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Product Design Recommendations to Improve the Sleep Quality of Young Adults

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ABSTRACT - Sleep quality is an important aspect of young adults' well-being, impacting their physical and mental health. Many individuals aged 18 to 30 struggle to achieve the recommended 7 to 9 hours of sleep, facing challenges such as bedtime procrastination and excessive use of electronic devices before bedtime. This research, conducted in Sibu, analysed sleep patterns and contributing factors using quantitative and qualitative data. Findings indicate that many respondents, particularly students, experience poor sleep quality, often exacerbated by technology. This study aims to provide effective solutions for improving the overall sleep quality of young adults. The product will become the solution to the prevalent issue of electronic devices use before bedtime by incorporating features that limit screen time, integrating music and aromatherapy to create a soothing environment conducive for better sleep.

INTRODUCTION

Sleep is an essential aspect of our lives, allowing our bodies and minds to rejuvenate and recover. For young adults aged 18 to 30, sleep quality is particularly significant as it affects daily functioning and overall well-being. Sleep quality refers to how well and deeply one sleeps, as well as how refreshed they feel upon waking. Although the recommended sleep duration is 7 to 9 hours per night [1], many young adults struggle to achieve this due to various challenges, such as bedtime procrastination and excessive use of electronic devices before bed. These behaviors can severely disrupt sleep patterns, leading to poor sleep quality. Addressing these issues and finding effective solutions is crucial, as poor sleep quality can result in fatigue, impaired cognitive functioning, and emotional distress.

The primary aim of this study is to explore the factors contributing to poor sleep quality among young adults and to evaluate existing methods for improving sleep. Additionally, this research seeks to propose design solutions for sleep-related products that can enhance sleep quality. Specifically, the study focuses on young adults living in the Sibu area, examining factors such as bedtime procrastination, technology use, and other influences on sleep. The research objectives are as follows:

Objective 1: To identify the factors that contribute to poor sleep quality among young adults.
Objective 2: To find the existing methods to improve sleep quality of young adults.
Objective 3: To propose the design for sleep-related products that improve sleep quality of young adults.

By achieving these objectives, this study aims to offer comprehensive solutions to help young adults achieve better sleep. Moreover, improving sleep quality aligns with Sustainable Development Goal 3 on Good Health & Well-being, and designing sustainable sleep products connects to Sustainable Development Goal 12 on Responsible Consumption & Production.

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MATERIALS AND METHODOLOGY

This study adopts a mixed-methods approach, integrating both quantitative and qualitative research methods to gain a comprehensive understanding of sleep patterns among young adults, identify factors contributing to poor sleep quality, and evaluate existing methods for improving sleep. By combining quantitative data from questionnaires with qualitative insights from interviews, the study aims to provide a holistic understanding of participants' experiences and challenges.

The target population for this study is young adults aged 18-30 who experience sleep quality issues. This age group is selected because this stage of life is characterised by various transitions, including entering the workforce, pursuing higher education, and gaining greater independence [2], which can lead to emotional challenges affecting sleep quality. The research methods selected for this study include questionnaire and interview. The questionnaire includes sections designed to identify factors contributing to poor sleep quality among young adults and to analyse the effectiveness of existing methods for improving sleep quality. Participants has been given three weeks to complete and return the questionnaires. This instrument was providing numerical data for statistical analysis, addressing the quantitative aspects of the research objectives. Semi-structured interviews have been conducted to collect qualitative data that complements the quantitative findings from the questionnaire. Semi-structured interviews conducted with a subset of questionnaire for respondents who met the study criteria and each interview will last around 20-40 minutes. The interview aims to identify the factors contributing to poor sleep quality among young adults and the effectiveness of current methods for improving sleep quality to propose designs for sleep-related products aimed at enhancing sleep quality.

By combining questionnaires and interviews, this research aims to gather comprehensive data addressing each research objective from both quantitative and qualitative perspectives, offering a deeper understanding of factors affecting sleep quality and insights for designing improved sleep-related products. The target population for this study consists of young adults experiencing sleep quality issues. A purposive sampling technique was employed, selecting participants based on criteria aligned with the research objectives. Recruitment occur through universities, social media platforms and other relevant networks. The sample size was determined to ensure data saturation and the availability of resources for thorough analysis.

Data from the questionnaires analysed using descriptive statistics to summarise sleep patterns, sleep quality ratings and other numerical variables. Inferential statistics, such as correlation analysis to explore relationships between variables. Statistical software like IBM SPSS have been used for this analysis. Interview data have been analysed using thematic analysis. Transcriptions of interviews are being coded to identify recurring themes and patterns related to sleep challenges, coping strategies and experiences with sleep-related interventions. The integration of quantitative and qualitative data provide a comprehensive understanding of sleep experiences among young adults. The findings from both data types were compared and triangulated to enhance the validity and reliability of the study.

RESULTS AND DISCUSSION

The study aimed to investigate sleep quality among young adults in Sibu, focusing on various factors including bedtime habits, electronic device usage, and methods used to improve sleep quality. Data was collected from 42 respondents aged 18 to 30 through surveys and interviews. The analysis provides insights into their sleep patterns and practices, revealing significant trends and issues affecting sleep quality.
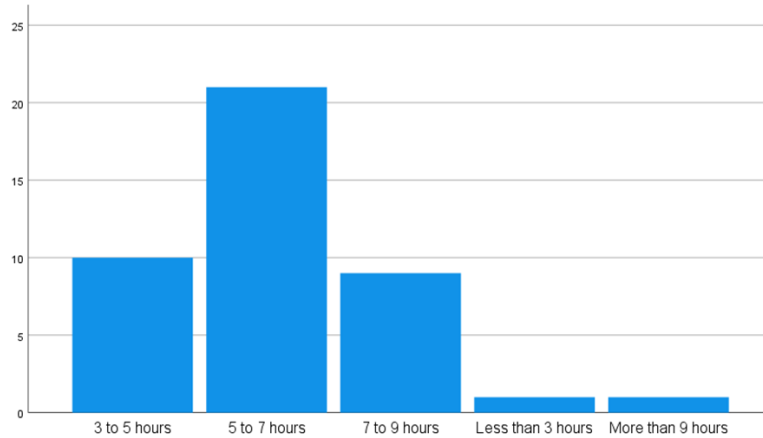
Figure 1. Graph on young adults hours of sleep per day.

According to Figure 1, majority of respondents (21 out of 42) reported sleeping between 5 to 7 hours per day, with 10 individuals sleeping between 3 to 5 hours, indicating a prevalence of insufficient sleep. Notably, only one respondent reported sleeping less than 3 hours, suggesting severe sleep deprivation in a minority of participant.

Chronotype, which refers to an individual's natural preference for morning or evening activity plays a significant role in sleep quality. Chronotypes are typically categorised into morning types (larks), intermediate types and evening types (owls). Research indicates that evening types often experience poorer sleep quality and higher levels of sleep-related issues compared to morning types [3]. This is attributed to a misalignment between circadian rhythms and daily schedules, resulting in sleep insufficiency and cognitive impairments [3]. Therefore, understanding one's chronotype is crucial for predicting and enhancing sleep quality.

Bedtime procrastination, the delay in going to bed despite having no external reasons, is a prevalent issue among young adults [3]. Key factors influencing bedtime procrastination include future time perspective and self-control. Individuals with a strong future time perspective and higher self-control are less likely to procrastinate and more likely to prioritise sleep [3]. Addressing bedtime procrastination is essential, as it is associated with sleep deprivation, daytime fatigue and mental health issues.
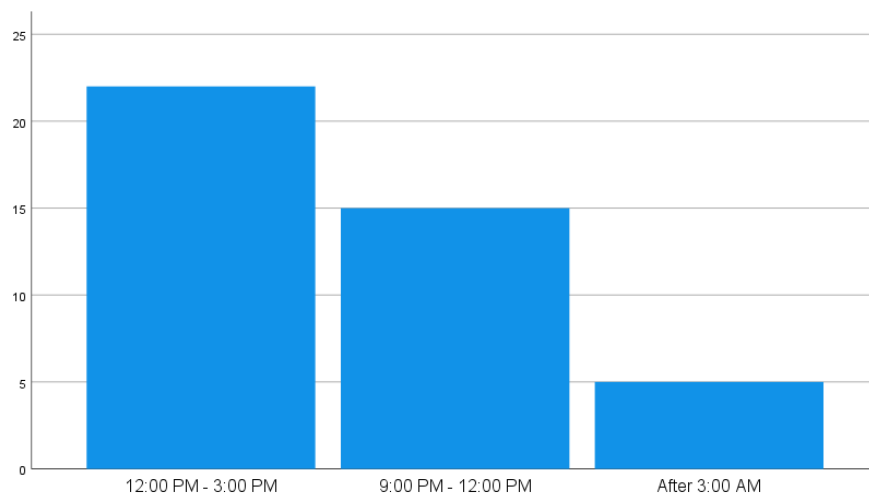

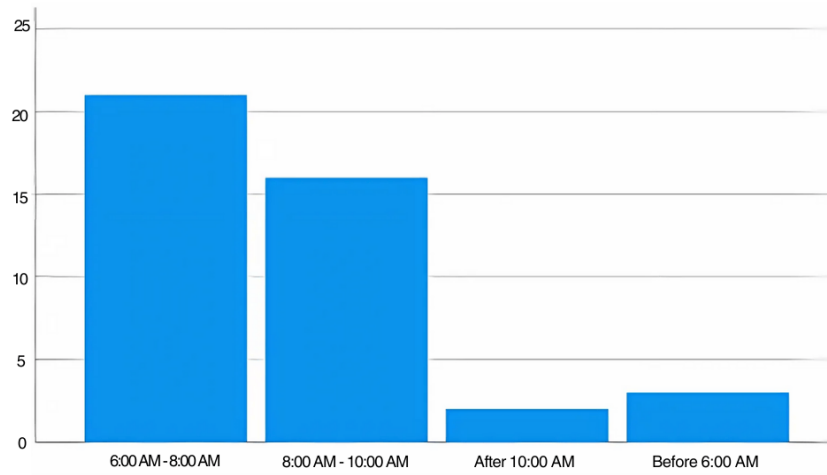**Figure 2.** Graph of young adults bedtime.

Figure 3. Graph of young adults wake up time.

Based on Figure 2 the respondent's bedtime were predominantly late, with 22 respondents going to bed between 12:00 AM and 3:00 AM. This is coupled with early wake-up times for most (refer to Figure 3), as 21 individuals wake up between 6:00 AM and 8:00 AM. This mismatch between late bedtimes and early wake up times may contribute to reduced sleep quality. Poor sleep quality often leads to sleep deprivation and excessive daytime sleepiness, both of which are common among young adults. Sleep deprivation defined as insufficient sleep duration, negatively affects physical and mental health with over 60% of young adults experiencing moderate to severe deprivation [4]. Daytime sleepiness, even with adequate nighttime sleep can impair daily functioning and cognitive performance. Managing sleep quality effectively is crucial for mitigating these adverse effects.
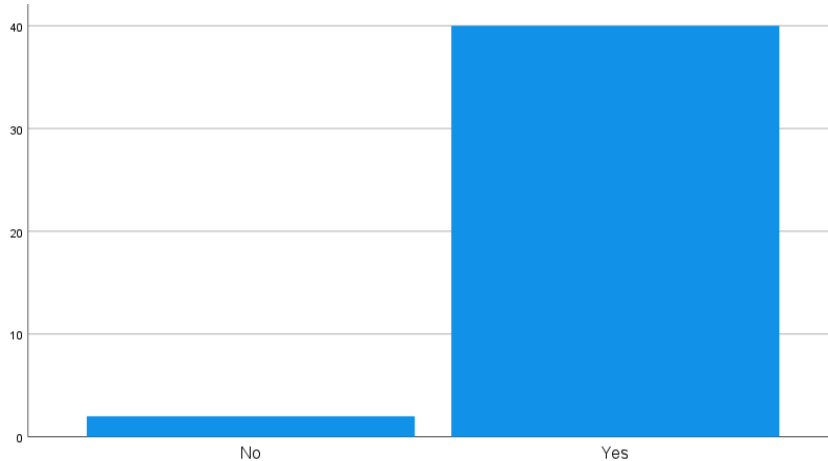

Figure 4. Graph on young adults habit of using electronic devices before bedtime.
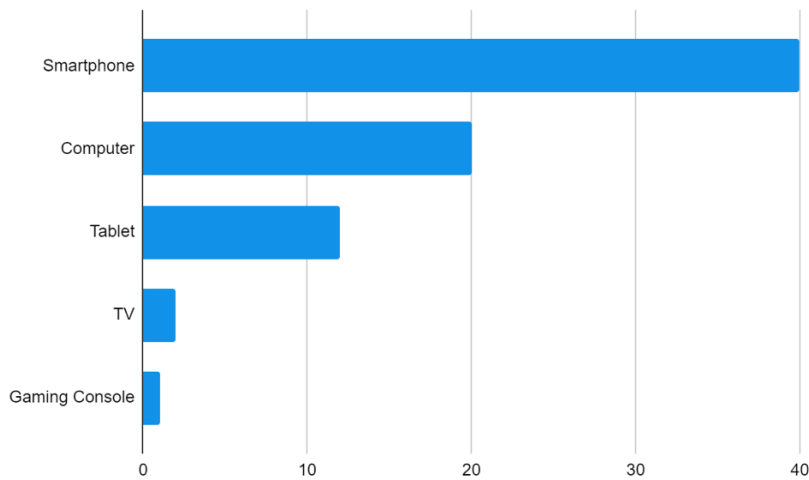
Figure 5. Graph on type of electronic devices used by the young adults.

Based on Figure 4, substantial number of respondents 40 out of 42 admitted using electronic devices before bedtime. This extensive use of devices contributes to bedtime procrastination, as many individuals find it difficult to disconnect. According to Figure 5, the most commonly used devices were smartphones (40 users) followed by computers (20 users) and tablets (12 users).
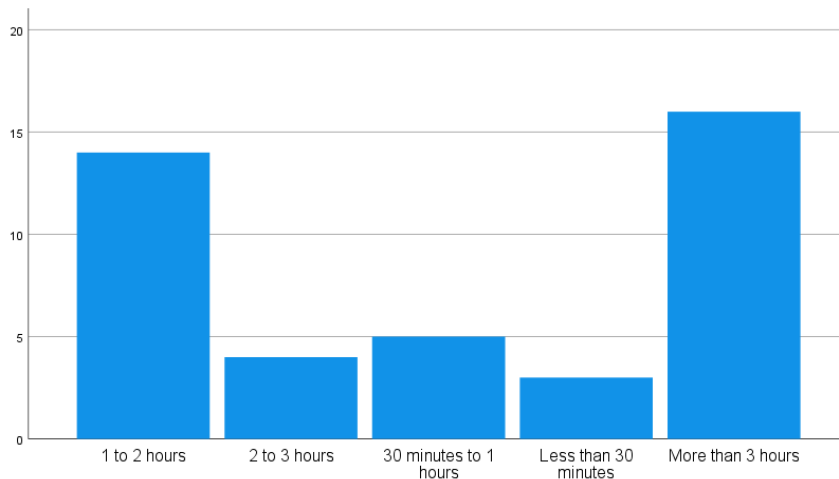

Figure 6. Graph on hours spend by young adults on electronic devices before bedtime.

According to Figure 6, majority (16 people) spent more than 3 hours on electronic devices before sleep. The predominant reasons for device usage included entertainment and social media engagement. Several factors contribute to poor sleep quality in young adults such as influence of technologies. These factors including smartphone usage, social media addiction, internet gaming, and blue light exposure. Excessive smartphone and social media use before bedtime can delay sleep onset and disrupt sleep patterns [4]. Internet gaming, especially late at night, can also negatively impact sleep by delaying sleep onset and reducing sleep duration [5]. Additionally, blue light exposure from screens suppresses melatonin production, disrupting the sleep-wake cycle and making it harder to fall asleep [6].
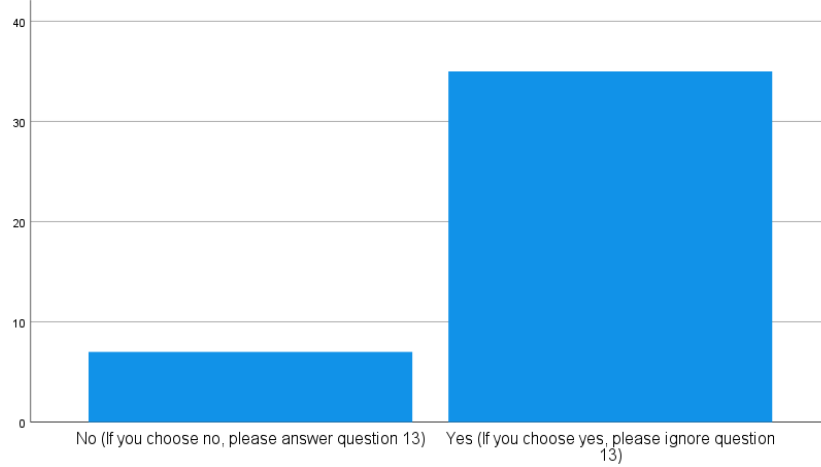
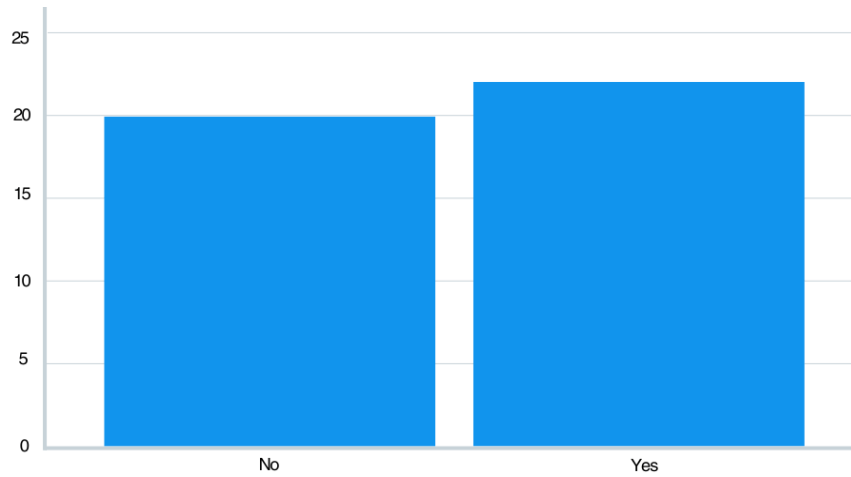**Figure 7.** Graph on young adults taking action to improve sleep quality.

Figure 8. Graph on young adults using music therapy to improve sleep quality.
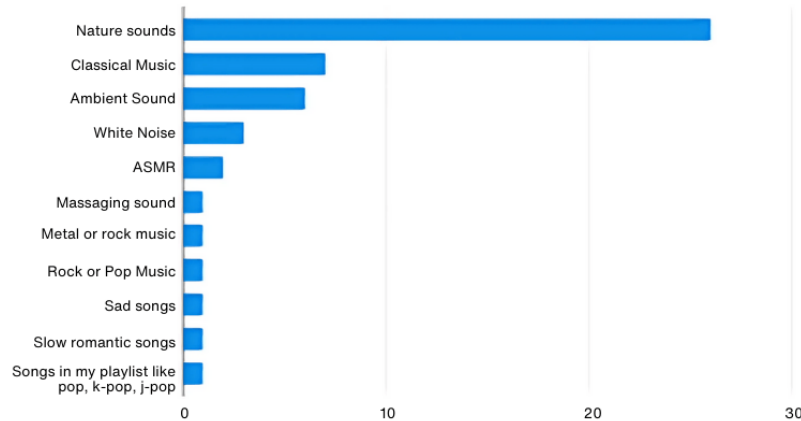

Figure 9. Graph on preferred type of music for music therapy.

In terms of interventions, 35 respondents (refer to Figure 7) reported actively taking measures to improve their sleep quality. Music therapy which has been shown to extend sleep duration and enhance sleep efficiency by reducing stress and anxiety [7] was tried by 22 individuals, with nature sounds (refer to Figure 9) being the most preferred type.
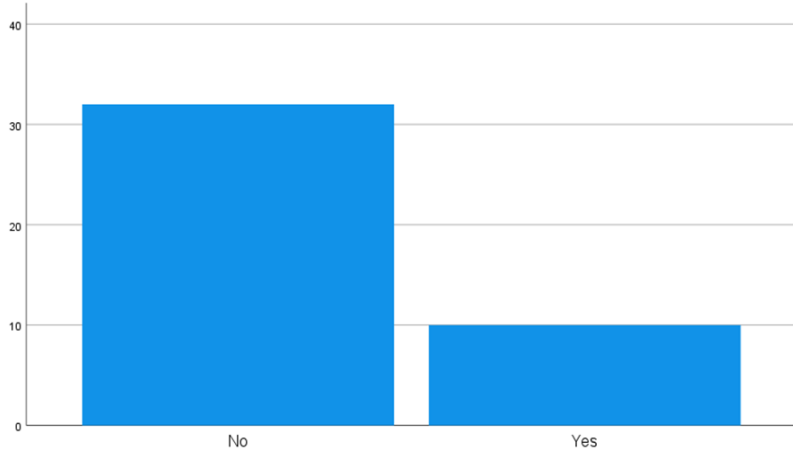

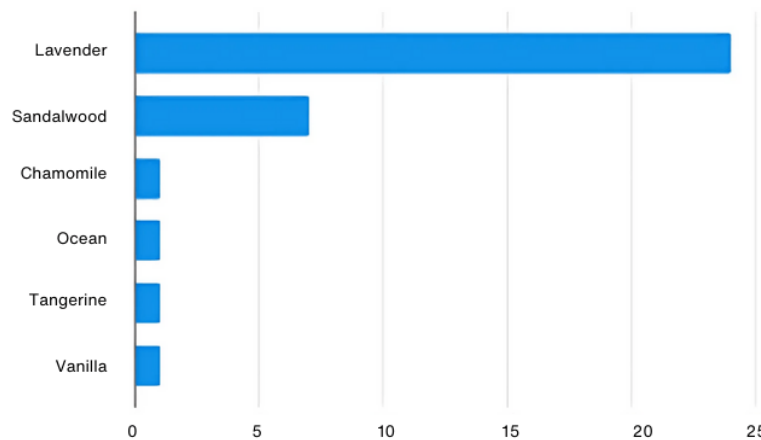**Figure 10.** Graph on using aromatherapy to help improve sleep quality.

Figure 11. Graph on preferred type of scent fo aromatherapy.

Based on Figure 10, aromatherapy was less commonly used with only 10 individuals having tried it and lavender (refer to Figure 11) was the most favored scent among those who did. The use of smart pillows and sleep tracking apps was minimal, with only 9 and 13 respondents respectively having utilised these methods.

Interpretation of Results

The results highlight significant issues impacting sleep quality among young adults in Sibu. The data indicates that insufficient sleep is prevalent, with a substantial portion of respondents sleeping less than the recommended 7 hours per night. Late bedtimes and the extensive use of electronic devices before sleep appear to be key contributors to poor sleep quality. The high prevalence of smartphone usage before

bedtime coupled with prolonged exposure to screens, underscores the need for effective interventions to mitigate these practices.

Impact of Electronic Devices

The findings suggest that the excessive use of electronic devices, particularly smartphones before sleep is a critical factor influencing sleep quality. This aligns with existing literature that links pre-sleep screen time with delayed sleep onset and poorer sleep quality. The extensive time spent on devices may contribute to sleep disturbances and decreased overall sleep duration. This highlights the necessity for interventions that encourage reduced screen time before bed.

Effectiveness of Sleep Improvement Methods

While a majority of respondents are actively seeking to improve their sleep quality, the effectiveness of various methods varies. Music therapy, especially involving nature sounds, shows promise in enhancing sleep quality. However, aromatherapy remains underutilised despite its potential benefits. The low adoption rates of smart pillows and sleep tracking apps suggest that these technologies may not yet be widely accepted or accessible to all respondents.

Design Recommendations

Based on the study's findings, several design recommendations emerge for improving sleep quality among young adults. The product should address the widespread issue of electronic device use before bedtime, which contributes to bedtime procrastination, by incorporating features that reduce screen time, such as reminders to disconnect. As many respondents indicated that music therapy and aromatherapy helped improve their sleep quality, music therapy can enhance sleep duration and efficiency by reducing stress and anxiety [7]. At the same time, aromatherapy, particularly with lavender essential oil promotes relaxation and further improves sleep quality [8]. Therefore, integrating both methods could effectively enhance overall sleep quality. The design should also focus on simplicity and user-friendliness to ensure widespread adoption.

CONCLUSION

Improving sleep quality among young adults can be achieved through various methods and technologies. Music therapy has been shown to extend sleep duration and enhance sleep efficiency by reducing stress and anxiety [7]. Sleep apps with white noise can mask disruptive sounds and promote better sleep routines [8]. Aromatherapy, particularly with lavender essential oil, has been found to improve sleep quality by promoting relaxation and reducing anxiety [9]. AI-powered wearables offer personalised sleep insights and recommendations, making sleep monitoring more accessible and affordable [10].

The significance of this research lies in its potential to improve sleep quality for young adults, thereby enhancing their overall well-being. By identifying key factors that contribute to poor sleep quality and evaluating effective methods to improve it, this study aims to design products that can offer practical solutions. This approach supports both Sustainable Development Goal 3 and Sustainable Development Goal 12, promoting healthier lifestyles and responsible production practices.

In summary, this research investigates the sleep quality of young adults by identifying contributing factors, assessing existing improvement methods and proposing designs for sleep-related products. The ultimate goal are to enhance sleep quality, support healthier sleep patterns and contribute to the overall well-being of young adults while also promoting sustainable and responsible production practices.

In conclusion, this paper reveals significant patterns in sleep quality among young adults, with electronic device usage and late bedtimes being prominent factors. Effective design interventions that address these issues and incorporate relaxation techniques like music and aromatherapy can potentially

enhance sleep quality. This approach was not only supports improved well-being but also aligns with sustainable practices in product design.

ACKNOWLEDGEMENT

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