



A Study of Smart Pillow with respect of sleep quality & advance health

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Abstract:

The quality of sleep at night has an impact on productivity during the day. To make the most of a day, it is essential to recognise the elements that interfere with sleep, such as stress. Technological advancements may enable a person to self-analyze such circumstances. For this, we suggest a system that, depending on a person's sleeping habits, assists in reducing stress. Temperature, blood pressure, respiration rate, and heart rate all vary during the NREM (Non Rapid Eye Movement) and REM (Rapid Eye Movement) stages of sleep. Non-physiological factors such as the amount of sleeping hours, snoring range, sleeping posture, and ambient variables can all have an impact on sleep quality. These elements are taken into account in order to examine sleeping patterns. A system that can anticipate stress levels in up to five states is defined: High, Medium-High, Medium-Low, and Low stress levels.

Key words: Smart pillow, sleep quality, NREM, NodeMCU, healthcare, force sensing resistor

Introduction:

Stress is a common occurrence that affects people of all ages as a result of a range of external and internal elements such as work load. Persistent anxiety has emerged as a risk to various mental or biological processes, altering human behavior and causing sleeplessness. According to the World Health Organization²³, stress has become a "Global Wide Epidemic." According to a WHO assessment, India is the most depressed country in the world. One out of every five Indians has a mental illness. Half of the workforce in India is chronically stressed.

Mental health receives 0.06 percent of total health spending in India. Insomnia is treated with drugs and yoga, both of which can be ineffectual at times. Sleeping pills can have serious health effects, and drug addiction can lead to overdose. A Smart Pillow is necessary to avoid such detrimental effects on the human body and to have a decent night's sleep. The Smart Pillow will allow a person to sleep soundly by producing electromagnetic waves.

This study focuses on the sleeping problem insomnia and proposes a method for conquering it by lowering mental stress through the use of a range of human body characteristics such as Heart Rate, GSR, and ECGSignal.

When it comes to snoring, the Gen Z smart pillow may make a significant impact. Actually, if they use the right anti-snoring pillow, they may get a better night's sleep and minimize snoring. This may be quite beneficial to them and anybody else who shares their space. The Smart Pillow is intended to improve the quality of human sleep. A smart pillow may also be characterized as an electronic pillow that has a variety of functionalities. To begin, the Gen Z Pillow can eliminate snoring by detecting snoring and softly vibrating to change the user's sleep posture without waking them up. This is because the Smart Pillow has an embedded microphone that detects snoring events throughout the night. A sleep analysis tool is also included in the Gen Z Pillow, which connects to your smartphone via applications. During the night, your sleeping data and snoring score will be identified. In addition, it offers Music and Audio Streams.

The Gen Z Smart Pillow can wirelessly play sleep music, other sounds, and even video from the popular app without disturbing your sleeping spouse.

As a result, you may use our Gen Z Pillow to play your favorite music to help you go asleep easily. Classical music, for example, or soothing piano music. On the other side, it may also be used as a sleep tracker by monitoring sleep movements and snoring decibels, which results in a Sleep Score and a daily report of sleep quality and relaxation. Aside from that, instead of utilizing an alarm clock, Gen Z Smart Pillow may set one and it will softly vibrate and play some nice music to greet the user and let them enjoy the new day for enhanced morning energy. Finally, the smart pillow is the sleep technology of the future, allowing users to sleep comfortably while keeping track of their sleep data.

History and Background

Sleep is a condition of rest in which our bodies are not active and our minds are insensible. Sleep refers to the act of slumbering. At this time, our biological systems will be replenished. The English Dictionary defines sleep as "a condition of body and mind that relapses for several hours every night, with the eyes closed, physical muscles relaxed, and the nervous system inactive."

As we all know, everyone needs sleep to function on a daily basis. Sleep is required by all living creatures. We will sleep for around 36% of our lives.

People' physical and mental health, as well as their safety, can be safeguarded if they get enough quality sleep at the appropriate periods. Our sleep quality has a direct influence on our physical and mental health, as well as the quality of our life, including productivity, heart and brain health, imagination, immune system, vigor, and even weight. When sleeping, it aids in the repair and maintenance of body cells and networks, endocrine function, energy conservation, environmental and brain adaption, and learning ability.

If you do not get enough restorative sleep, your brain will undergo physical changes. We will be exhausted during the day and will be unable to operate at near-full ability. We also pay attention but are unable to focus or reply swiftly. Sleep deprivation increases the risk of obesity, infections, cardiovascular disease, and diabetes.

Purpose of Study

The most essential factor that may influence sleep is light. It makes it more difficult for individuals to fall asleep by interfering with their internal clock and shifting their typical sleeping time. The retina of our eyes contains "light sensitive" cells that detect light and influence our internal clock. These cells will communicate with the brain to determine whether it is day or night and adjust their sleep schedule accordingly. Apart from that, late-night light exposure will cause their internal clock to be delayed, making it more difficult for them to fall asleep. Light exposure after midnight may have more serious implications since it resets their internal clock and makes it harder to fall asleep again.

Second, people will have sleep problems if they are subjected to light variations as a consequence of a change in work schedule or travel across time zones. Their ability to sleep is regulated by their internal clock under regular settings. People who work the night shift or travel across time zones, for example, will notice two symptoms. For starters, when their internal clock signals that it is time to sleep, they will feel extremely drowsy. Second, they have difficulty falling asleep when they try to sleep outside of their internal phase. Night shift workers, such as airline pilots, nurses, and other public safety employees, should be aware of this danger.

Literature Review

As individuals become more concerned about their health and fitness, the smart pillow industry has grown significantly in recent years. Smart pillows can detect sleeping patterns, offer feedback on sleep quality, and even aid to improve posture.

Numerous studies have found that smart pillows can enhance sleep quality while also reducing snoring and sleep apnea. These advantages have increased demand for smart pillows, especially in developed nations with more purchasing capacity. According to Allied Market Research, the worldwide smart pillow market was worth \$2.05 billion in 2020 and is predicted to reach \$5.16 billion by 2028, increasing at a CAGR of 12.2% between 2021 and 2028. This literature study will look at the domestic and foreign smart pillow markets during the last decade.

Literature Review - Domestic

During the last decade, the domestic smart pillow market has grown steadily. The growing demand for smart home items has aided the growth of the smart pillow market tremendously. According to Grand View Research, the worldwide smart pillow market was worth USD 4.4 billion in 2020 and is predicted to increase at a compound annual growth rate (CAGR) of 21.5% between 2021 and 2028.

The growing awareness of the benefits of utilizing smart pillows is one of the reasons driving the domestic smart pillow market. According to a National Sleep Foundation research, over 45% of Americans admit that poor or insufficient sleep has interfered with their daily activities at least once in the last seven days. Smart pillows can solve these difficulties by recording sleeping patterns and delivering data on sleep quality. They can also aid to improve posture by providing feedback on head and neck alignment.

The increased availability of smart pillows in retail establishments is another factor driving the growth of the domestic smart pillow industry. Smart pillows are now available for purchase at major shops such as Walmart and Amazon, making them more accessible to customers. This has also increased market rivalry, resulting in reduced pricing and improved features.

Literature Review - Global

The international smart pillow market has also been growing at a significant rate over the past decade. According to Technavio, the worldwide smart pillow market is predicted to develop at a CAGR of more than 30% from 2020 to 2024. Many causes can be attributed to the worldwide market's rise. The rising frequency of sleep problems is one of the factors driving the international smart pillow market's expansion. According to a Global Sleep Society survey, over 45% of the worldwide population suffers from sleep problems, with insomnia being the most frequent. Smart pillows, which analyze sleeping habits and provide feedback on sleep quality, can assist to solve these difficulties.

The rising usage of smart home devices is another factor driving the growth of the international smart pillow market. Smart homes are growing increasingly popular throughout the world, and one of the things that is gaining favor is smart pillows. As a result, the number of producers joining the market has increased,

resulting in more creative features and reduced pricing

In recent years, the smart pillow industry has seen numerous technical breakthroughs. Some businesses, for example, have created smart pillows with AI-based algorithms that study sleep habits and modify the hardness and height of the cushion accordingly. These developments have considerably enhanced smart pillows' efficiency in enhancing sleep quality.

Trends in the Smart pillow Market

According to research, the smart pillow business has grown significantly over the last decade, with new models and features being offered on a regular basis. One market trend is the incorporation of sensors and other technology into pillows in order to monitor sleep quality and offer feedback to consumers. Among these technologies are accelerometers, pressure sensors, and temperature sensors.

The usage of smart pillows for sleep tracking and analysis is another industry trend. These pillows may gather data on sleep patterns and provide users advice on how to enhance their sleep quality. They can also communicate with other devices, such as smartphones and smart home systems, to provide a more thorough sleep analysis.

Challenges in the Smart pillow Market

Despite the smart pillow market's development and promise, there are several difficulties that must be solved. One difficulty is that many smart pillow products are expensive, which may limit their accessibility to a larger variety of users. Also, there is a need for greater industry standards, particularly in data collecting and analysis, to guarantee that users can trust the veracity of the information offered by these products.

Another challenge in the market is the need for greater consumer education and awareness. Many people are unfamiliar with the notion of smart pillows or the potential benefits they provide, thus greater education and advertising of these items is required.

Future Prospects for the Smart Pillow Market

Despite these obstacles, the smart pillow industry is likely to expand in the future years. Integration of smart pillows with other technologies, such as virtual assistants and smart home systems, is one area of potential expansion. This might allow for more personalization and control over sleep settings, perhaps improving sleep quality even further.

Another area of development is the creation of more affordable and accessible smart pillow products. Prices are projected to fall as the market develops and competition increases, making these items more

affordable to a larger spectrum of customers.

Data Analysis and Interpretation:

Age of the Respondents

Table-1

SI NO	Age of the Respondents	Number of Respondents	Percentage
1	10-20	10	13.9%
2	20-40	31	43.1%
3	40-60	19	26.4%
4	60-80	13	16.7%
	Total	72	100

Table 1 and Fig 1 disclose the age-wise classification of respondents selected for the people. It knows that a maximum of 31 respondents (43.1 percent) belonged to the age of 20-40 years followed by 19 respondents (26.4% per cent) 40-60 years, 13 respondents (16.7% per cent) 60-80 years and only 10 respondents (13.9% per cent) come under the category of <20 years.

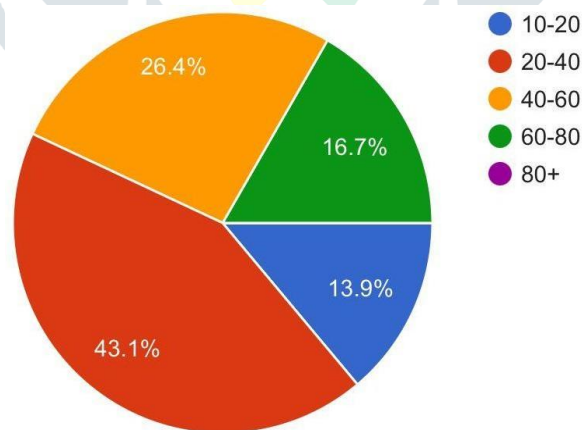


Fig-1

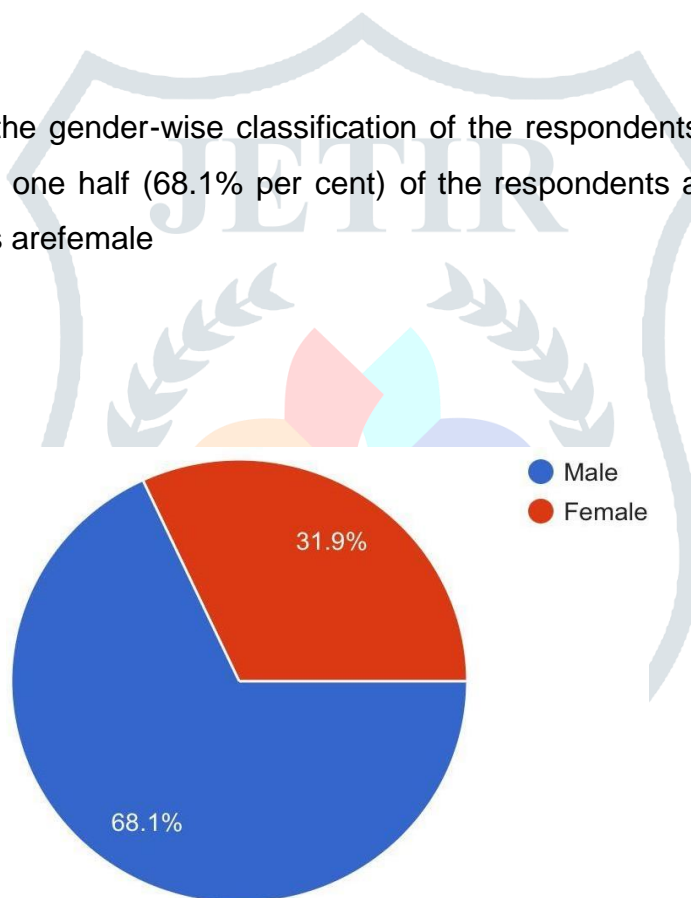
Gender of the Respondents

Table-2

SL.NO	Gender Status of the Respondents	Number of Respondents	Percentage
1	Male	49	68.1
2	Female	23	31.9
	Total	72	100

Table 2 and fig 2 reveals the gender-wise classification of the respondents selected for the study. It is understood that more than one half (68.1% per cent) of the respondents are male whereas 23 (31.9% percent) of the respondents are female

Fig-2



Occupation of the Respondents

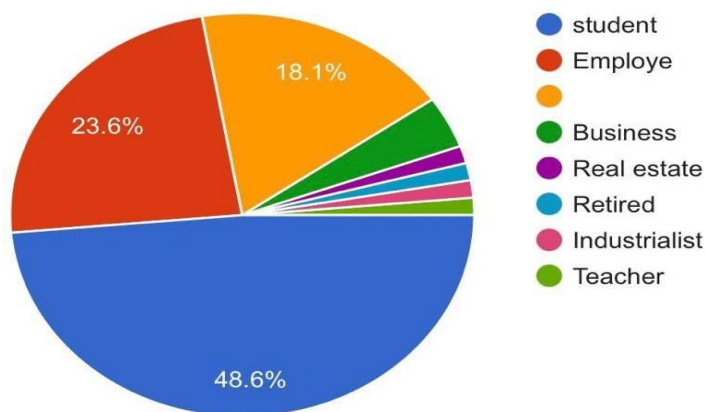


Fig 3

Fig 3 portrays the Occupation-wise classification of respondents. It is found that a maximum of 35 respondents (48.6% per cent) students, 17 respondents (23.6% per cent) employees and 20 respondents (27.8 per cent) Others.

Sleeping routine of the respondents

Fig 4

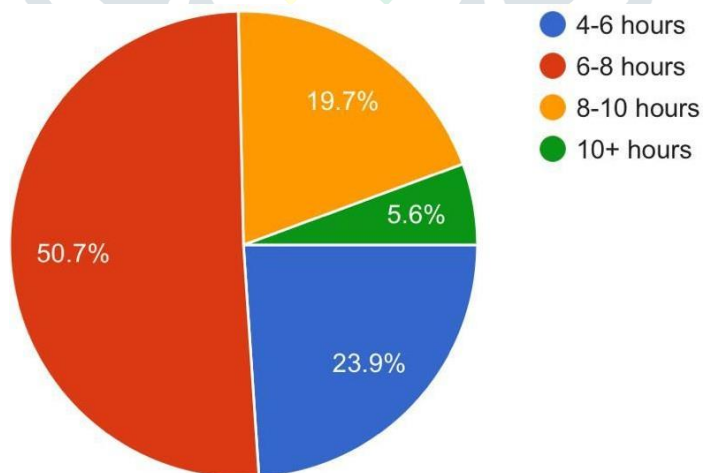


Fig 4 portrays the classification of hours the respondents sleep. It shows respondents who sleep in between 6-8 hours are highest (50.7%) compared to those who sleep 8-10hours (19.7%) and who sleep 4-6 hours (23.9%). The respondents who sleep more than10 hours are the lowest i.e.,5.6%.

Issues with sleeping

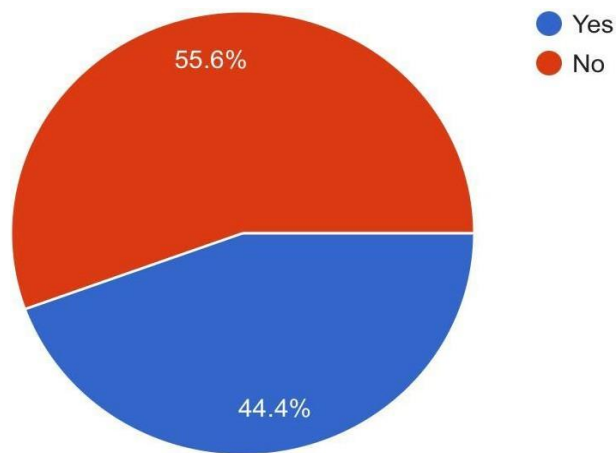


fig 5

Fig 5 determines that out of all the respondents 55.6% said they don't have any issues with sleep and 44.4% said they have issues with sleep which shows there is only a minor difference.

Usage of pillow

fig-6

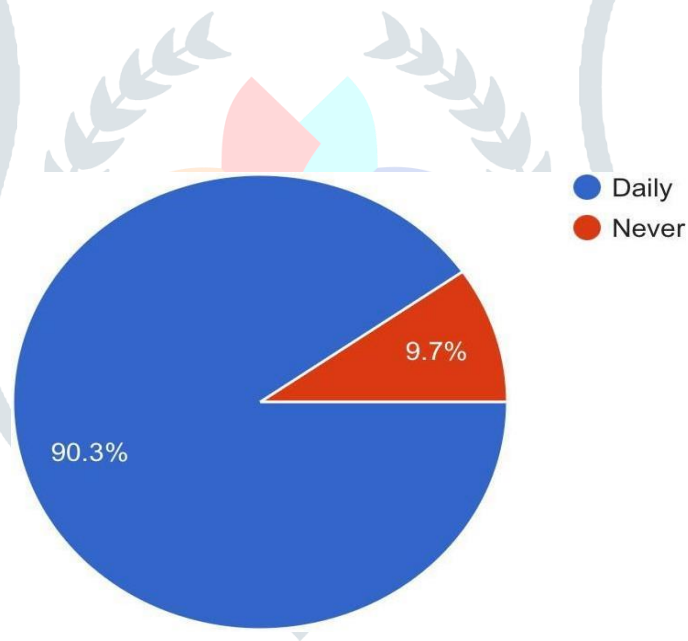


Fig 6 shows the response of the question “how often do you use a pillow “ in that 90.3 % said that they use a pillow daily and the remaining 9.7% said they don't use a pillow.

Snoring Issues

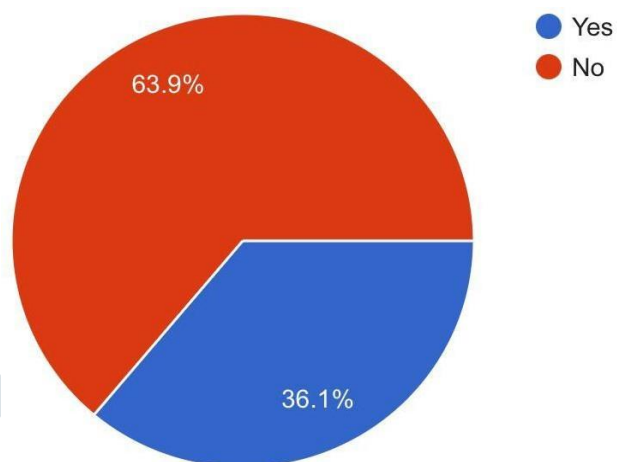


Fig-7

Fig 7 shows that 63.9% of the respondents said that they don't have snoring issues and the remaining 36.9% have issues with snoring.

Awareness of Smart Pillow

Fig-8

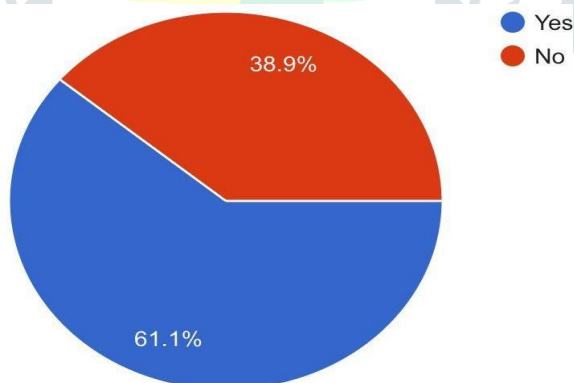


Fig 8 determines that 61.1% of the respondents are aware of smart pillows and the rest 38.9% don't have an idea about it.

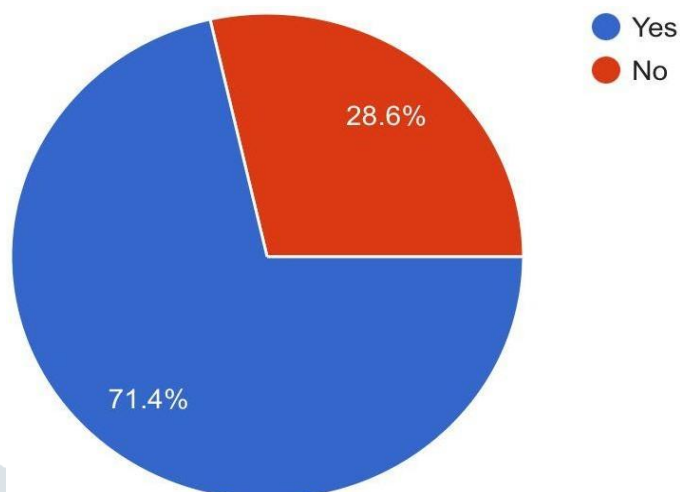
Setting up music in smart pillow

Fig 9 shows the response of the question “Do you prefer listening to music while you are sleeping “ in that 71.4% of the respondents said that they prefer music coming out of their pillow and the rest 28.6% don't prefer it.

Alarm in the pillow

fig-10

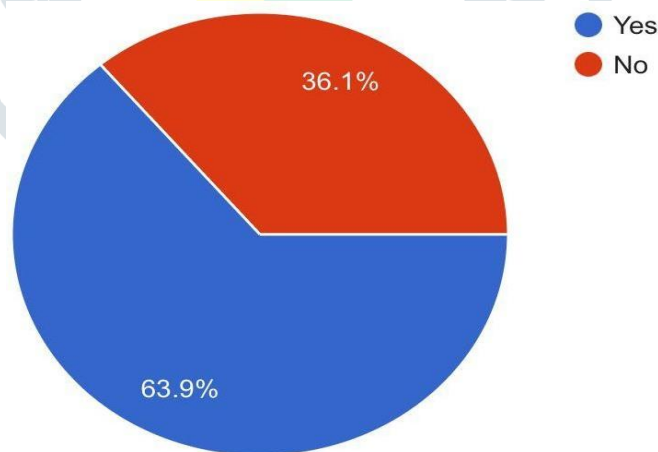


Fig 10 shows that 63.9% of respondents want an alarm in the pillow and the rest 36.1% don't prefer an alarm in a pillow.

Massaging sensors in pillow

Fig-11

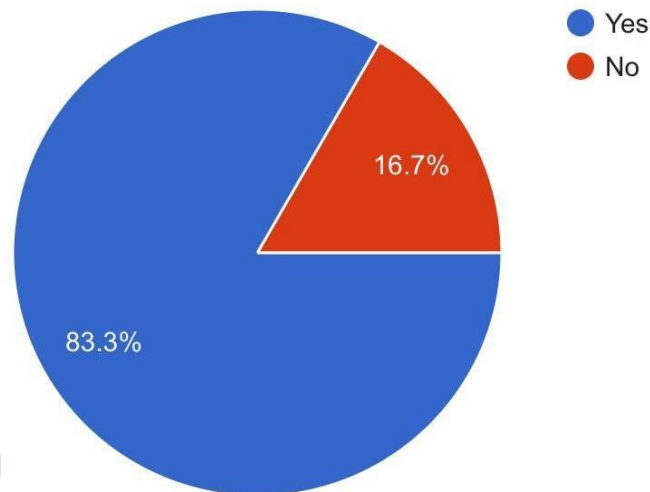


Fig 11 shows that 83.3% of the respondents like their head massaged while sleeping and the rest 16.6% don't like it.

Fragrance from pillow

Fig-12

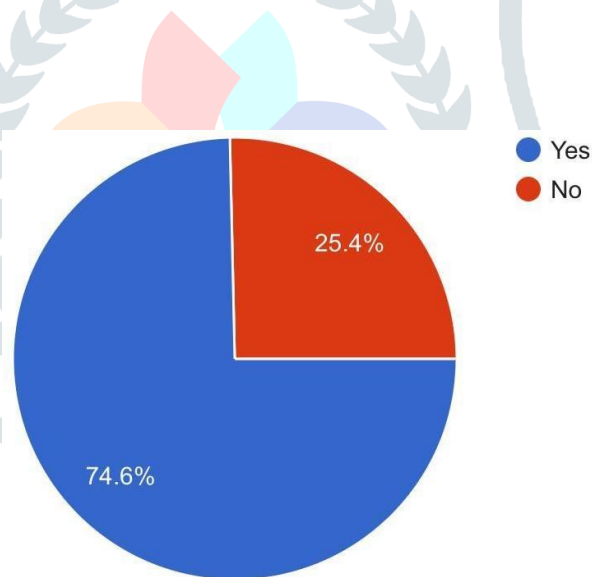


Fig 12 shows that 74.6% of the respondents like fragrances coming out of their pillow and the rest 25.4% don't prefer it.

Solving snoring issues

Fig-13

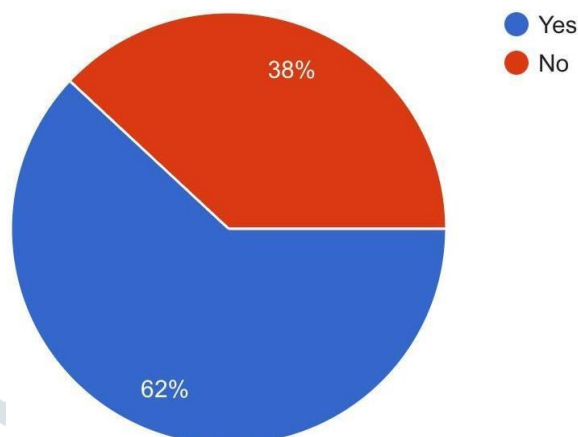


Fig 13 shows that 62% of the respondents who have snoring issues want to resolve it using the pillow and the remaining 38% don't prefer it.

Tracking sleep using pillow

Fig-14

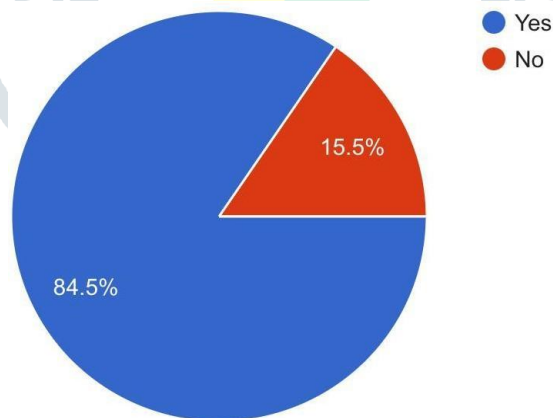


Fig 14 shows that 84.5% of the respondents prefer tracking their sleeping using a pillow and the rest 15.5% don't.

Estimated Price of the Respondents willing to invest on SmartPillow

Table-3

SL NO	Estimated Price of the Respondents willing to invest	Number of Respondents	Percentage
1	<2000	10	13.8%
2	2000-3000	31	43.05%
3	3000-4000	17	23.6%
4	4000-5000	9	12.5%
5	5000<	5	6.9%

The above table portrays the estimated price of a smart pillow that respondents are willing to invest in. In that majority (43.05%) of them are willing to buy the pillow if it falls under the price range of 2000-3000. 23.6% of the respondents opted in between 3000-4000. 12.5% are opting

4000-5000, 13.8% of them are opting <2000 and the rest 6.9% are willing to pay >5000.

Findings

→ The researcher found that a maximum of 31 respondents (43.1% percent) belonged to the age of 20-40 years followed by 19 respondents (26.4% per cent) 40-60 years and only 13 respondents (16.7% percent) 60-80 years and only 10 respondents (13.9% per cent) come under the category of <20 years.

→ It is understood that more than one half (68.1% per cent) of the respondents are male whereas 23 (31.9% percent) of the respondents are female.

→ It is found that a maximum of 35 respondents (48.6% per cent) students, 17 respondents (23.6% per cent) employees and 20 respondents (27.8 per cent) Others.

→ It shows respondents who sleep in between 6-8 hours are highest (50.7%) compared to those who sleep 8-10 hours (19.7%) and who sleep 4-6 hours (23.9%). The respondents who sleep more than 10 hours are the lowest i.e., 5.6%.

→ Out of all the respondents 55.6% said they don't have any issues with

sleep and 44.4% said they have issues with sleep which shows there is only a minor difference.

→ The response to the question "how often do you use a pillow" is that

90.3 % said that they use a pillow daily and the remaining 9.7% said they don't use a pillow.

→ It is known that 63.9% of the respondents said that they don't have

snoring issues and the remaining 36.9% have issues with snoring.

→ It is understood that 61.1% of the respondents are aware of smartpillows and the rest 38.9% don't have an idea about it.

→ The response of the question "Do you prefer listening to music while you are sleeping" is that 71.4% of the respondents said that they prefer music coming out of their pillow and the rest 28.6% don't prefer it.

→ It is understood that 63.9% of respondents want an alarm in the pillow and the rest 36.1% don't prefer an alarm in a pillow.

→ It is known that 83.3% of the respondents like their head massaged while sleeping and the rest 16.6% don't like it.

→ It is implicit that 74.6% of the respondents like fragrances coming out of their pillow and the rest 25.4% don't prefer it.

→ It is known that 62% of the respondents who have snoring issues want to resolve it using the pillow and the remaining 38% don't prefer it.

→ It is understood that 84.5% of the respondents prefer tracking their sleep using a pillow and the rest 15.5% don't.

→ The estimated price of a smart pillow that respondents are willing to invest in. In that majority (43.05%) of them are willing to buy the pillow if it falls under the price range of 2000-3000. 23.6% of the respondents opted in between 3000-4000. 12.5% are opting

4000-5000, 13.8% of them are opting <2000 and the rest 6.9% are willing to pay >5000.

Suggestions:

There are several strategies that can be employed to increase the sales of smart pillows, including:

1. Offering competitive pricing: One of the most effective strategies to increase sales is by offering competitive pricing. This can be achieved by reducing the manufacturing costs of the smart pillows or by offering promotions and discounts to customers.

2. Investing in technology: Smart pillows are all about technology, so investing in the latest technologies and features can help increase sales.

For example, adding new sensors or integrating with other smart home devices can make the smart pillow more attractive to consumers.

3. Creating a strong brand identity: A strong brand identity can help differentiate the smart pillow from its competitors and increase its appeal to consumers. This can be achieved through creative marketing campaigns, eye-catching packaging, and innovative product designs.

4. Offering personalized experiences: Personalization is becoming increasingly important in the tech industry, and smart pillows are no exception. Offering personalized experiences, such as adjustable firmness or customized sleep data tracking, can help increase sales and customer loyalty.

5. Building strong partnerships: Partnering with other companies or influencers in the health and wellness industry can help increase brand awareness and drive sales. For example, partnering with fitness or sleep tracking apps can help promote the smart pillow to a wider audience.

6. Providing excellent customer service: Providing excellent customer service is crucial for any business, but it is especially important in the tech industry where consumers may have questions or concerns about the product's technology. Providing a responsive and knowledgeable customer service team can help increase customer satisfaction and loyalty.

Conclusion

In today's globalized society, speed is the essential term that causes tension in almost everyone. Humans are bound to move quicker and faster, which increases tension.

Even students in today's society are robbed of the pleasures of childhood due to the demands of their academics. As a result, it may be stated that everyone, from adults to children, is under extreme stress. Rising stress in today's man has resulted in the cause of various ailments such as high blood pressure, headaches, insomnia, and so on. Science and technology are progressing. We want to be able to evaluate people's stress levels and so protect them from hazardous diseases, since we often believe that prevention is better than treatment. Sleep, for example, can help to regulate our stress levels. An 8 hour sleep is necessary for every human being. Hence, with the use of sleep aids, we can assist patients in overcoming sleep deprivation, which is the root cause of many disorders.

During the last decade, the smart pillow industry has grown substantially both locally and abroad. Increased awareness of the benefits of utilizing smart pillows, the availability of smart pillows in retail outlets, the incidence of sleep problems, and the adoption of smart home devices have all contributed to the market's rise. The smart pillow industry has a bright future, with steady growth projected in the following years.

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