Research Article

Android-Based Family Support to Improve the Quality of Sleep Patterns in the Elderly

Fery Agusman Mutoho Mendrofa[1], Umi Hani[1*], Sonhaji[1], Yoshua Irda Kurniawan[2]

[1]Universitas Karya Husada Semarang,
[2]Rumah Sakit Umum ANANDA Purwokerto

ORCID
Fery Agusman Mutoho Mendrofa: https://orcid.org/0000-0002-5407-2603

Corresponding Author: Umi Hani;
email: umi.hani.ners@gmail.com

Abstract.
Ageing is often associated with sleep disorders. This study aimed to describe the effect of using an Android application on family support in the sleep patterns of the elderly. The study used a cross-sectional survey design conducted among the elderly to assess the use of android-based applications in identifying the sleep pattern experienced and the perceived-family support. The research sample was 98 people selected by convenience sampling and snowball sampling techniques. Researchers enhanced family support through an Android app. The mean value of sleep patterns before using the app was 4.25 and after using the app was 8.35. The correlation test showed that perceived-family support had a significantly strong correlation with sleep patterns with a positive correlation (correlation coefficient 0.779, p-value 0.001; Table 5). The higher the family support perceived by the elderly, the better their sleep pattern. The study concluded that the elderly at risk of dementia often experience disturbed sleep patterns. Families play an important role in helping the improvement of elderly sleep patterns. Android applications can be a technological innovation in increasing family support for the elderly.

Keywords: android-based application, sleep patterns, family support

1. INTRODUCTION

Elderly is an aging process with increasing individual age which is characterized by a decrease in the function of body organs such as the brain, heart, liver and kidneys as well as an increase in the loss of active body tissues in the form of body muscles (1,2). The decline in the function of organs in the elderly is a result of the reduced number of body cell abilities, so that the ability of body tissues to maintain normal functions disappears, so they cannot survive infection and repair the damage suffered (3).

The world has seen an increase in the number of elderly people aged over 60 years and over around 500 million in 2018, according to WHO in 2050 it is expected to increase to 25.3%. In 2100, it will be 35.1%. The increase in the percentage of the

elderly will increase every year and the number of dependents will also increase along with the increasing number of the elderly population (4,5).

Based on the Semarang City Statistics Center Survey, in 2018 the population of the city of Semarang was around 1,240,274 people. The elderly population is around 45,103 people (3.6%). (6,7). Reported experiencing disturbances or insomnia and 7.3% of the elderly reported disturbances in initiating sleep and maintaining sleep. The prevalence of insomnia in Semarang in the elderly is relatively high, which is around 67% of the population over 65 years. It was found that insomnia was mostly experienced by women, namely 78.1% with the age of 60-74 years. This condition requires the role of the family in the form of support for the elderly who experience sleep patterns (6,8,9).

Family support is the attitude, action and acceptance of the family towards the elderly. The family also functions as a support system for its members, family members view that people who are supportive are always ready to provide assistance with assistance if needed and the family becomes an informant for the elderly while at home (10–12). The need for family support and attention lasts throughout life. The elderly who lack support are at risk of experiencing major episodes of depression, namely a melancholic picture, feeling inferior, feeling helpless, and the most threatening thing is the desire to commit suicide. Family support can be realized by giving attention, being empathetic, giving encouragement, providing advice and information (10,12).

A preliminary study in Semarang quantitatively showed that 45% of the elderly had sleep disorders, while 24% received family support. Some families seek health information to obtain health services. The preliminary survey qualitatively shows the family's efforts to overcome the disturbed sleep patterns of the elderly such as making warm water, milk, changing the night light, sunbathing in the morning and suggesting light physical activity. Some families expect the development of health services for the elderly.

Adequate health services are needed for the elderly to improve the health status and quality of life of the elderly, in living together with their families and communities. The use of technology to evaluate and improve sleep quality in elderly heals families or caregivers maintain overall health performance throughout the aging process. In addition, technology helps nurses reduce documentation time and shift it to improving the quality of direct care. In the era of society 5.0, the use of technology and informatics improve the effectiveness of nursing services, safety, and client care outcomes (13–15).

Smartphones are currently a platform that is widely used in health services. Mobile health in the elderly group can enhance care, especially in increasing sleep quality. Self-assessment with mobile phones helps families provide support for the health of the

elderly. this study evaluated android-based app, namely SILAMAS (Active, Independent, and Healthy Elderly Information System). SILAMAS is an android-based application to monitor the sleep patterns of the elderly in the family. This study has been attempted to take primary steps to help families improve the quality of sleep of the elderly. The aim of this study was to develop and validate this android-based app.

2. MATERIALS AND METHODS

2.1. Study Design

The study was a cross-sectional survey conducted among the elderly to assess the use of android-based applications in identifying the sleep disturbances experienced and the perceived family support. It was conducted between February-March 2022. Before starting the study, the entire protocol was approved by the Ethical Comitte of Universitas Karya Husada Semarang (No. 0112/KEP/UNKAHA/LPPM/XII/2021). All participants received and understood an oral and written explanation of the entire study and provided written informed consent to participate.

2.2. Participants

Since it is difficult to specify the population of elderly with sleep disturbance, we used convenience sampling and snowball sampling. The study was conducted with 98 respondents who met the inclusion criteria. Participants were selected based on inclusion criteria: (1) 60-69 years old, (2) willing to participate in research, (3) lives with other family members, (4) has android cellphone facilities. Respondents in temporary respite care and those who had recent hospitalization were excluded as they were likely to be readjusting to the nursing home setting and this may affect their sleep patterns. The director of nursing home compiled a list of eligible residents based on the criteria. Information on the capacity to give informed consent was also provided during this process. Once consent was obtained, the sleep assessment was conducted using SILAMAS. Demographic details were collected from the participant. Each participant was informed about the study nature, purpose, and benefits, the right to refuse or withdraw at any time, as well as the obtained data confidentiality.

2.3. Procedure

This study conducted in two phases: (1) development and implementationof the SILA-MAS app, (2) analysis of the correlation between the SILAMAS app with the respondents' sleep disturbance and their perceived-family support.

Phase One: Implementing the SILAMAS App

To implement the SILAMAS as an Android app, we used the qualitative exploratory method of focus group interactions [25]. The focus group consisted of an app developers and 2 expert lecturers specializing in elderly nursing care. The investigators in this study directed communications within the focus group; the expert lecturers specializing in elderly nursing care composed app scenarios, and the app developers used the Android Studio to produce a pilot file based on these scenarios. Elderly experts discussed scenario visualization, content application on a page and score expression as an evaluative result. Based on this scenario, the app development specialists used a programming language (Java) to construct the app. Next, the whole group participated in a process of qualitative communication to finalize the function and design of the app from the users' perspective. Finally, an app administration website was created for data management.

2.3.1. SILAMAS

The SILAMAS app is an application that monitors the health of the elderly (elderly) in the city of Semarang. This application is intended to monitor family support related to daily activities and increase cognitive abilities of the elderly.

Some of the features in SILAMAS are elderly health information, information on elderly activities in Semarang, data collection on the elderly, family data collection for elderly companions, assessment of elderly sleep patterns, access to telegrams, DASS test for the elderly, check on elderly activities, check risk of falls, check depression for the elderly, check elderly cognitive, elderly mental status checks, elderly memory checks, elderly nutrition checks, and links to the Alzaimer Indonesia website, Semarang City Health Office, and Semarang City Government.

At this early stage, the SILAMAS application is an application that is integrated with the telegram application for two-way communication media. In the next development stage, SILAMAS is planned to have other features that are more complete in relation to monitoring and evaluating elderly health programs in Semarang City. Users who can

access the SILAMAS application include nurses, community health workers, the elderly, and elderly families.

SILAMAS aims as a tool for monitoring the health of the elderly in the community which includes biological, psychological, social, cultural, emotional, and spiritual aspects; as a means of communication with the elderly accompanying families; and the gradual implementation of the needs of elderly health promotion in the community.

2.3.2. Phase Two

The day before giving the family about SILAMAS as an instrument, the respondents' sleep duration was observed using a table that contains the hours of sleep during the morning, afternoon, and night. The family member of elderly were also explained about the android-based application using a guideline book. Assistance in the management of sleep disorders in the elderly by the family is carried out in one week (7 days). Respondents' sleep disturbance were then observed the day after using application ii as a tool in the care of the elderly.

2.4. Instruments

Respondents' health was monitored by SILAMAS as an android-based application to measure the family support and sleep disturbance. Respondents' sleep disturbance was measured through the recapitulation of respondents' sleep duration that is observed using a table that contains the hours of sleep during the morning, afternoon and night. The family support observed through some questions in the application.

2.5. Analysis

All analyses were computed using IBM SPSS Version 23. The demographic characteristics of the respondents are reported as numbers and percentage distributions. Data analysis using Chi-Square test.

3. RESULTS

3.1. General Characteristics of Participants

Tabel 1 menunjukkan general characteristics of the focus group.

Table 1: General characteristics of respondents (n=3).

Characteristics	Value
Focus group	
Sex, n (%) Male Female Age (years), mean (SD) 30 – 40 41 – 50 51 – 60 Area of expertise, n (%) App development Elderly nursing care	2 1 41,7 (9.63) 2 (67) 0 (0) 1 (33) 1 (33) 2 (67)
Elderly	
Sex, n (%) Male Female Age (years) n (%) 60 – 64 65 – 69 Marital status n (%) Menikah hidup Janda/duda	56 (57) 42 (43) 47 (48) 51 (50) 35 (36) 63 (64)

The average sleep pattern before using the application in the elderly with family support is 4.25 hours with a standard deviation of 0.910 (3 ± 6 hours). In the measurement after using the application, the average sleep pattern was 8.35 hours with a standard deviation of 0.988 (6 ± 9 hours). It can be seen that the difference in elderly sleep patterns before and after using the application is increased by 4.10 hours with a standard deviation of 0.078 (table 1). There is an effect of using android-based applications in increasing family support on the sleep patterns of the elderly (p value <0.05).

Table 2: Self-report assessment of sleep disturbance and perceived-family support.

		before	after
sleep pattern	mean	4.25	8.35
	standard deviation	0.910	0.988
	min	3	6
	max	6	9
perceived-family support	mean	5.771	9.4
	standard deviation	0.630	0.861

Table 3. Correlation between perceived-family support and sleep pattern

			perceived-family support	sleep pattern
Spearman's rho	perceived-family support	Correlation Coefficient	1.000	.779**
		Sig. (2-tailed)	.	.000
		N	142	142
	sleep pattern	Correlation Coefficient	.779**	1.000
		Sig. (2-tailed)	.000	.
		N	142	142

**. Correlation is significant at the 0.01 level (2-tailed).

The Spearmen Rank Correlation Test analyzing the correlation of perceived-family support with sleep pattern of elderly showed that perceived-family support had a significantly strong correlation with sleep pattern with a positive correlation (correlation

coefficient 0.779, p-value 0.001; Table 5). The higher the family support perceived by the elderly, the better the sleep pattern.
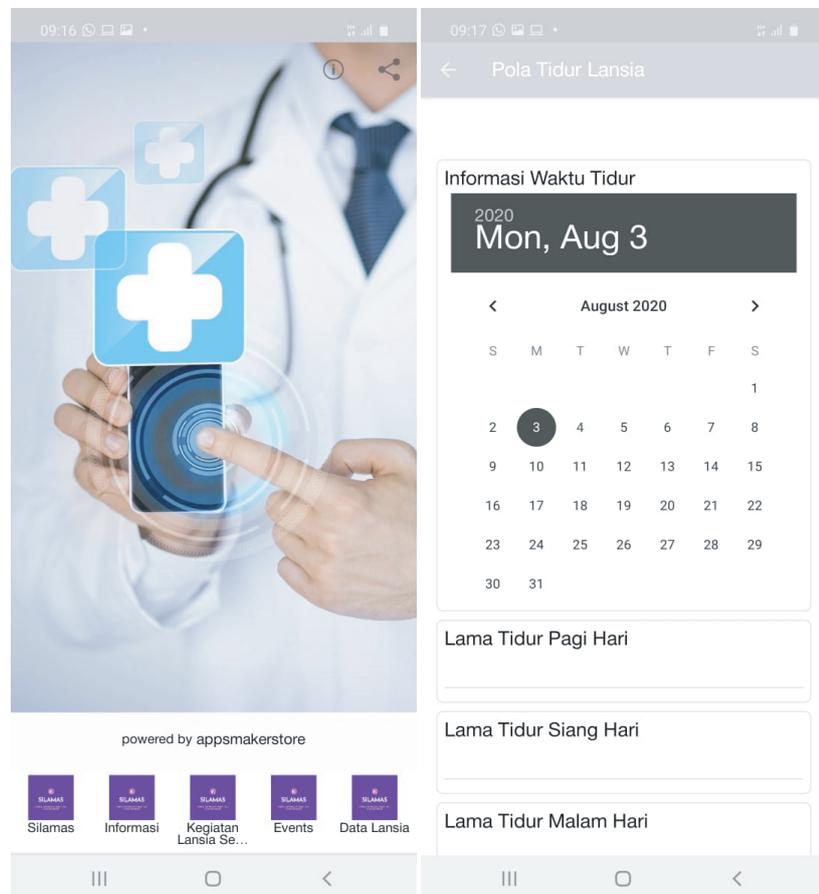

Figure 1: Sleep pattern measurement using android-based application.

4. DISCUSSION

4.1. Sleep disturbance in elderly

Old age causes various health problems, both mental and physical (16). Along with many of the physiological changes seen with aging, significant changes also occur in sleep and circadian rhythms (23). Sleep disturbance is a health problem that is often experienced by the elderly (17). Statistics related to sleep disorders say that 30% - 48% of the elderly experience insomnia (18). The prevalence of insomnia occurs more in the elderly than the young (19). Insomnia is characterized by the inability to initiate sleep, maintain sleep, wake up too early or sleep that is not refreshing. Insomnia in the elderly
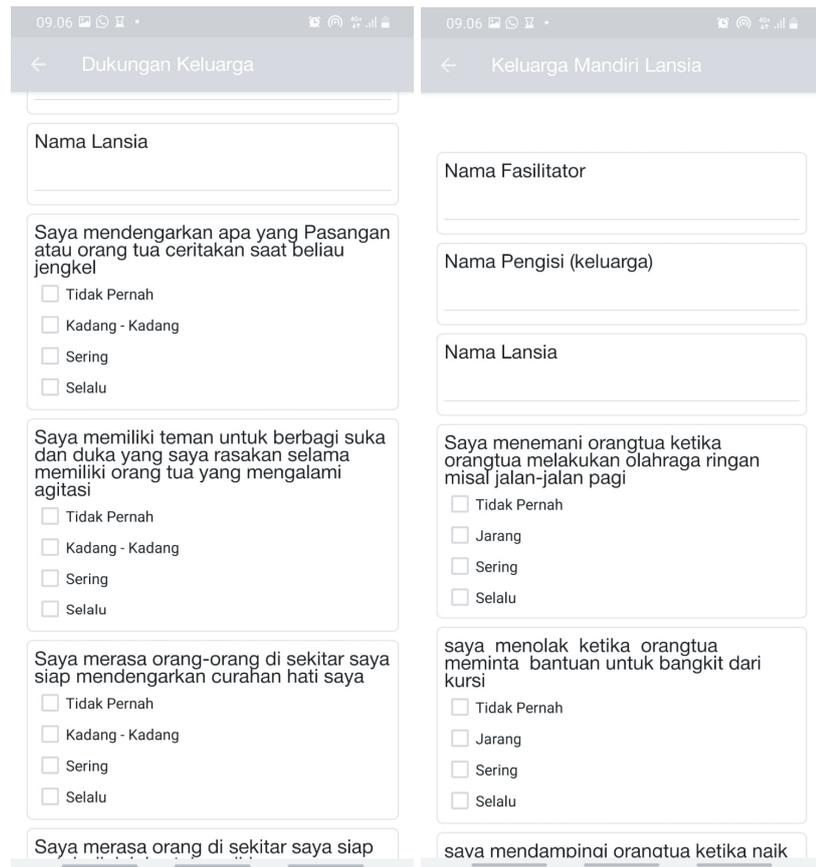
Figure 2: Family support measurement using android-based application.

often occurs as a result of mental problems, respiratory symptoms, physical disability, and fair to poor perceived health (18,20).

Complaints experienced by the elderly regarding the quality and satisfaction with sleep. Sleep problems in the elderly are often caused by depression related to social support felt by the elderly, illnesses suffered, joint stiffness, and knee pain (16). Sleep is a basic need that needs to be met and has an impact on cognitive function. A night's sleep of six to seven hours and naps of less than 30 minutes are associated with optimal cognitive function in middle-aged and older people (21). The National Sleep Foundation recommends 7-8 hours of sleep per day for people 65 years of age or older. This is supported by various studies which state that sleeping 6-9 hours has an impact on good mental, physical and cognitive health and a better quality of life compared to the elderly who have shorter sleep hours (21,22). Therefore, treatment is needed to improve sleep quality, especially for the elderly.

4.2. Family support for elderly

Old age provides changes not only in physical condition, but also mentally. Often, the elderly feel the perception of being ignored which has an impact on health. Therefore, the family or caregiver has an important role in maintaining the health of the elderly in the family sphere. Positive life situations lead to more positive self-perceptions about aging (23–25).

In contrast, older adults with family dysfunction have more negative self-perceptions about aging. The family is the most basic social unit, so it is closely related to the lives and health of parents and provides their main spiritual and psychological support (23). Elderly who receive appropriate care and support will be able to negotiate the aging process and be able to maintain physical and mental health by developing a positive self-perception of aging. Resilience and hope may play important roles for people with dementia and their care partners during difficult times, such as a pandemi (26). This has an impact on the quality of life of the elderly to be able to enjoy life in old age.

Several studies have confirmed that the elderly who live with their families and are in frequent contact with them perceive aging more positively (23). Therefore, it is recommended that the elderly do not live alone but interact more with their children. Meanwhile, public health workers need to seek emotional comfort and support for the elderly to promote positive management of aging and improve their quality. The caregiver's attitude has an impact on the condition of the elderly, showing the importance of family support in caring for the elderly. In this case, families need to be strengthened on the importance of environmental modification, one of which is in handling disorders tidur (29).

The form of support from family members can be in the form of helping to modify the environment to support the improvement of the sleep quality of the elderly. Support from family is the most important element in helping individuals solve problems. If there is support, self-confidence will increase and motivation to deal with problems that occur will increase (27).

The family is the main actor in determining the behavior of sick members. In this case, the family must also play an active role in supporting sleep patterns in the elderly. Family support will be increasingly needed when someone experiences difficult problems and is sick, this is where the role of family members is needed to go through difficult times quickly (28).

4.3. Android-based health care for elderly

Currently, various technological developments are carried out in health services to facilitate access and procedures for health services for the community. In this case, Electronic Health is an alternative that is starting to be used. Digital health services have been widely used along with the need for fast and precise services. Some of the existing digital services include health consultation services via online video, emergency alarms with critical medical conditions or accidents; upload medical reports with necessary safety measures during consultations, online medical prescriptions, appointment scheduling, information about the nearest hospital and medical, medication monitoring system, etc. It is designed with the aim of facilitating faster and more efficient communication between healthcare professionals and patients providing transparency of their location or distance when using the app (29,30).

For the elderly group, the use of digital technology in health services helps families or caregivers in health care. Treatment of the elderly group requires continuous monitoring of the patient's condition. Currently, self-assessment plays an important role in care decision making. One of them is in the management of sleep disorders by involving the family, so self-assessment can be an alternative for nurses to assist the development of clients. Currently, monitoring the client's condition has evolved from paper-based to computer-based. Along with the development of technology, various developments are also carried out to obtain a more efficient way according to social realities, and can provide easier access and faster feedback to elderly clients (31).

Currently, various Android-based health service applications have been developed to assist health care in various populations. Although the elderly population may have limitations in the use of technology, various benefits are obtained by using technology for the elderly, such as various access to information, convenience, and decreased social isolation. However, the use of technology for the elderly aged 65 years and over is influenced by the surrounding social groups, family, or caregiver (31).

5. CONCLUSION

Older people are often faced with sleep problems. Family support by utilizing android-based applications affects the sleep patterns complained of by the elderly. This study uses an application that was developed, namely SILAMAS so that it can be a recommendation for health services in the community, especially for families with the elderly.

The SILAMAS application is effectively used in the elderly with sleep pattern problems and can be carried out by health workers involving support from the family.

Acknowledgments

References

[1] Mendrofa FA, Iswanti DI, Hani U. Efficacy of Brain Gym on the Cognitive Function Improvement of People with Dementia. J Keperawatan Jiwa. 2020;8(4):557.

[2] Mendrofa FA, Hani U, Putri AA, Aeni M. Natural light therapy to lower agitation and sleep disturbance of dementia patients in semarang. Int J Psychosoc Rehabil. 2020;24(7):7752–9.

[3] Lee R, Wong J, Lit Shoon W, Gandhi M, Lei F. EH K, et al. Art therapy for the prevention of cognitive decline. Arts Psychother [Internet]. 2019;64:20–5. Available from: https://www.sciencedirect.com/science/article/pii/S0197455618300741

[4] Ministry of Health RI. Hasil Utama Riskesdas 2018. 2018;

[5] Badan Pusat Statistik. Statistik Penduduk Lanjut Usia di Indonesia 2019. Stat Pendud Lanjut Usia di Indones 2019.

[6] BPS KS. Profil lansia Kota Semarang 2020. Badan Pus Stat Kota Semarang [Internet]. 2021;30. Available from: https://rb.gy/bfpu

[7] Semarang BK. Profil Lansia Kota Semarang. Bps. 2018.

[8] Retnanigsih D. R. Apriana M. Pengaruh Senam Lansia Terhadap Skala Insomnia Pada Lansia Di Panti Wredha Harapan Ibu Ngaliyan Kota Semarang D. J Kesehat; 2019. pp. 52–60.

[9] Wungouw H, Hamel RS, Studi P, Keperawatan I, Kedokteran F, Sam U, et al. Pengaruh Terapi Rendam Air Hangat Pada Kaki Terhadap Insomnia Pada Lansia Di Kelurahan Angges Kecamatan Tahuna Barat. J Keperawatan. 2018;6(2).

[10] Mamom J, Daovisan H. Listening to Caregivers' Voices: The Informal Family Caregiver Burden of Caring for Chronically Ill Bedridden Elderly Patients. Int J Environ Res Public Health. 2022 Jan;19(1):567.

[11] Kazemian S, Zarei N, Esmaeily M. Effect of strengthening family coping resources on emotion regulation of family caregivers of patients with schizophrenia. Evid Based Care J. 2020;10(2):7–17.

[12] Wang L, Yang L, Di X, Dai X. Family support, multidimensional health, and living satisfaction among the elderly: A case from shaanxi province, china. Int J Environ Res Public Health. 2020 Nov;17(22):1–18.

[13] Nikou S, Agahari W, Keijzer-Broers W, de Reuver M. Digital healthcare technology adoption by elderly people: A capability approach model [Internet]. Telemat Inform. 2020;53:101315. Available from: https://www.sciencedirect.com/science/article/pii/S073658531930807X

[14] Meng F, Guo X, Peng Z, Ye Q, Lai KH. Trust and elderly users' continuance intention regarding mobile health services: the contingent role of health and technology anxieties [Internet]. Inf Technol People. 2022 Jan;35(1):259–80.

[15] Meng F, Guo X, Zhang X, Peng Z, Lai KH. Examining the role of technology anxiety and health anxiety on elderly users' continuance intention for mobile health services use. In: Proceedings of the 53rd Hawaii International Conference on System Sciences. https://doi.org/10.24251/HICSS.2020.403.

[16] Papi S, Karimi Z, Amini Harooni GG, Nazarpour A, Shahry P. Determining the prevalence of sleep disorder and its predictors among elderly residents of nursing homes of Ahvaz City in 2017. Salmand Iran J Ageing. 2019;13(5):576–87.

[17] Zitser J, Allen IE, Falgàs N, Le MM, Neylan TC, Kramer JH, et al. Pittsburgh Sleep Quality Index (PSQI) responses are modulated by total sleep time and wake after sleep onset in healthy older adults [Internet]. PLoS One. 2022 Jun;17(6):e0270095. Available from: https://www.proquest.com/scholarly-journals/pittsburgh-sleep-quality-index-psqi-responses-are/docview/2687704869/se-2

[18] Patel D, Steinberg J, Patel P. Insomnia in the Elderly: A Review. J Clin sleep Med JCSM Off Publ Am Acad. Sleep Med. 2018 Jun;14(6):1017–24.

[19] Ding L, Zhang L, Cui Y, Gong Q, Ma J, Wang Y, et al. The association of sleep duration and quality with depressive symptoms in older Chinese women [Internet]. PLoS One. 2022 Mar;17(3):e0262331. Available from: https://www.proquest.com/scholarly-journals/association-sleep-duration-quality-with/docview/2639216445/se-2

[20] Garcia AD. The effect of chronic disorders on sleep in the elderly [Internet]. Clin Geriatr Med. 2008 Feb;24(1):27–38. Available from: https://www.sciencedirect.com/science/article/pii/S0749069007000730

[21] Hu M, Shu X, Feng H, Xiao LD. Sleep, inflammation and cognitive function in middle-aged and older adults: A population-based study

[Internet]. J Affect Disord. 2021 Apr;284:120–5. Available from: https://www.sciencedirect.com/science/article/pii/S0165032721001245

[22] Miner B, Kryger MH. Sleep in the Aging Population [Internet]. Sleep Med Clin. 2020 Jun;15(2):311–8. Available from: https://www.sciencedirect.com/science/article/pii/S1556407X20300278

[23] Gao F, Zhou L, Gao Y, Zhang Y, Zuo A, Zhang X. Effects of physical and mental health factors and family function on the self-perception of aging in the elderly of Chinese community [Internet]. Brain Behav. 2022 Sep;12(9):e2528. Available from: https://www.proquest.com/scholarly-journals/effects-physical-mental-health-factors-family/docview/2714903941/se-2

[24] Kaspar R, Wahl HW, Diehl M. Awareness of Age-Related Change as a Behavioral Determinant of Survival Time in Very Old Age. Front Psychol. 2021 Sep;12(September):727560.

[25] Plys E, Smith R. Profiles of Expectations Regarding Aging After Relocation to Assisted Living [Internet]. J Aging Environ. 2021;35(3):319–37.

[26] Bacsu JR, O'Connell ME, Cammer A, Ahmadi S, Berger C, Azizi M, et al. Examining the Impact of COVID-19 on People With Dementia From the Perspective of Family and Friends: Thematic Analysis of Tweets [Internet]. JMIR Aging. 2022 Jun;5(2):e38363. Available from: https://www.proquest.com/scholarly-journals/examining-impact-covid-19-on-people-with-dementia/docview/2682537596/se-2

[27] Shulman L, Krause D, Cameron M. The skills of helping individuals, families, groups and communities. 2009.

[28] Wakefield JR, Bowe M, Kellezi B, Butcher A, Groeger JA. Longitudinal associations between family identification, loneliness, depression, and sleep quality. Br J Health Psychol. 2020 Feb;25(1):1–16.

[29] Chandran PD, Adarkar S, Joshi A, Kajbaje P. Digital Medicine : An android based application for health care system. Int Res J Eng Technol [Internet]. 2017;4(4):3696. Available from: https://www.irjet.net/archives/V4/i4/IRJET-V4I4584.pdf

[30] Selvakanmani M. Android Based Health Monitoring System for Elderly People. Int J Trend Res Dev [Internet]. 2015;2(4):72–5. Available from: http://www.ijtrd.com/papers/IJTRD55.pdf

[31] Hwang HS, Choi SY. Development of an Android-Based Self-Report Assessment for Elderly Driving Risk (SAFE-DR) App: Mixed Methods Study [Internet]. JMIR Mhealth Uhealth. 2021 Jun;9(6):e25310. Available from: https://mhealth.jmir.org/2021/6/e25310