

Impacts of Late-Night Phone and Video Calling on Sleep Quality and Technological Barriers

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Abstract. This study analyzed the impacts of nighttime phone and video calling on sleep behaviors using survey data from 193 Indonesian consumers. Descriptive findings revealed prevalent engagement in late-night calls with family and friends, frequently till midnight or beyond. Over 50% of respondents reported sleep disturbances like insomnia. Technological problems encountered also included connectivity issues, overheating, and ambient noise. Qualitative insights highlighted desires for lower battery consumption, automatic shut-offs after inactivity, and built-in do-not-disturb features. While exploratory, results indicate potential circadian disruption and platform design issues that can negatively impact sleep quality and daily functioning. Targeted education for aware technology usage and human-centered interface improvements focused on well-being may help mitigate emergent risks of 24/7 social availability expectations enabled via mobile devices.

Keywords: Sleep call, sleep, sleep disorder, communication, technology, phone calls, video calls

1. Introduction

Every living organization, including humans, needs several principal necessities, one of them being adequate sleep. Adequate sleep is vital for the body as it will regenerate cells and as a medium for the body to rest after a long day doing lots of activities. A good quality of sleep can benefit the human body by improving our thinking ability, being more vigilant, sustaining attention, and consolidating memories. Good sleep also helps the body process emotional events and better cope with stress. Lack of sleep or sleep deprivation can make humans more sensitive to negative stimulation. Not only that, but good sleep also impacts metabolic and hormonal balance as it affects appetite, blood sugar level, immune system, and hormonal regulation, which, if sleep deprivation occurs, can increase the possibility of obesity, diabetes, cardiovascular, and infection. Adequate sleep also protects the brain from neurodegenerative disease and dementia and boosts or increases the growth of new brain cells and connections (Worley, 2018).

Another essential need for social beings is communication with others. Communication is considered vital because information is shared among those who participate in the conversation. This information can be thoughts, feelings, opinions, and facts. With proper communication, individuals or groups can reach or meet specific needs and goals and express themselves despite many differences, including context, situation, language, symbols, and many others (Durga & Mehrotra, 2022).

Communication can be done in many ways, the conservative way is to deliver the information directly to the individual or group. As time progresses, many ways or forms can be used to communicate with others, one of them is by calling or making a video call using specific tools or devices to communicate with the other half to talk or discuss something. These changes are made because humans are widely known as social beings. Communication is becoming important nowadays because it enables the individual or group to have real-time and un-delayed connectivity, creating communication possibilities that maintain social bonds. Using specific tools or devices like mobile phones enables individuals or groups to have online and mobile connectivity, which can expand social networks and professional purposes among them (Zarhin, 2023).

In this digital era, technologies have become essential for human beings. Technologies make every process easier and faster. Overall, the presence of technology can enhance the quality of human life. However, sometimes there are some downsides to technology, such as it can affect human behavior by making people more individualist and relying too much on technology in daily activities. With the presence of technology, sleeping behavior is also affected. Technology can reduce sleep quality, leading to health problems such as obesity, cardiovascular disease, and many other health problems (Manickavasagam, 2021).

This preliminary research aims to understand the relationship between sleep quality and communication activity, especially phone and video call activity, and its possible impact and implications in the technological aspect. This preliminary research will be done using data from respondents from Indonesia with no special requirements. Various segments can contribute to this preliminary research, as the criteria are people who sleep late at night and have a phone or video call conversation.

2. Literature Review

2.1. Sleep

Sleep is essential for almost every living creature, including human beings. Sleep can be defined as a psychological process needed for all body parts; one of them is brain function, which controls mood, memory, feeling, and consciousness (Kanda et al., 2016). At first, sleep was only seen as an activity to ease fatigue or, in short, an activity that aims to rest, but it is not that simple; sleep is essential and complex because it brings many benefits to the body as well as its lousy effect from lack of sleep.

Sleep is caused by brain activity (neurophysiological process) that reflects on the cerebral cortex.

To understand sleep stages, neurophysiological features need to be understood as they are the key to it. In sleep, there are several stages, which encompass Slow Wave Sleep (SWS) or Non-Rapid Eye Movement (NREM) that use slow wave activity, and the other stage is Rapid Eye Movement (REM). REM can be identified by low voltage, rapid electroencephalography (EEG), low level of electromyogram (EMG), high activity of electrooculogram (EOG), and phasic events. EEG is a technique or tool used to measure the brain's electrical activity. This measurement uses electrodes attached to the scalp, EEG can give information on sleep stages. EEG can also reveal information about the rhythmic activity of cortical neurons during sleep and wakefulness stages. EMG is a technique to measure muscle activity, usually used for monitoring sleep stages, which aims to detect muscular atonia during REM stages. In contrast, muscle atonia itself is a state of muscle paralysis that prevents the body from reacting to dreams that happen during REM stages. EOG can be defined as a technique that is used to measure or monitor the occurrence of eye movement in REM stages, which is commonly associated with dreams and brain activation (Kanda et al., 2016).

Most people already understand that sleep is essential, not just to ease fatigue by resting the body through a proper and adequate amount of sleep, but it is more than that. Sleep is used for energy conservation and allocation purposes, which means it can reduce energy consumption needed in some parts of the body and allocate it to different biological processes. Another purpose of sleep is to recover and repair damaged cells, which can be caused by metabolic processes, oxidative stress, and the circadian clock during the wakefulness stage. To preserve learning, memory, and cognition for every human being, neural network reorganization needs to be obtained through sleep because it can affect brain plasticity, synaptic homeostasis, and network pruning. Having a good quality of sleep can enhance the chance of removal of toxic metabolites from the brain, which can be one of the causes of neurodegenerative diseases; it can also stimulate the immune system along with inflammatory responses that are beneficial as a defensive mechanism towards chronic diseases and infection. High blood pressure, heart rate, and sympathetic activity in NREM stages can be reduced through proper sleep and eventually can improve cardiovascular health (Barone & Krieger, 2015). Not to mention mood, emotion, cognitive function, physical health, and performance can also be maintained by having a good quality of sleep.

Good quality of sleep means getting enough sleep. The appropriate sleep amount depends on several factors, mainly age (Rao et al., 2021). Different age stages require different amounts of sleep. Details about the relation between sleep amount and age can be found in Table 1 (Hirshkowitz et al., 2015).

Table 1. Age and Sleep Duration Comparison

Age Category	Age Range	Sleep Duration (Each Day)
Newborns	0-3 months	14-17 hours
Infants	4-11 months	12-15 hours
Toddlers	1-2 years	11-14 hours
Preschoolers	3-5 years	10-13 hours
School-age children	6-13 years	9-11 hours
Teenagers	14-17 years	8-10 hours
Young adults	18-25 years	7-9 hours
Adults	26-64 years	7-9 hours
Older adults	>65 years	7-9 hours

2.2. Communication

Human beings are often called social creatures, meaning they need other people in their daily lives. Social interaction is considered vital in their daily life, by social interaction. One thing that is key in this matter is communicating with each other. Communication can be defined as a process of social interaction because, in its process, various information and ideas are exchanged. These exchanges happen between individuals consisting of at least two persons or groups. In exchanging information in the communication process, several things are included, for instance, language, common signs, and standard rules applied in society. Communication is also called a forum because many people can participate by sharing their thoughts, opinions, feelings, and experiences with others. In a forum, usually, persuasion and negotiation can also happen. For communication to be formed, many factors and conditions can influence it, namely culture, norms, values, power, media, and other things that are also part of the subject of sociological study (Tasruddin & AB, 2022).

Appropriate communication is essential to be done. It is more complex than talking to the respective person because poor communication can lead to many downsides, the most common being miscommunication over a topic being discussed. Because of that, the use or purpose of good communication is to deliver or transmit a message or information from the speaker to the receiver using both verbal and non-verbal language. Communication is also used to interact with others to form a connection or relationship and justify moral norms recognized in society (Russo & Russo, 2010).

Regarding communication type, there are several differences; each has different meanings and purposes. The detailed explanation can be found in Table 2 (Singh, 2022):

Table 2. Type of Communication

Type	Description
Intrapersonal communication	Occurs in that individual own mind (thoughts, feelings, and self-talk)
Interpersonal communication	Occurs between two or more people (verbal, non-verbal, gestures, and body language)
Group communication	Occurs within a group among group members (teams, committees, and families)
Organizational communication	Occurs within the organization (rules, policies, hierarchy, etc.)
Cross-cultural communication	Occurs between different cultures (values, beliefs, customs, and norms)
Mass communication	Occurs through mass or large media (newspaper, radio, television, and internet)

Forms of communication are not only verbal but can be found in many forms. Here is the detailed explanation in Table 3 (Cachon, 2015):

Table 3. Form of Communication

Form	Description
Human symbolic production	Pre-historic rock art, musical instruments, personal ornaments, etc.

Parietal and mobiliary art	Drawings, engraving, wall or ceiling painting
Religion or cosmology	Social norms, practices, or habits, and religious ritual
Music	Musical activity

Nowadays, many technologies exist along with the emergence of various social media platforms, which causes changes in communication patterns. A long time ago, communication was simply referred to as delivering messages or information from an individual or group to their respective receiver or recipient. However, with all those technological things, the pattern is slightly changing. Social media has changed communication patterns because it enables the user or individual to be more expressive and increases social interaction, information sharing, or emotions to a much wider audience. Hence, it can create specific images of themselves, which can be referred to or lead to narcissism. Another harmful side effect of these changes in communication is that it can put peer pressure on specific individuals and envy because broad information is not filtered correctly. Technology and social media also reduce the amount and quality of live or face-to-face communication as communication can be done anywhere and anytime because it enables individuals to have virtual interactions without paying attention to physical surroundings. Virtual communication that can be done using technology and social media platforms is not necessarily bad, considering the fast-paced daily activities that require us to adapt. To adapt to the current situation, fast information flow is much more needed compared to a long time ago. A fast communication flow resulted in many acronyms, abbreviations, and slang language (Bala, 2014). These things are used to make communication faster, which will eventually make information flow faster. Technology and social media bring many benefits, but if not used properly, they can cause addiction because of the content that they bring. Misinformation can also happen if the information needs to be well-filtered.

2.3. Sleep Disorder

Sleep is an activity that is considered necessary for the human body as its benefits are mentioned in various research. However, several people may experience certain conditions during or in their sleep that affect their sleep, whether quality, timing, or duration, which can be considered a sleep disorder. Many people have experienced difficulty falling asleep, meaning an individual stays awake when he or she is supposed to sleep; this condition can be called insomnia. On the contrary to insomnia, there is also a condition where the individual feels heavy drowsiness or even unintentionally falls asleep when it is not supposed or intended to, this condition is often referred to as narcolepsy. An individual who snores loudly by making large and harsh sounds when breathing during sleep is often misinterpreted as a sign of tiredness after work. However, it actually can be considered a sleep disorder as it is one of the characteristics. The other sign or characteristic of someone who may experience sleep disorder is having sleep apnea, which can be defined as breathing that repeatedly stops and then continues (cessation) during sleep (Liu et al., 2021).

Sleep disorder and its characteristics can be caused by many factors, which vary from the comforts of the sleep environment, which covers hygiene, humidity, or temperature, to disturbance from several things near the sleep area. Disturbance from things near the sleep area means sleep quality is impaired by something. In this case, it is the presence of a technological communication device. Technological devices like smartphones, laptops, or tablets can affect or impair sleep quality because they emit electromagnetic radiation, which can cause disturbances as they interfere with the brain's natural electrical activity, leading to sleep cycle disruption. Electronic devices around the sleeping area also emit blue light; blue light itself can suppress the production of humans' natural melatonin, a hormone whose primary purpose is to regulate the sleep cycle and circadian rhythm in

the human body which is mainly produced in sleep. The use or presence of electronic devices also affects the psychological aspect because the content or usage can cause many levels of emotion, for instance, stress, anxiety, and excitement, which eventually affect sleep quality as it prevents that individual from falling asleep. Using technological devices before and during sleep can also alter sleep habits, affecting regular bedtime and sleep environment (AlShareef, 2022).

3. Research Methodology

3.1. Research Instrument

To collect necessary information, the objective needs to be defined and survey indicators also need to be designed, this allows the survey to gather necessary information. This preliminary research utilized a simple random sampling approach through a survey or questionnaire to collect the necessary data. All questions were made into an online form and were presented in English. The survey consisted of a total number of 18 questions, divided into three sections. The first section was comprised of 5 questions about the respondent's demographic. The second section consists of 9 questions that discuss the respondent's call and sleep behavior. Lastly, the third sections contain 5 questions about the respondent's technology used during phone or video call activity. The questionnaire uses two types of questions: open questions and closed questions. Open questions aim to collect respondents' more detailed responses which allows a broader range of insights, while closed questions capture a more specific and direct answer from respondents which provides quantitative data for analysis purposes.

3.2. Data Collection and Procedure

This preliminary research uses a quantitative and descriptive approach to explore the relationship between making a phone or video call before and during sleep and human behavior along with its technology issues.

Data collection occurred between 5 January 2024 and 14 January 2024. The data for this preliminary research comes from many segments or sources within Indonesian society. The criteria are individuals who make a phone call or video call before and during sleep at night. These criteria have no special requirements. Thus, the population can be defined as infinite. The sample in this research is 210, which surpasses the minimum sample of 75. The minimum sample was calculated based on the number of indicators, which is 15, and multiplied by a factor of 5. Data collected will be presented in an appropriate graph and analyzed according to the indicators with the largest number. Table 4, Table 5, and Table 6 will provide detailed information on the questionnaire items.

Table 4. Demographic Questionnaire Items

Identifier	Indicator
DG1	Gender
DG2	Age
DG3	Last Education
DG4	Jobs
DG5	Respondent's experience with sleeping at night (above 10 p.m.)

Table 5. Sleep and Call Behavior Questionnaire Items

Identifier	Indicator
SC1	Respondent's experiences with the intensity of making a phone call above 10 p.m.
SC2	Respondent's experience with the duration of the phone call above 10 p.m.
SC3	Respondent's experience with what time the phone call occurs
SC4	Respondent's experience with when the phone call occurs
SC5	Respondent's experience with where the phone call occurs
SC6	Respondent's experience with who the phone call will be
SC7	Respondent's experience with what time usually go to sleep
SC8	Respondent's purpose for having phone calls at night
SC9	Respondent's experience with several conditions that may occur in their sleep

Table 6. Technology Used Questionnaire Items

Identifier	Indicator
TG1	Respondent's experience with what application was used for calling
TG2	Respondent's reason for using certain applications for calling
TG3	Respondent's device preference for calling
TG4	Respondent's hardship while making a call
TG5	Respondent's technological expectation during calling

4. Results and Discussion

Data collected through survey or questionnaire has accumulated a total of 210 data, of which 193 respondents (92%) are valid, meaning surpass the criteria set for the respondents. The demographic data will be detailed in Table 7:

Table 7. Demographic Data

Indicator	Answer	Amount
Gender	Male	89
	Female	104
Age	<10 years	0
	10-19 years	17

	19-44 years	162
	>45 years	14
Last Education	Not graduated from elementary school	0
	Elementary school	0
	Junior high school	2
	Senior high school	92
	Bachelor degree	88
	Master degree	11
	Doctorate degree	0
Jobs	Student	123
	Private employee	67
	Government employee	0
	Entrepreneur	1
	Professional	1
	Housewives	1
	Not working	0

Table 7 summarizes the respondents' demographic; from 193 valid data, 104 are female (54%), while 89 are male (46%). It showed only slight differences between males and females who make a phone or video call before and during sleep. From those 193 respondents, the age group of 19-44 years made up a significant (majority) part at 162 data (84%) of the total respondents involved, while the rest are a combination of the age group of 10-19 years and >45 years, these data indicate that most of the participant involved are a productive group of age which consist of adolescent, young adult, and adult. Regarding respondents' job distribution, students comprise the majority with 123 data (64%), followed by private employees with 67 data (35%). This job distribution data emphasized the participation of the productive group of age.

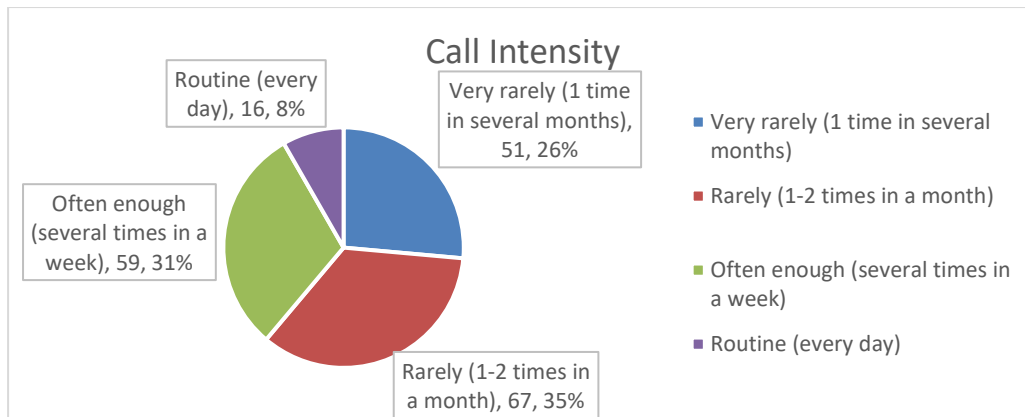


Fig. 1: Call Intensity Graph

In Figure 1, it is shown that all of the respondents have made a phone or video call after 10 p.m.; the difference is the intensity of doing that activity. Sixty-seven respondents (35%), which were the majority of the respondents, make a phone or video call above 10 p.m. rarely (1-2 times a month), while 59 respondents (31%) quite often (several times a week) do this activity. Also, there are groups of respondents consisting of 16 people (8%) who routinely engage in this activity (every day). However, the rest of the respondents (51 data) rarely (once every several months) do this activity.

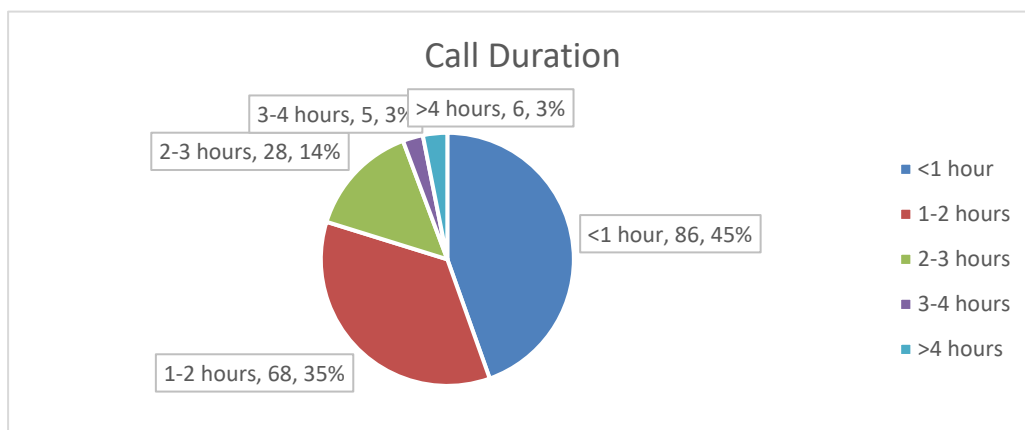


Fig. 2: Call Duration Graph

One of the critical aspects of making a phone or video call is how long the activity is going, or it can be defined as duration. Figure 2 shows 86 respondents (45%) showed that their call duration is relatively short, taking less than an hour. Then, 68 respondents (35%) made their call for about 1-2 hours, and 28 respondents (14%) needed 2-3 hours to finish their call. While the rest of the respondents spend more time on the phone, there are a total of 10 respondents that spend 3-4 hours and more than 4 hours on their call. These data show that making a phone or video call at night mainly was for small or short talk, while the others needed a longer duration to finish their call. The longer the duration of the call will or may bring risk toward sleep quality.

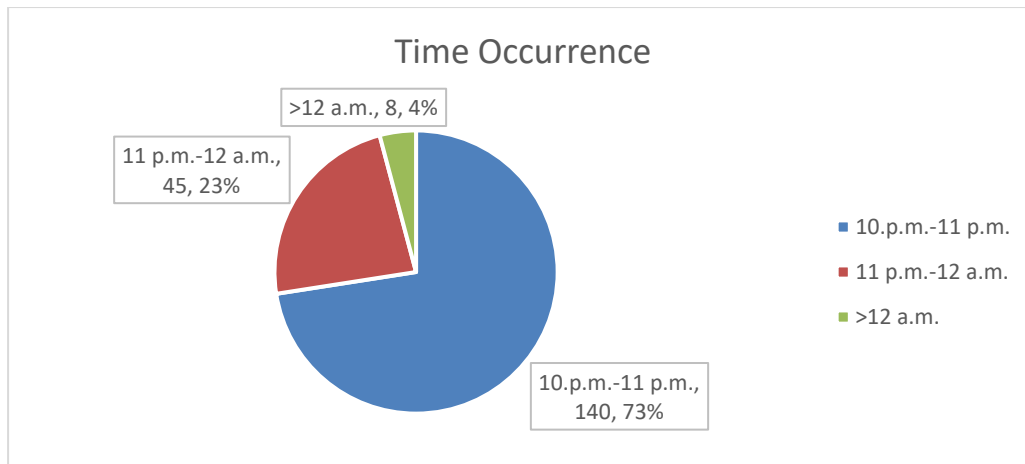


Fig. 3: Time Occurrence Graph

This study gathers information on the phone or video call time to understand respondents' habits regarding what time they make the call. In Figure 3, 140 respondents (73%) make their call at 10 p.m.-11 p.m., 45 respondents (23%) at 11 p.m.-12 a.m., and eight respondents (4%) make their call above midnight. Although the number of people who make their calls above midnight is low, it still shows that some still do this activity.

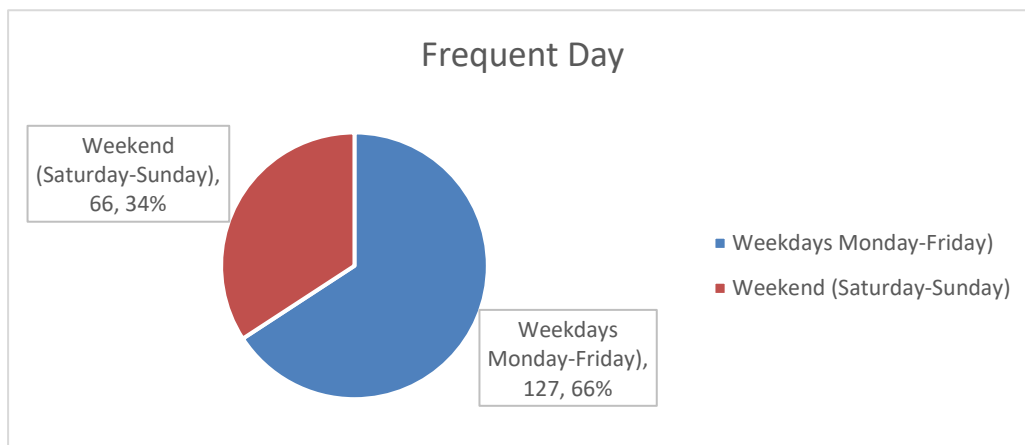


Fig. 4: Frequent Day Graph

Besides time occurrence, respondents more frequently make their night calls on weekdays as the data shows in Figure 4 that 127 respondents (66%) do this activity on weekdays, while 66 respondents (34%) make their night calls on weekends. This data means the respondents must consider whether it is a working day when making their night calls because it may affect their cognitive performance during the day if they lack sleep.

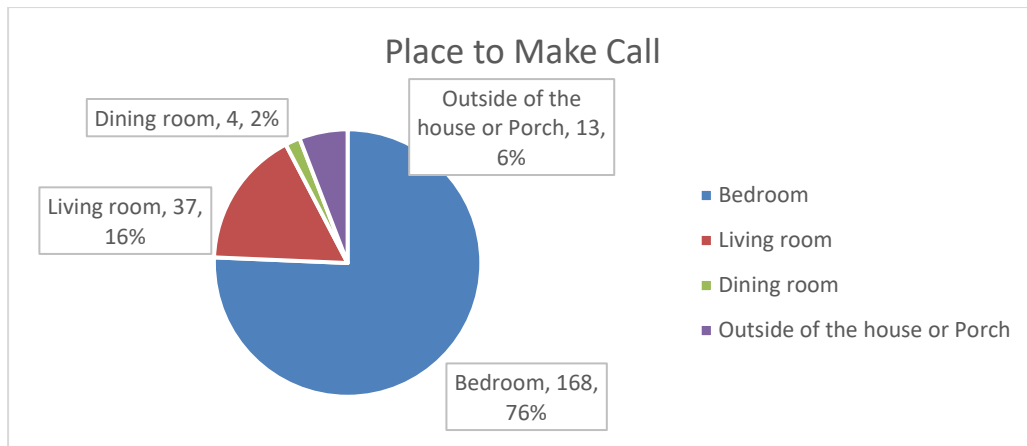


Fig. 5: Place to Make Call

This data is gathered to determine where is the place used the most by respondents to make their night calls. According to data in Figure 5, the bedroom became the most used place by respondents to make their calls as it took 168 data (76%) of the total data, followed by the living room with 37 data (16%), outside of the house or porch with 13 data (6%), and dining room with 4 data (2%). This data shows that most respondents consider comfort and private surroundings while making night calls.

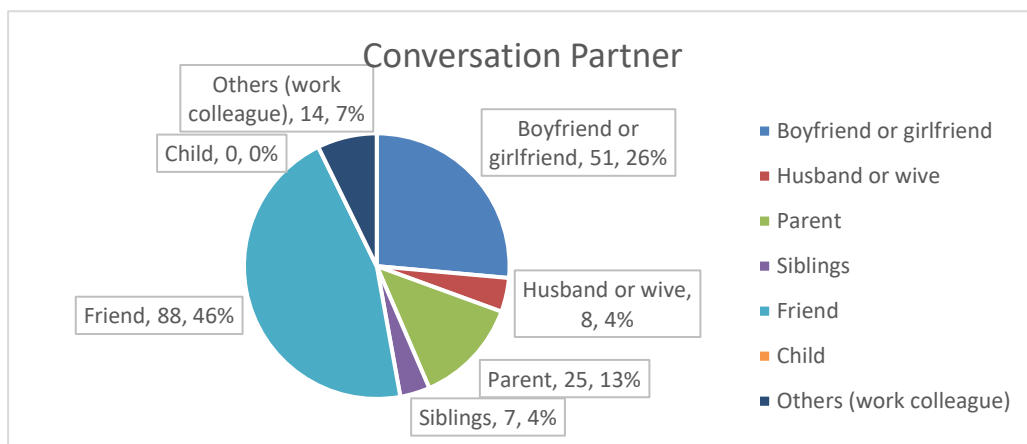


Fig. 6: Conversation Partner Graph

In a phone or video call, it needs to involve at least two people in order to get the conversation going. Data in Figure 6 shows that 88 respondents (46%) make their night call with their friends, 51 respondents (26%) with their boyfriend or girlfriend, 25 respondents (13%) with their parents, 14 respondents (7%) with their coworker, and the rest with the accumulation of 15% (8%) are with their relatives and husband or wives. With this data, there is a wide variety of partner conversations in doing night calls.

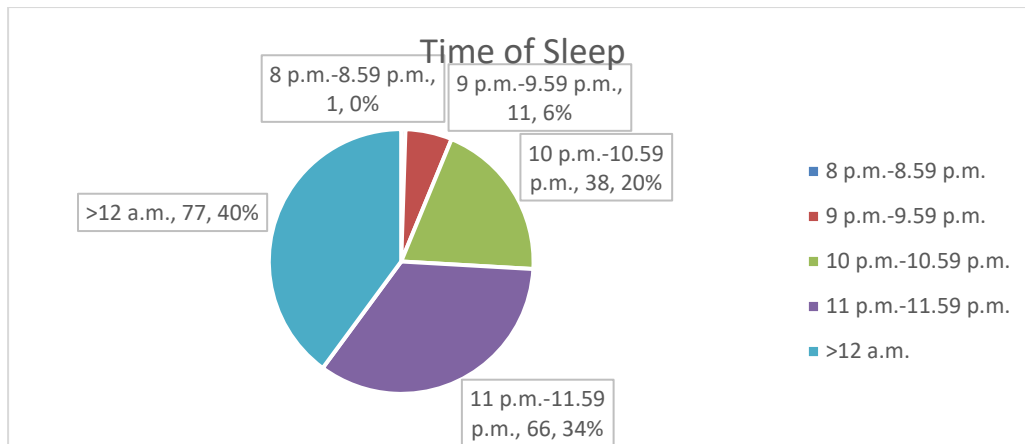


Fig. 7: Time of Sleep Graph

After a tiring day followed by a night call, sleep is the last thing to do to end that person's day. Figure 7 shows that 77 respondents (40%) sleep above midnight; 66 respondents (34%) sleep at 11 p.m.-11.59 p.m.; 38 respondents (20%) sleep at 10 p.m.-10.59 p.m.; 11 respondents sleep at 9 p.m.-9.59 p.m.; and only one respondent who sleep below 9 p.m.; this data show that most of the respondents sleep late at night which differs from the ideal time of sleep.

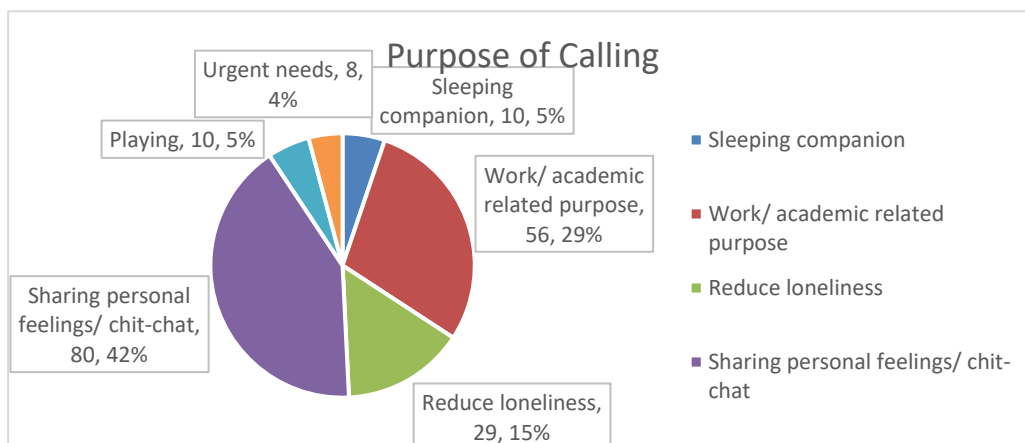


Fig. 8: Purpose of Calling Graph

Every respondent who chooses to make a phone or video call before and during sleep must have their reason or purpose for doing it. It is shown in Figure 8 that Sharing personal feelings or chatting is the most answered with 80 respondents (42%), followed by work or academic-related purpose with 56 respondents (29%), reducing loneliness with 29 respondents (15%), playing and sleeping companion contributed with ten respondents each (10% in total), and urgent needs with eight respondents (4%). There are diverse responses regarding the purpose of night calls, but the most notable one is to be a conversation partner for chit-chatting or recreational activities.

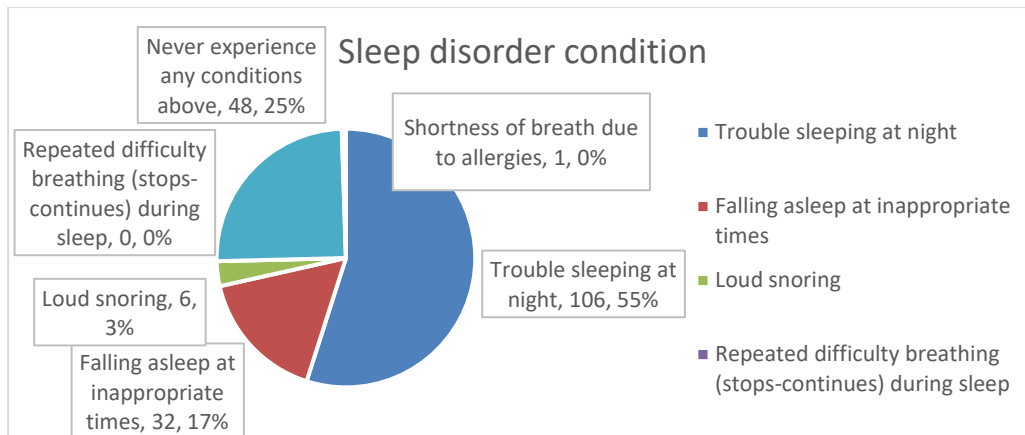


Fig. 9: Sleep Disorder Graph

This research aims to determine if there is any relation between night call activities and sleep behavior, along with technological implications that may occur. Thus, analyzing potential sleep disorder conditions is essential. In Figure 9, the most common sleep disorder condition is trouble sleeping at night or insomnia with 106 respondents (55%), followed by quickly falling asleep at inappropriate times or narcolepsy with 32 respondents (17%). Snoring also became one of the problems while sleeping, with six respondents (3%) who had it. However, a large group of people have never experienced such a problem during sleep, with 48 respondents (25%). This data shows that sleep disorders are experienced by a broad group of people, which eventually will reduce the sleep quality of that person. These sleep disorders may have been caused by some habit done at night; one is a late-night phone call.

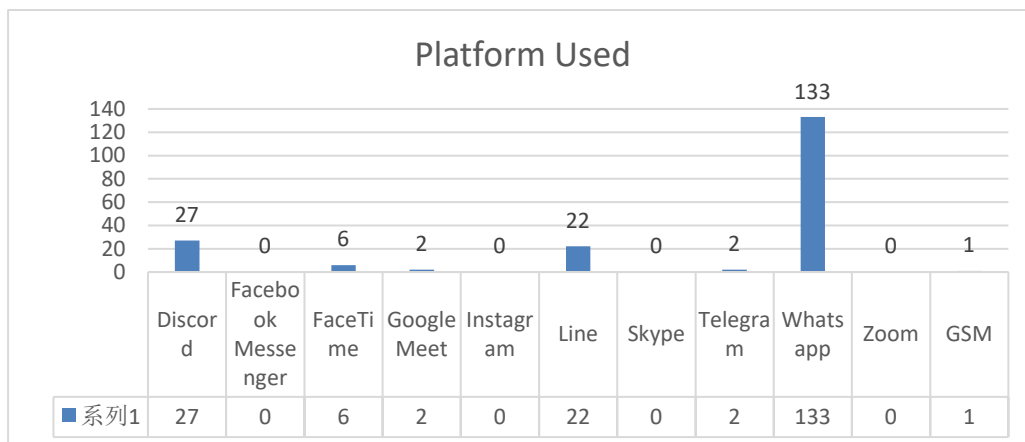


Fig. 10: Platform Used Graph

A phone or video call can be run on various platforms or applications. This data shows which platform or application the respondent uses the most. Figure 10 shows that WhatsApp became the most common platform used with 133 respondents, followed by Discord with 27 respondents, Line with 22 respondents, and FaceTime, Google Meet, Telegram, and GSM with an accumulation of 11 respondents. Platform used for phone or video calls is mainly based on the individual's personal preference.

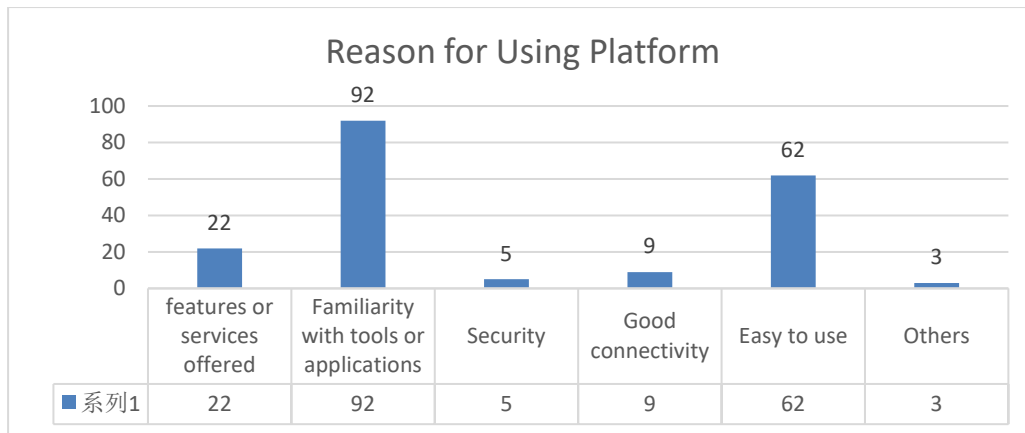


Fig. 11: Reason for Using Platform

Respondents can use various platforms or applications for phone or video calls based on certain aspects. The most common reason is their familiarity with the platform. Data from Figure 11 shows that 92 respondents, followed by the ease of platform use by 62 respondents, features offered by the platform also matter as 22 respondents answered this. In comparison, security and connectivity also play a part in respondents using the platform, with an accumulation of 14 respondents. Each person's reason for using a specific platform or application can vary from one another; that person's subjectivity mainly influences it.

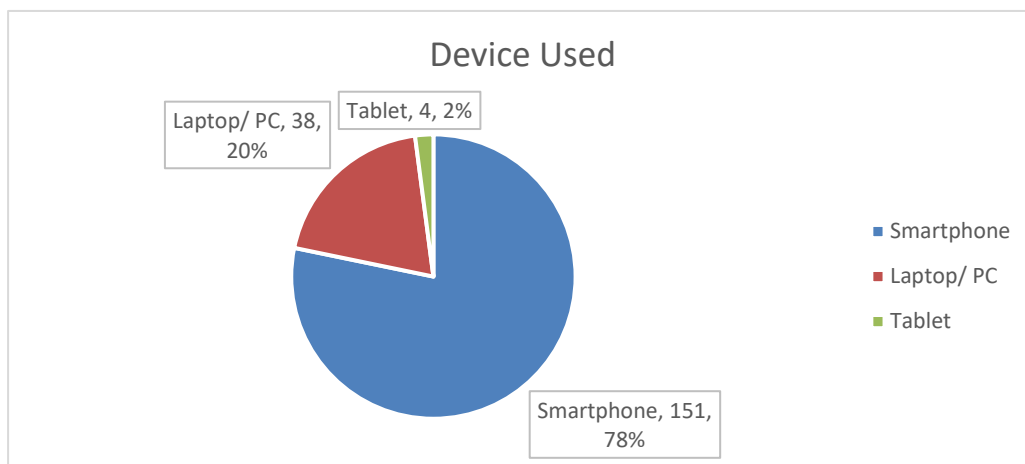


Fig. 12: Device Used Graph

The type of device also affects the calling experience. Personal preference is the biggest driver in the choice of the type of device. As Figure 12 shows, 151 respondents (78%), which was the majority of the total data, chose to use a smartphone for calling activities, 38 respondents (20%) chose a laptop or PC for calling, and only four respondents (2%) used a tablet for calling. Portability and convenience are a plus point of smartphones that other devices do not possess.

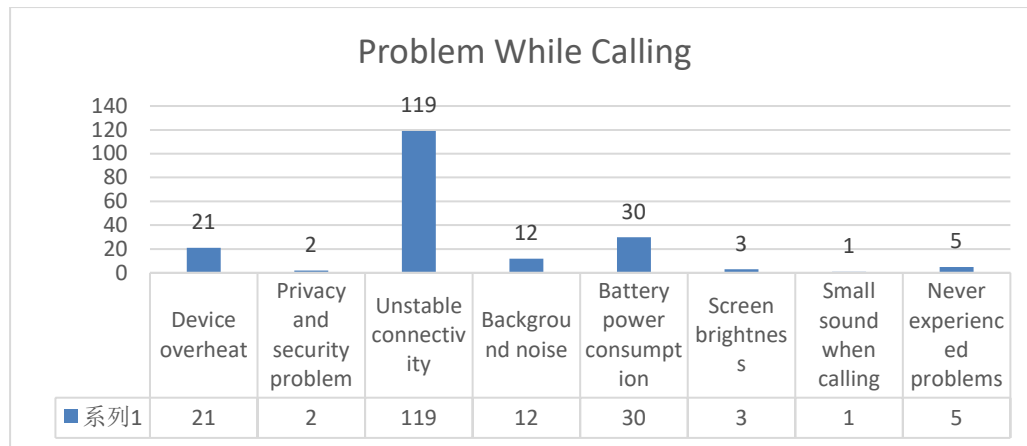


Fig. 13: Problem While Calling

Everyone expects a smooth and good experience while making their night call. However, problems or disturbances may occur while they are doing it. Data from Figure 13 shows that connectivity is the main problem with 119 respondents, followed by connectivity problem with 30 respondents, device being too hot or overheating with 21 respondents, background noise with 12 respondents, and the rest are a combination of security, screen brightness, and sound with an accumulation of 6 respondents. In comparison, five respondents never experience any problems during their calls.

Also based on the given problem faced during call activity, some feedback is gathered from the respondents regarding improving or increasing call experience. Feedback regarding a lower consumption application and better connectivity is the most common because these types of problems occur the most when referring to the problems faced by respondents during calling. Several feedbacks mentioned noise canceling features to reduce or dampen unnecessary background sound and automatic volume adjustment to adapt to the surrounding environment. Respondent also said that in order to enhance the call experience, both phone and video calls, interactive features should be implemented in most platforms, by interactive features. It can vary from filters, direct connection to other apps, share screen features, automatic dark mode at night, etc. This research emphasizes using mobile phones in the form of phone or video calls before and during sleep; hence, accidentally falling asleep is likely to happen. If both people are falling asleep, the application still runs and can cause problems, for instance, overheating and running out of battery. Because of that, several respondents suggested that it would be better if the application had reminders for sleep time and automatic power off after a specific time of inactivity in the application. It is done to prevent the device from overheating from the continuously running application despite not being used. Several respondents also suggested that the app should have better privacy and security.

5. Conclusion

This preliminary investigation of “sleep-calling” practices and their influences offers initial evidence regarding a widely prevalent phenomenon among digitally immersed consumers. Findings confirm connections between late-night technology use for social interactivity purposes and sleep disorder prevalences, hinting at well-being impacts. However, further research incorporating physiological measures, experimental manipulations, and longitudinal observation can enrich understanding. As cultural norms and device functionalities increasingly blur boundaries between domains like work and personal life, maintaining spaces for recuperation remains vital. Multi-stakeholder efforts centered on responsible design and balanced technology integration can help nurture individual and collective welfare going forward.

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