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Sunbathing and walking morning exercise for patient with sundown syndrome

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Abstract
One of the typical symptoms exhibited by patients with cognitive impairment is restlessness in the afternoon or evening, disorientation, and hallucinations. These symptoms are commonly referred to as sundown syndrome or sundowning. Sundown syndrome describes a series of neuropsychiatric symptoms that occur in the elderly, with or without dementia, typically in the early or late afternoon or at night. From a neurobiological perspective, the causes of sundown syndrome are often linked to primary alterations in normal circadian rhythms. One key component in the regulation of circadian rhythms is melatonin. Research has shown that melatonin levels decrease with age and decline even further in conditions such as Alzheimer's disease and other neurodegenerative disorders. Complementary therapies, such as sunbathing and morning walks, can help reduce the symptoms of sundown syndrome. These therapies are based on the understanding that exposure to sunlight influences the production of melatonin and serotonin, the precursors of melatonin. Serotonin has a calming effect, preparing the brain and body for sleep, while melatonin helps reduce sleep alertness. Sunbathing therapy aims to optimize melatonin production in the afternoon and evening. Meanwhile, morning walking exercises stimulate the pineal gland to secrete serotonin. Both sunbathing and walking are accessible activities that can be performed by elderly individuals who do not have significant mobility issues. In this case study, the complementary therapy provided to the client included sunbathing for 15 minutes each morning between 7:30 and 8:00 AM for five days, along with morning walking exercises for 15 to 20 minutes, depending on the client's tolerance. After the intervention, the score for sundowning symptoms decreased from 12 to 8, indicating a positive response to the complementary therapies.

Keywords: Sundowning syndrome; psychogeriatric; mental health nurses; walking exercise; prevention

Introduction
The aging process naturally decreases the anatomical, physiological, and biochemical abilities of the body, which affects overall bodily function (Agustia et al., 2014). Among elderly individuals aged 50-59, 39% report experiencing forgetfulness. This percentage increases significantly with age, rising to 85% in those aged 80 and older, with common complaints including forgetting where they live, their favorite objects, and the names of close family members (Azhari et al., 2022). Dementia is a clinical syndrome characterized by a loss of intellectual function and memory, leading to dysfunction in daily life. It involves a decline in memory and other cognitive abilities that significantly interferes with daily activities. One typical symptom appearing in the early phases of dementia is sundown syndrome. This term describes a pattern of increased behavioral disturbances, such as fussiness and agitation, towards the end of the day. Symptoms can vary widely and may include mood swings, disorientation, hallucinations, confusion, wandering, insomnia, refusal of help, and even aggression towards others (Carrarini et al., 2021). The reported prevalence of sundown syndrome varies significantly across studies, with some reporting rates as high as 60% and others as low as 2.5% among dementia patients, depending on various factors (Khachiyants et al., 2011; Canevelli et al., 2016). Overall, sundown syndrome is a multifactorial phenomenon with various interacting factors contributing to its occurrence and characteristics. From a neurobiological perspective, the syndrome is linked to primary alterations in normal circadian rhythms. Disturbances in circadian rhythms have been associated with changes in the suprachiasmatic nucleus (SCN), located in the hypothalamus and considered the main circadian rhythm pacemaker in the human body. Several studies suggest that the volume, morphology, and activity of the SCN may be influenced by factors such as age, gender, and pathological conditions.

Most of the existing evidence regarding the pharmacological management of sundown syndrome focuses on the clinical efficacy of melatonin supplementation. Cholinesterase inhibitors have demonstrated significant reductions in behavioral disturbances among dementia patients. However, current data on the use of the N-methyl-d-aspartate receptor antagonist memantine for treating sundown syndrome is lacking. Antipsychotics are frequently prescribed for this condition, but their use can lead to polypharmacy and an increased risk of psychotropic medication

misuse. Therefore, non-pharmacological approaches are recommended as the first-line management strategy, reserving pharmacotherapy for cases that do not respond to these interventions (Canevelli et al., 2016). In the Psychogeriatric Room at Soerojo Hospital, nursing interventions for clients with cognitive impairment or dementia adhere to the Nursing Care Standards established by the hospital. These standards apply broadly to psychogeriatric services, regardless of whether patients exhibit sundown syndrome. Some nursing interventions provided in the Psychogeriatric Room include special geriatric assessments, psychogeriatric nursing modality therapy, assistance with activities of daily living (ADLs), and exercises such as walking. While in the Psychogeriatric Room, nurses assist patients with both collaborative therapy and independent nursing care. Complementary therapies often include sunbathing and morning walks. Research titled "The Relationship Between Sunlight Exposure Duration and Depressive Symptoms: A Cross-Sectional Study on Elderly Chinese Women" indicates that sunbathing is closely linked to improved emotional regulation. Sunlight exposure helps reduce serum cortisol levels and regulates circadian rhythms, where cortisol is a stress hormone.

Serotonin plays a crucial role as a neurotransmitter, hormone, and morphogen for the brain, influencing appetite, energy expenditure, sleep, body temperature, mood, and social cognition. The precursors of melatonin and serotonin are also affected by sun exposure. Serotonin is typically produced during the day and converted to melatonin in the dark. High serotonin levels contribute to a positive mood and a calm, focused mental state. Sunbathing for just 10-15 minutes can yield significant health benefits (Mead, 2008). Mishima et al. reported that bright light exposure in the morning can reduce insomnia and behavioral disorders, including delirium. Numerous studies have shown melatonin's effectiveness for sleep disorders in the elderly and dementia patients. Research conducted by Kandar et al. at RSJD Dr. Amino Gondohutomo in Central Java utilized a pre-test and post-test design with a control group. The study comprised 50 respondents, with 25 in the control group and 25 in the intervention group. Sunbathing interventions were implemented from 09:00 to 10:00 AM for 5-10 minutes over ten days in the intervention group. Analysis revealed that sunbathing positively impacted emotional regulation in patients at risk of violent behavior, highlighting the role of sunlight in reducing serum cortisol levels and enhancing serotonin secretion (Kandar et al., 2022). Furthermore, elderly individuals are strongly encouraged to engage in physical activities such as walking, particularly in the morning. Morning walks promote dynamic movement, are easy to perform, inexpensive, foster joy and enthusiasm, and place a low burden on the body (Supriadi et al., 2023). These activities can enhance relaxation, increase the need for regular rest, boost energy levels, and improve sleep quality through endorphin production and temperature regulation (Oktaviatama et al., 2023). Walking stimulates the pineal gland to secrete serotonin, which has a calming effect, preparing the brain and body for sleep, while melatonin helps reduce sleep alertness. Therefore, the study aims to evaluate the use of sunbathing and walking exercise for patient with sundowning syndrome.

Case Description

In this case study, the author focused on a patient diagnosed with F 06.7 (Mild Cognitive Impairment) and hypertension (controlled with pharmacotherapy), who exhibited symptoms consistent with Sundown Syndrome. The patient had a history of behavioral changes characterized by prolonged silence, frequent pacing at home, limited mobility (only sitting on the terrace), excessive lying down throughout the day, and increasing forgetfulness regarding family members' names over the past six months. Anamnesis gathered from the patient's family, especially the client's children, revealed that the patient had been confused, pacing back and forth, particularly in the afternoons and evenings, for three weeks prior to hospitalization. The patient occasionally screamed or talked to themselves and experienced restlessness and difficulty sleeping at night. During the day, the patient often remained inactive, but by the afternoon, they would become disoriented and pace around. If addressed loudly, the patient would either scream in anger or cry. These symptoms were corroborated by the nurse in the Psychogeriatric Room, who noted similar behaviors during the assessment. According to research by Lineweaver et al. (2022), the general manifestations of Sundown Syndrome can be categorized into seven symptom groups: confusion, anxiety, agitation, aggression, difficulty being directed, repetitive behavior, and inappropriate responses. The author conducted mental and physical assessments on the patient, following established procedures, including special assessments for the elderly to evaluate cognitive conditions. The Mini Mental State Examination (MMSE) was administered, yielding a score of 11, indicating definite cognitive impairment. Additionally, the Indonesian version of the Ascertain Dementia 8 questionnaire (INA-AD8) was utilized through interviews with family members, resulting in a score of 7, further confirming cognitive impairment.

To specifically assess Sundown Syndrome symptoms, the author employed a questionnaire evaluating signs such as inability to sit still, agitation, irritability, confusion or disorientation, difficulty sleeping, and hallucinations or delusions. The scoring scale ranged from 0 (none) to 3 (all the time), with caregiver observations and interviews yielding a score of 12. The nursing diagnoses identified were chronic confusion (D.0065) and sensory perception disorders (D.0085). These diagnoses were based on both subjective and objective symptoms observed in the patient, with over 80% of major symptoms fulfilling the criteria for the diagnoses. Chronic confusion is characterized by irreversible, long-lasting, and progressive disorders of consciousness, attention, cognition, and perception. Major symptoms included a significant decline in cognitive function, as evidenced by the MMSE score of 11 and the INA-AD8 score of 7. Furthermore, family reports and nurse observations indicated a notable decrease in the patient’s ability to perform

activities of daily living (ADLs). Another significant symptom of chronic confusion was the altered response to stimuli, with the patient frequently appearing blocked and experiencing hallucinations. Changes in cognitive interpretation were evident, such as misordering the names of their children. The patient also faced both short-term and long-term memory issues, struggling to recall names of friends from their youth, children's birth years, and the name of their previous elementary school. Short-term memory challenges manifested in forgetting names upon introduction and failing to remember if they had eaten.

For the diagnosis of sensory perception disorders, characterized by changes in the perception of internal and external stimuli along with reduced, exaggerated, or distorted responses, the patient had been experiencing hallucinations for approximately three weeks prior to hospitalization. Major symptoms included talking to neighbors or seeing family members who were not present, along with inappropriate responses, such as conversing with imaginary individuals. Minor symptoms included daydreaming, diminished concentration, and disorientation regarding time, place, people, and situations. The patient was admitted to the Psychogeriatric Room on the afternoon of April 22, 2024. The implementation of Evidence-Based Practice (EBP) was planned for day two of treatment. The planned EBP interventions included sunbathing therapy and morning walks, which were complementary therapies added to the standard nursing interventions in the Psychogeriatric Room, such as reminiscence modality therapy and group therapy. These interventions were deemed appropriate for the patient, considering vital signs, general physical condition, and mental status. Importantly, these activities can be easily integrated into the patient's home routine, requiring no special training for family members. The patient was scheduled to receive complementary nursing interventions, including sunbathing therapy for 15 minutes each morning between 7:30 and 8:00 AM for five days, followed by morning walks for 15-20 minutes based on the patient's tolerance. On the first day of intervention, the patient participated in sunbathing for 15 minutes and a morning walk for 20 minutes, covering a distance of approximately 1.5 km. The patient's physical and psychological responses were positive. The second and third days of intervention maintained similar durations, with consistent positive responses. On the fourth day, the morning walk was shortened to 10 minutes due to the patient's fatigue. By the fifth day, the patient sunbathed for 15 minutes and walked for 15 minutes, covering about 1 km. On the sixth day following the intervention, the author reassessed the symptoms of Sundown Syndrome using the previously employed questionnaire. This comprehensive approach highlights the importance of tailored interventions in managing the complex needs of patients experiencing cognitive impairment and Sundown Syndrome.

Discussion

In this case study, the author focused on a patient diagnosed with Mild Cognitive Impairment (MCI, F 06.7 in DSM IV) that progressed to vascular dementia, linked to the patient's history of hypertension, which had not received prior medical management. The patient exhibited significant signs of sundowning from home until the initiation of treatment at the hospital. On day 2 of the sunbathing and morning walk intervention, the antipsychotic dosage was increased from 1.5 mg of haloperidol to 2 mg every 12 hours, and the nighttime dosage was raised from 5 mg to 10 mg over 24 hours. Additionally, clobazam was replaced with clozapine at a dosage of 6.25 mg. These adjustments were made based on the patient's ongoing reports of restlessness in the afternoons and difficulty sleeping at night. Following the increase in medication, the patient reported improved sleep; however, sundowning symptoms persisted in the afternoons and evenings, including pacing, restlessness, hallucinations, and disorientation. A notable decrease in sundowning symptoms began to emerge by the fourth day of intervention. After five days, the author evaluated the sundowning symptoms, which included inability to sit still, agitation, irritability, confusion or disorientation, difficulty sleeping, and hallucinations or delusions. The evaluation revealed a reduction in the total score from 12 to 8. Specifically, the patient showed improvement in the inability to sit still and agitation, which decreased from often (score of 2) to sometimes (score of 1). Disorientation shifted from all the time (score of 3) to frequent (score of 2), while irritability remained at a score of 1, and hallucinations continued to be frequent (score of 2).

Although the decrease in sundowning symptom scores was positive, it was not statistically significant. Several studies support the benefits of sunbathing therapy and morning walks on emotional regulation and sleep quality in the elderly, which informed the choice of these complementary therapies for patients with sundown syndrome. The aim of sunbathing therapy is to optimize melatonin production, particularly in the afternoon and evening. Notably, a significant reduction in sundowning symptoms was reported in 7 out of 10 dementia patients with sleep disorders treated with 3 mg of melatonin before bedtime for three weeks. Another study involving 14 Alzheimer's disease (AD) patients treated with 6–9 mg/day over a period of 2–3 years also noted improvements in sleep quality (Cardinali, 2019). According to a WHO pamphlet, the optimal times for sunbathing in equatorial regions are between 7:30-9:30 AM or 3:00-4:00 PM, with a duration of 5 to 10 minutes. During these times, UVB intensity is low, which is beneficial for vitamin D synthesis and enhancing the body's immune response. Exposure to sunlight or bright artificial light in the morning accelerates evening melatonin production, facilitating easier sleep onset at night. Bright morning light exposure has been effective in addressing insomnia by advancing the melatonin rhythm.

Research conducted by Kandar et al. at RSJD Dr. Amino Gondohutomo in Central Java Province utilized a quasi-experimental design with a pre-test and post-test framework, including a control group. The study involved 50 respondents, split into 25 for the control group and 25 for the intervention group. Sunbathing interventions were implemented between 9:00-10:00 AM for 5-10 minutes over ten days in the intervention group. The results indicated that sunbathing positively impacted emotional regulation in patients at risk of violent behavior, as sunlight helps lower serum cortisol levels and influences serotonin secretion. The mechanism by which sunbathing affects emotional regulation is linked to vitamin D, which enhances serotonergic neurotransmission and regulates serotonin metabolism. Alessi et al. showed that five consecutive days of sunlight exposure for 30 minutes increased physical activity, structured sleep times, and controlled light and noise at night, leading to a significant reduction in daytime sleep duration among intervention participants compared to controls. Participants in the intervention group also reported increased social and physical activity engagement and longer sleep durations at night when exposed to bright morning light. Mishima et al. studied the effects of bright morning light exposure (5000-8000 lux on the cornea) over two weeks on rest-activity rhythm disturbances in patients with vascular dementia and Alzheimer's disease. The findings indicated a significant reduction in nocturnal activity and the percentage of nocturnal activity compared to the pre-treatment period (Figueiro, 2017). Additionally, a comprehensive review by Moon et al. highlighted that melatonin supplements improved sundown syndrome, sleep quality, and rest-activity disorders in Alzheimer's patients. Most clinical studies in this context used relatively high doses of melatonin, up to 10 mg, primarily administered at bedtime. Furthermore, melatonin supplementation ranging from 1 to 24 mg in MCI patients has been shown to enhance rest-activity rhythms and improve sleep profiles, including sleep quality, morning alertness, and sleep onset latency (Moon et al., 2022).

The lack of structured daily activities adversely affects sleep duration and quality. Maintaining physical activity is one effective strategy to enhance sleep quality. Physical activity, defined as body movement that expends energy, is crucial for physical and mental health and overall quality of life. It induces fatigue, leading to the production of DIPS (Delta Inducing Peptide Sleep) protein, which improves sleep quantity. Walking is an accessible form of physical activity for the elderly (Supriadi et al., 2023). Research by Setyarini et al. at Panti Wrdha Bandung indicated that initially, 100% of the elderly participants had poor sleep quality. Post-intervention, 90% still had poor sleep quality, while 10% reported good sleep quality. A paired sample T-Test yielded a p-value of 0.000 < α (0.05), demonstrating a significant influence of leisurely walking on the sleep quality of the elderly. The study recommended scheduling walking activities three times a week in nursing home environments to enhance sleep quality. Although leisurely walking may appear minimal, it effectively engages muscles continuously, yielding physiological benefits such as blood sugar regulation and improved sleep quality. The psychological benefits include relaxation, reduced tension and anxiety, and increased happiness, contributing to long-term physical fitness, mental health, cognitive function, and motor skills (Setyarini et al., 2020). The findings align with research by Supriadi et al., which reported significant differences in average sleep quality among elderly participants before and after walking in the intervention group (p-value = 0.001). In contrast, no significant changes were observed in the control group (p-value = 0.173). The intervention group experienced a statistically significant improvement in sleep quality after walking, with a difference of 4.1 (Supriadi et al., 2023).

Walking is classified as an aerobic exercise that can be performed continuously for at least 30 minutes daily. It is a simple, cost-effective activity that promotes joy and enthusiasm while minimizing injury risk for the elderly. Walking stimulates the pineal gland to secrete serotonin, which has a calming effect, preparing the brain and body for sleep. Melatonin production is enhanced in low-light conditions (afternoon to night), facilitating restful sleep. Additionally, the hypothalamus stimulates the pituitary gland to produce beta-endorphins, creating a relaxed and happy atmosphere conducive to sleep. In a study by Supriadi et al. (2023), walking was conducted for 20 minutes, including 5 minutes for warm-up and 5 minutes for cool-down. The recommended duration for optimal benefits is 20-30 minutes, as less than 10 minutes may not yield significant advantages. Regular walking can mitigate sleep disorders in the elderly (Supriadi et al., 2023). In conclusion, nursing interventions such as sunbathing therapy and morning walks for clients with sundown syndrome represent evidence-based practices aimed at addressing circadian rhythm disruptions related to activity and rest. These interventions help reduce afternoon and evening agitation, irritability, and improve nighttime sleep quality. Although conducted in the morning, these activities positively influence the client's circadian rhythm, promoting adequate melatonin production in the evening. Sunbathing and morning walks are complementary activities that support the medical treatment provided in the hospital. This case study has limitations, including the focus on only one patient, which precludes comparison, and the brief intervention duration of five days. Given that sundowning in MCI or dementia patients is typically a chronic condition, it is essential to provide education to the family members who serve as caregivers at home. This education should encompass nursing problems experienced by the client, condition progression, medication adherence, environmental modifications, and activities to continue at home, such as sunbathing, morning walks, and cognitive exercises like conversation and time orientation. Additionally, considering that MCI is a chronic condition that can progress to dementia, education should be extended to several family members, including the client's children, who are the primary caregivers, and other children living nearby who can serve as substitute caregivers. This strategy aims to ensure that when the primary caregiver experiences fatigue, a backup caregiver is prepared to support the client's care.

Conclusion

Based on the results of the case study, it can be concluded that patients with cognitive impairment, whether starting from Mild Cognitive Impairment (MCI) or those who have progressed to dementia, may experience sundown syndrome. Common manifestations of sundown syndrome include inability to sit still, agitation, irritability, confusion or disorientation, difficulty sleeping, and hallucinations or delusions. In addition to medical therapy, which serves as the primary treatment, complementary therapies such as sunbathing and morning walks can effectively support the reduction of sundowning symptoms. In this case study, the complementary therapy implemented was sunbathing for 15 minutes in the morning between 7:30-8:00 AM for five days, along with morning walking therapy for 15-20 minutes, adjusted according to the client's tolerance. Following the intervention, the sundowning symptom score decreased from 12 to 8. Future researchers are encouraged to conduct case studies with a larger sample size to facilitate comparisons of the effects observed. Additionally, interventions should be extended over a longer duration, and objective assessments, such as monitoring target pulse rates during morning walking activities, should be integrated to enhance the rigor of the findings.

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