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Implementation of Voice Recognition for an Ios Framework Based Bedtime Music Application

Alexander Jason Waworuntu

Information System for Business, Ciputra University Indonesia

Abstract
Sleep Deprived is a common health issue that can significantly impact one's quality of life. The development of an iOS-based application called Dreamify has been undertaken as an innovative solution for individuals suffering from Sleep Deprived. This project combines sophisticated technical approaches with cognitive psychology principles to provide a holistic and personalized user experience. Dreamify offers various features including sleep pattern tracking, relaxation exercises, and audioscapes, all specifically designed to enhance sleep quality. The application integrates cutting-edge sleep analysis and stress management technologies while maintaining a user-friendly approach with an intuitive and easy-to-understand interface. The primary beneficiaries of Dreamify are individuals seeking non-pharmacological solutions for their sleep issues. It is anticipated that this application will positively contribute to improving users' mental and physical health, providing an effective and practical alternative for addressing Sleep Deprived. This research provides an in-depth insight into the design and implementation of Dreamify, along with preliminary evaluations of its effectiveness and user satisfaction.

Keywords: Sleep Deprived, Sleep, iOS

INTRODUCTION

Sleep deprivation has become a significant public health issue globally. According to research in 2021, up to 45% of the global population experiences sleep deprivation. Both adults and teenagers are at risk of sleep deprivation. In fact, the prevalence of sleep deprivation in some countries is alarming, with significant reductions in sleep duration in some countries and increases in others. Teenagers, in particular, are vulnerable to depression and obesity due to sleep deprivation. The economic losses resulting from sleep deprivation are also substantial, estimated to be around $680 billion per year in five OECD countries, including the United States and Germany. Productivity is also affected due to absenteeism related to sleep deprivation, with an estimated 10 million working hours lost annually in the United States.

In Indonesia, sleep deprivation is also a significant issue. Approximately 28 million people in Indonesia, or about 10% of the population, experience sleep difficulties. Surveys show that sleep difficulties are commonly experienced by those aged between 20-22 years. A stressful lifestyle, excessive use of electronic devices, and mental health issues are the main factors causing sleep deprivation in Indonesia. Another survey found that almost a third of Indonesian society sleeps less than three hours a day, and only 25% sleep for 8 to 9 hours a day.

The effect of Sleep Deprivation

Sleep deprivation can cause various physical and cognitive impacts, including fatigue, hypertension, cognitive impairment, and increased risk of workplace accidents as well as mental health complications.

Factors such as smoking also contribute to sleep disorders in Indonesia. The long-term risks of chronic sleep deprivation include serious health problems that can threaten one's life.

The solution we need

To address sleep deprivation, a holistic solution is required, including consuming the right nutrition, engaging in sufficient physical activity, and using aids to overcome sleep difficulties. A sleep music player application is one attractive solution because it provides personal, practical, and non-pharmacological support.

Previous Study

Previous studies have provided a comprehensive overview of the effectiveness of music and music therapy in addressing sleep deprivation and improving sleep quality across various groups, including individuals with sleep deprivation related to depression and the elderly.

Trahan et al. (2019) revealed the importance of using music as a sleep aid, highlighting that stress, age, and music use are significant predictors of sleep quality scores. Scarratt, Heggli, Vuust, & Jespersen (2023) found that individual variations in music choice divide sleep music into six different groups based on audio features, with half mirroring overall sleep music characteristics and the other half having higher energy and lower instrumentality. Research by Scarratt, Heggli, Vuust, & Sadakata (2023) showed that sleep music and study music share similarities in creating a comfortable and non-disturbing auditory environment for listeners.

Dickson & Schubert (2022) found that music that helps sleep has specific features such as lower main frequency, legato articulation, moderate tempo, and major mode.

These studies provide a solid foundation for designing a music player application, considering various contexts and user groups, and exploring the potential combination of music therapy with cognitive behavioral approaches.

Technology

This research utilizes current technologies in the development of an iOS application using SwiftUI and Voice Recognition implementation. The technologies used include:

SwiftUI

SwiftUI is a user interface development framework introduced by Apple in 2019. Its declarative approach allows defining application layouts in an intuitive and clean manner.

Swift Speech Framework

This framework enables the integration of voice recognition capabilities into iOS applications.

Model-View-ViewModel (MVVM)

This software architectural pattern separates Model, View, and ViewModel to facilitate testing and code maintenance.

Combine Framework

This framework is used for managing data streams and functional reactive programming in iOS applications.

UML (Unified Modeling Language)

Used for modeling object-based systems.

Waterfall

A software development life cycle methodology that adopts a structured approach.

AV Kit

A framework for developing multimedia applications, particularly for audio and video manipulation.

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Foundation

A fundamental framework that provides classes and tools for developing applications on Apple platforms.

MediaPlayer

A vital component in Apple's ecosystem for delivering a rich and captivating multimedia experience across various devices.

By leveraging these technologies, a music player application can be developed with features suitable for user needs in addressing sleep issues.

RESEARCH METHOD

Two Sample Dependent T-test

In this research, the method used to test this research is the two-sample dependent test. The two-sample dependent test, also known as the T-test, is a statistical method used to compare the means of two samples that are dependent on each other. In this test, data is collected as 30 samples in two conditions or times for the same subject. The main goal is to determine whether there is a significant difference between the two conditions or times. The process of the two-sample dependent test is data collection, calculation of differences, and hypothesis testing. In this context, the T-test is one of the commonly used methods. This test uses the T-test distribution to calculate the T-value and determine whether the difference between the two means is significant or not.

RESULTS AND DISCUSSION

This testing process uses Google Forms and Excel, where 30 users will fill out the initial form about data and how long it takes to sleep and the second form containing how long it takes to sleep after using this application. Then, after that, we take how long it takes to sleep before and after using the application to be tested using Excel. The steps are as follows:

Step 1: Setting Hypothesis

The null hypothesis (H0) is the result if the difference before and after using the application is the same (no change).

The alternative hypothesis (H1) is the result if the difference before and after using the application is not the same.

Step 2: Collecting Data and Calculating the Difference

The collected data is how long it takes to sleep before and after using the application, and to calculate the difference, we will find the difference (d) by finding the difference between the data for each before and after using the application. Here is an example of the diagram and the results:

Nama :	Berapa lama waktu yang dibutuhkan untuk tertidur ?	Berapa lama waktu yang dibutuhkan untuk tertidur setelah menggunakan Aplikasi Dreamify (	Difference (d)
Julian	50	30	20
Fran	60	48	12
Adam	45	37	8
Shendy	40	38	2
Krisna	30	29	1
Sixco	90	55	35
Catherine	55	34	21
Matthew	45	36	9
Dicky	55	41	14
Nicho	40	29	11
Hans	90	43	47
Justin	40	35	5
Gilbert	45	32	13
Richard	60	34	26
Haryanto	80	48	32
Bobby	60	39	21
Eric	30	24	6
Jeffry	50	32	18
Grace	30	19	11
Jen	40	22	18
John	40	26	14
Michael	45	28	17
Kelvin	60	44	16
James	45	31	14
Putri	40	18	22
Putu	50	29	21
Fikri	60	38	22
Devara	50	26	24
Iqbal	45	34	11
Joshua	55	33	22
			$\sum d =$ 513
n = 30			

Step 3 : Calculating the Average Difference ($\bar{d}$)

To calculate the average difference, we need the result of ($\sum$d) obtained by summing up all the differences and (n) derived from the total data of 30. Here is the formula and the calculation result: $\bar{d} = \frac{\sum d}{n} = \frac{513}{30} = 17{,}1$

Step 4 : Calculating the Standard Deviation of Differences (S_d)

To calculate the standard deviation of differences, we need $\sum(d - \bar{d})^2$ which is derived from each difference (d) subtracted by the average $\overline{(d)}$, then each result is squared and summed up. Here is the formula and the calculation result:

$$S_d = \sqrt{\frac{\sum(d - \bar{d})^2}{n-1}} = \sqrt{\frac{2780{,}7}{30-1}} = 9{,}792$$

Step 5 : Calculating the t-value

To calculate the t-value, we use the t-test formula for paired samples. We need the average difference ($\bar{d}$), standard deviation of differences (S_d), and the number of data (n). Here is the formula and the calculation result: $t = \frac{\bar{d}}{S_d/\sqrt{n}} = \frac{17{,}1}{9{,}792/\sqrt{30}} = \frac{17{,}1}{1{,}7877} = 9{,}565$

Step 6 : Interpreting the Results

With the t-value obtained as 9,565 the standard deviation (Sd) sebesar 9,792 and the common critical value used is 5% or 0.05, the t-test result for the paired sample difference can be interpreted as follows: The obtained t-value is greater than the critical value at the selected significance level, so the null hypothesis (H0) is rejected, and it can be concluded that there is a significant difference between the means of the two paired data groups.

System Design

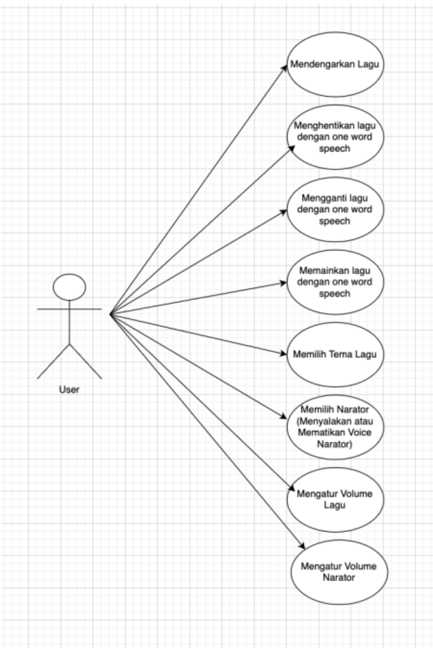

Figure 2

Use case diagram is a diagram that explains the interaction between the user and the system. Figure 2 shows the use case diagram that the author will create within the iOS application. From Figure 2, it can be seen that the user can listen to songs, stop the song with one-word speech.

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Implementation

Onboarding Screen

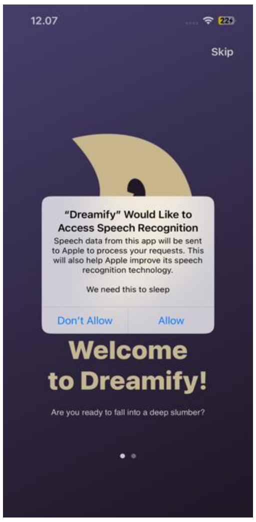

Figure 3

On the Onboarding Screen shown in Figure 3,the user can press "allow" for several permissions so that all the features available in this app can work. Then, after that, press the skip button and will move to the Select Stories page.

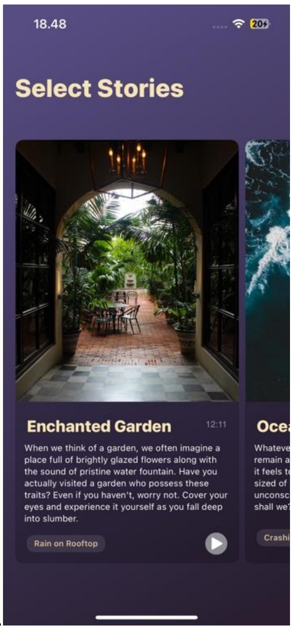

Figure 4

On this screen, as shown in Figure 4, the user can see various song options and their descriptions.

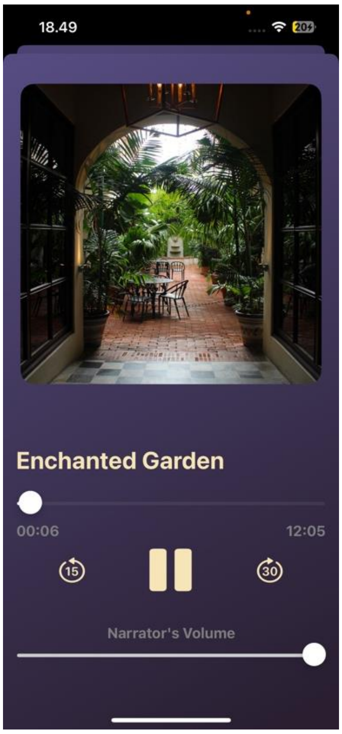

Figure 5

On this screen, as shown in Figure 5, after the user selects a song, the song will be played, and the user can control the song using one-word speech on this page.

Conclusion

A music sleep-inducing application can help students who have difficulty sleeping by sending stimulation to the cerebral cortex in the brain, giving a calming and relaxing effect on the heart, so that the mind becomes calm and the quality of sleep becomes good and sufficient. The music listened to will send stimulation to the cerebral cortex, which can help reduce stress and sleep disturbances. In this research, from the analysis, design, implementation, and testing of the application, the author concludes that:

1. The application design has successfully produced a sleep-inducing application with one-word speech based on iOS that is easy and efficient to use.
2. This application has a one-word speech feature that is useful for helping users to reduce contact with their iPhone so that they can still control the song by saying the keyword only.
3. The features available on the application have successfully addressed the problem and the needs of users to help users overcome sleep difficulties.

Suggestion

1. Suggestions for further development of the application are: improving the voice recognition part to work more effectively.
2. There is a need to add a feature to conserve battery life.
3. Providing more song options and narration.

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