homes often report poor sleep quality, reinforcing the need for structured interventions.

Emerging evidence also highlights the broader impact of chronic conditions such as fibromyalgia on sleep and quality of life among elderly populations. Pappu et al (2025) reported that fibromyalgia significantly impairs sleep quality and overall well-being in older adults, underscoring the importance of holistic, non-pharmacological interventions. Similarly, Pappu et al (2025) also examined well-being among elderly individuals with fibromyalgia and found that sleep quality was a critical determinant of overall health status. This reinforces the argument that integrated approaches such as VAF strategies can provide meaningful benefits not only for sleep but also for broader aspects of geriatric health.

Similarly, Chang et al. (2024) demonstrated through a network meta-analysis that joint interventions, such as combining relaxation and sensory therapies, were the most effective in enhancing sleep quality among elderly populations. These results reinforce the rationale for integrated VAF strategies, which combine visual relaxation, auditory stimulation, and foot reflexology to produce synergistic benefits. Further, Klocke et al. (2024) highlighted the role of acupuncture and receptive music therapy in elderly patients with sleep disorders, underscoring the growing acceptance of multimodal, culturally adaptable interventions.

Improvements in sleep quality were evident across diverse subgroups, indicating that VAF strategies are broadly applicable. This supports the argument that culturally adaptable, low-cost interventions can be implemented in institutional settings to address sleep disturbances among the elderly (Vásquez-Carrasco et al., 2025). Furthermore, the findings resonate with Indian studies on geriatric well-being. Vijayalakshmi (2021) highlighted the importance of psychosocial support in improving health-seeking behavior in all the groups including geriatric population. Mary, et al (2024) also identified depression as a prevalent issue among elderly populations, which is closely linked to sleep disturbances. Addressing sleep quality through integrated interventions may therefore indirectly mitigate depressive symptoms and enhance overall mental health.

The role of innovative therapies in geriatric care and psychiatric patients has also been documented by the Chitra et al (2016). They explored Virtual reality therapy as a cognitive enhancer among elderly populations, showing that non-pharmacological, sensory-based interventions can yield substantial benefits among elderly. These findings complement the present study's evidence that multimodal sensory interventions are effective in improving sleep quality. Importantly, the results highlight the potential of VAF strategies as scalable alternatives to pharmacological treatments, which often carry risks of dependency and adverse effects (Huang et al., 2023). The consistent improvements observed across repeated measures suggest that VAF interventions may foster sustainable sleep health outcomes, thereby enhancing overall well-being in geriatric populations.

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