

CHAPTER 1

INTRODUCTION

Background of the Study

The development of a mobile app-controlled head massager device is a response to the ever-increasing demand for innovative solutions to address the wellness and stress reduction needs of individuals in our fast-paced, modern world. The relentless pace of modern life has placed a premium on convenient and effective ways to relax and reduce stress. This device takes advantage of the ubiquity of smartphones and the proliferation of health and wellness apps to offer a novel way of achieving relaxation and well-being. In a study conducted by Bieda A. et al. (2016), titled "The effects of daily stress on positive and negative mental health: Mediation through self-efficacy," the researchers aimed to explore the impact of daily stressors on mental health, considering the role of self-efficacy. They highlighted the increasing recognition of daily stress as a significant risk factor for mental health, independent of traumatic events.

In our contemporary society, smartphones have become an indispensable part of our lives, serving as multifunctional tools that provide access to a wide range of services and utilities. Among the many applications available, health and wellness apps have gained immense popularity. These apps enable users to take control of their well-being, from tracking their fitness routines to monitoring their sleep patterns. The idea of integrating a head massager with a mobile app capitalizes on this trend, allowing users to remotely control and monitor the device, thus making it incredibly convenient and user-

friendly. In another study conducted by Almeida D. et al. (2013), titled "The Wear and Tear of Daily Stressors on Mental Health," the researchers noted that seemingly insignificant daily events can have long-term effects on mental well-being, despite receiving limited research attention

Traditional head massagers, while effective, often come with their own set of limitations. They can be costly, making them less accessible to a broad audience. Moreover, the inconvenience of having to visit a spa or wellness center for a head massage can deter individuals with busy schedules. Customization options are often limited, as these devices offer a one-size-fits-all approach, which may not cater to the unique needs and preferences of each user. This has created a clear need for a more advanced and adaptable solution. It's important to recognize that the experience of a head massage is highly individualized. Factors like the intensity, duration, and technique of the massage can vary significantly from one person to another. Therefore, it's essential to create a device that empowers users to tailor their head massage experience to their specific requirements. By doing so, it ensures that users can derive maximum relaxation and therapeutic benefits from the device. In another study conducted by BASO, NBR, and W. R. W. Omar. "DEVELOPMENT ON PORTABLE LUMBAR SUPPORTER WITH ELECTRONIC MOTOR MASSAGER FOR LOW-BACK PAIN RELIEVER." (2022). massager electronic components (control system), the Arduino Uno R3 microcontroller and the Motor Driver (L298), which controls two DC motors, are powered by a 7.3-volt power source (installed together in control system). Activating the sequence rollers on each DC motor causes a shiatsu-like movement in the motor. The device itself can be controlled from user's smartphone via blynk application.

A comprehensive market analysis has been conducted to ascertain the potential of a new app-controlled head massager. As technology continues to advance at a

rapid pace, this device can harness the latest innovations to provide a highly personalized and effective head massage experience. The market analysis will also help in identifying gaps in the current offerings and evaluating the competition in the wellness and massage device market. This information provides a solid foundation for understanding the potential impact and success of the device within the broader market landscape.

In conclusion, the development of a mobile app-controlled head massager represents a timely fusion of technology and wellness. This innovative device not only aligns with the needs and preferences of modern consumers but also addresses various challenges related to safety, regulation, and technological constraints. It holds the potential to make head massages more accessible, effective, and enjoyable, ultimately contributing to the overall well-being and relaxation of users in today's fast-paced world. This project promises to enhance the quality of life by offering a convenient and customizable solution for stress reduction and relaxation, which is in high demand in our modern society.

Objectives of the Study

The General objective of the study is to develop a Bluetooth relaxation headgear massager controlled through an application.

Specifically aims to:

- a. Design a prototype of headgear with a massage function.

- b. Fabricate the prototype using a mobile application, DC motors, and a microcontroller with a Bluetooth module.
 - c. Test the prototype in terms of functionality, applicability, and safety.
 - d. Evaluate the performance or acceptability of the prototype.
2. Fabricated the device using the following components:
- a. ESP32WROOM
 - b. DC Motor
 - c. 3D Printed Base Frame
3. Create the program using the C++ Language
4. Test to improve the functionality of the device, and
5. Evaluate the performance of the prototype.

Scope and Limitation of the Study

This study focuses on developing a Bluetooth-controlled head massage headgear device and the corresponding mobile app for controlling the device. It encompasses the design and creation of a functional prototype, mobile app integration, and a comprehensive evaluation of the user experience, with a primary emphasis on stress relief and relaxation. Market analysis is conducted to identify competitors, market trends, and potential target

demographics, aiding in the effective positioning of the product. The study also considers the incorporation of safety features in the device design and explores its technical feasibility. However, it should be noted that the study is limited to the prototype stage and does not yet address mass production, scalability, regional market specifics, or long-term user satisfaction.

This study is subject to constraints related to time and resources, which may impact the depth of research in various areas. While market analysis is part of the scope, the study does not delve into the specifics of regional or country-based markets or extensively address business-related aspects beyond preliminary assessments. Additionally, it refrains from making medical or therapeutic claims about the device, as it is designed for relaxation and well-being, not for medical purposes. The study may not fully cover the wide spectrum of user diversity, including those with specific medical conditions or disabilities. It may not provide insights into potential issues that may arise with long-term use.

Significance of the Study

The significance of this research becomes apparent in its ability to bridge the divide between modern technology and individual well-being, presenting a Bluetooth-controlled head massage headgear device with mobile app integration as a potential remedy for the stress and tension that pervade our fast-paced and demanding lives. This innovation underscores the transformative role of technology in enhancing personal wellness, offering users a personalized and easily accessible means of managing stress. It not only caters to the burgeoning demand for relaxation solutions but also underscores the importance of user-centric design, with a focus on customization and comfort. Moreover, the study's

market analysis yields invaluable insights for entrepreneurs and businesses, guiding them in recognizing opportunities within the wellness and technology sectors. Through this research, it becomes evident how the fusion of traditional wellness practices with contemporary technology contributes to ongoing advancements and makes wellness solutions more widely available and inclusive, benefiting a diverse spectrum of users.

Furthermore, the significance of this study is heightened by its potential to provide a technologically innovative and convenient solution for stress relief and relaxation, addressing a pertinent need in today's high-stress environment. It signifies the synergy of modern technology and traditional well-being practices, revealing how the combination can lead to a more balanced and healthier lifestyle. The user-centric approach, enabling personalization and comfort, showcases the importance of considering individual preferences in wellness solutions. As the study delves into market analysis, it empowers businesses to tap into emerging opportunities and design products that cater to the evolving demands of the wellness and technology markets. Ultimately, this research contributes to the ongoing dialogue about the role of technology in promoting well-being, pushing the boundaries of innovation, and making relaxation and stress management accessible to a wide and diverse user base.

CHAPTER 2

CONCEPTUAL FRAMEWORK

Review of Related Literature and Studies

Head massage

Head massage has been practiced for centuries around the world and has been used for relieving stress, headaches and reducing tension. Head massage involves pressing and applying pressure points on the said part of the head, and uses various types of techniques for massaging, and going beyond its extent, it not only focuses on giving relaxation but also the good benefits like improving blood circulation to the scalp and promoting the healthy growth of hair. Which helps relieve headaches, reduces stress and anxiety, improves sleep quality, enhances mental clarity, and helps soothe the muscles.

In a study conducted by Deng, X. et al. (2022). 3D digital head-shaped platform construction for head acupoint massage product design. The research paper focuses on designing head acupoint massage products suitable for Chinese head shapes. It suggests using a 3D digital head-shaped platform to examine how well these products fit and are adaptable. Based on theories from traditional Chinese medicine, the platform reconstructs head models and creates 3D distribution models of meridians and acupoints. Additionally, a design module for gap and acupoint space analysis is included. The effectiveness of the module is demonstrated through a case study using a head massager, which also demonstrates how the product can be optimized for better

fit and precise acupoint massage. The suggested platform helps create head acupoint massage products that are more comfortable and effective.

In another study conducted by Aman C, and Rajkumar E. (2021). Design, Analysis, Control, and Manufacturing of a Head Massaging Machine. This paper presents a new design for a head massaging machine that focuses on pressing the optimum pressure points on the forehead to provide quick relief from headaches. The design makes use of a linear actuator-modified rocker arm mechanism. The paper uses simulations and finite element analysis to describe the entire design, control, and manufacturing process. A variety of tests are performed on the design, including stress analysis, frequency response analysis, fatigue test, and thermal analysis. SOLIDWORKS software is used to create the computer-aided design, and ANSYS is used for finite element simulations and optimization. The paper also discusses manufacturing planning and suggests using Nylon 6 for 3D printing with a Flash Forge Guider II printer. The Arduino UNO is used to design the control system.

In a study conducted by Ernst E and Lee Ms (2010). Acupressure: An Overview of Systematic Reviews. The study discusses the nine systematic reviews that were published between 1996 and 2010 were found by the authors after they conducted a literature search. The reviews evaluated the efficacy of acupressure for ailments like dysmenorrhea, vomiting, and allergic rhinitis. The majority of the reviews, however, were of low quality and based on primary studies with methodological issues. These reviews' conclusions varied, with some pointing to promising outcomes and others indicating ambiguous results. Overall, the evidence is scarce and contradictory, making it difficult to determine whether acupressure is effective for treating any

condition. The authors stress the importance of conducting a more thorough scientific analysis of acupressure and issue a warning against making unproven therapeutic claims.

DC MOTORS

A DC motor is a type of electric motor that converts electrical energy into mechanical rotation. It operates on the principle of electromagnetic induction, where a magnetic field is generated by passing an electric current through a coil of wire, known as an armature. This magnetic field interacts with permanent magnets or other magnetic components to produce rotational motion. In the context of headgear relaxation, a DC motor can be employed to enhance the relaxation experience by providing gentle vibrations or massage-like sensations. The motor can be integrated into the headgear design, allowing users to enjoy the benefits of relaxation therapy conveniently and comfortably.

In a study of Arce D, et al (2018). Automatic M1-SO Montage Headgear for Transcranial Direct Current Stimulation (TDCS) Suitable for Home and High-Throughput In-Clinic Application. This study aimed to develop and test a new headgear design for non-invasive transcranial direct current stimulation (tDCS) over the motor cortex, specifically the M1-SO montage. This montage typically requires precise measurements using the 10-20 EEG system, which can be inconvenient for clinics and patients. However, the researchers successfully designed a headgear prototype that eliminates the need for measurements by utilizing an orthogonal, fixed-

angle approach to connect the frontal and coronal components. The accuracy and replicability of the headgear were evaluated through electrode position comparisons and computational modeling. The results demonstrated the successful inclusion of navigational points for accurate electrode placement, resulting in minimal deviation from the C3 position. This novel approach simplifies tDCS studies in home settings and replaces the cumbersome measurement process for clinical tDCS applications.

In another study of Wolny, S. (2012). *The Influence of Operating Loads on the State of Stress and Strain in Selected Load-Bearing Elements of a Tower-Type Headgear Structure*. Operating loads have a significant impact on the stress and strain experienced by load-bearing elements in a tower-type headgear structure. A structural engineering analysis is conducted to assess this influence. The analysis is typically carried out by a team of structural engineers or consultants with relevant expertise. The specific organization or individuals responsible for the analysis depend on the project and can vary. The analysis involves considering the design and specifications of the structure and assessing anticipated operating loads such as wind, snow, seismic forces, or dynamic loads from machinery. Techniques like finite element analysis are employed to determine the state of stress and strain in the selected load-bearing elements under these operating loads.

Cause of Headaches in Daily Life

The causes of headaches in daily life can vary and are often multifactorial. Common triggers include stress, tension, dehydration, lack of sleep, poor posture, eye strain from prolonged screen time, caffeine withdrawal, sinus congestion, and muscle

tension in the neck and scalp. Additionally, certain foods, such as those containing MSG or artificial sweeteners, alcohol, and processed meats, can act as triggers for some individuals. Hormonal changes, particularly in women during menstruation or menopause, can also be a contributing factor. Environmental factors like loud noises, strong odors, and bright lights can provoke headaches in susceptible individuals.

Identifying and addressing the specific triggers, maintaining a healthy lifestyle, practicing stress management techniques, and seeking medical advice, when necessary can help mitigate the frequency and intensity of headaches in daily life.

In a study conducted by Hainer B MD. and Matheson E. MD (2013), titled “Approach to Acute Headache in Adults,” around half of the global adult population experiences some form of headache disorder. To distinguish between primary headaches (such as tension, migraine, and cluster headaches) and secondary headaches (caused by underlying conditions like infection or vascular disease), physicians can rely on the classification and diagnostic criteria provided by the International Headache Society. By conducting a comprehensive medical history review, performing a thorough physical examination, and being familiar with the characteristic symptoms of primary headaches, healthcare professionals can potentially minimize the necessity for further investigations such as neuroimaging, lumbar punctures, or additional tests.

In another study conducted by Binkley P. MD et al. (2016), titled "What Factors Contribute to Headache-Related Disability in Teens?" In adolescents experiencing frequent migraine headaches, depression emerges as the most influential risk factor for disability associated with headaches. Stress is recognized as a potential

trigger for headaches, and teenagers expressed their desire to acquire straightforward stress management techniques through a smartphone application to alleviate the impact of headache-related disability.

Daily Stressors

Daily stress is a prevalent experience characterized by the psychological and physiological strain individuals face due to the demands and pressures of their everyday lives. It stems from various sources such as work responsibilities, financial pressures, relationships, and time constraints. This stress can manifest as emotional distress, physical tension, cognitive overload, and behavioral changes. If not effectively managed, daily stress can have adverse effects on mental and physical health, including anxiety, fatigue, sleep disturbances, weakened immunity, and reduced overall well-being. Therefore, it is crucial for individuals to adopt healthy coping strategies, engage in relaxation techniques, seek social support, and prioritize self-care to mitigate the negative impact of daily stress and maintain resilience in the face of life's challenges.

In a study conducted by Bieda A. et al. (2016), titled "The effects of daily stress on positive and negative mental health: Mediation through self-efficacy," the researchers aimed to explore the impact of daily stressors on mental health, considering the role of self-efficacy. They highlighted the increasing recognition of daily stress as a significant risk factor for mental health, independent of traumatic events. The study specifically examined the mediation effects of self-efficacy on

positive and negative mental health, taking into account the dual-factor model that views mental health as more than the absence of psychopathological symptoms.

In another study conducted by Almeida D. et al. (2013), titled "The Wear and Tear of Daily Stressors on Mental Health," the researchers noted that seemingly insignificant daily events can have long-term effects on mental well-being, despite receiving limited research attention. The study aimed to investigate the relationship between daily negative affect, emotional reactivity to daily stressors, and their predictive role in general affective distress, self-reported anxiety, and depressive disorders after a 10-year period since initial assessment.

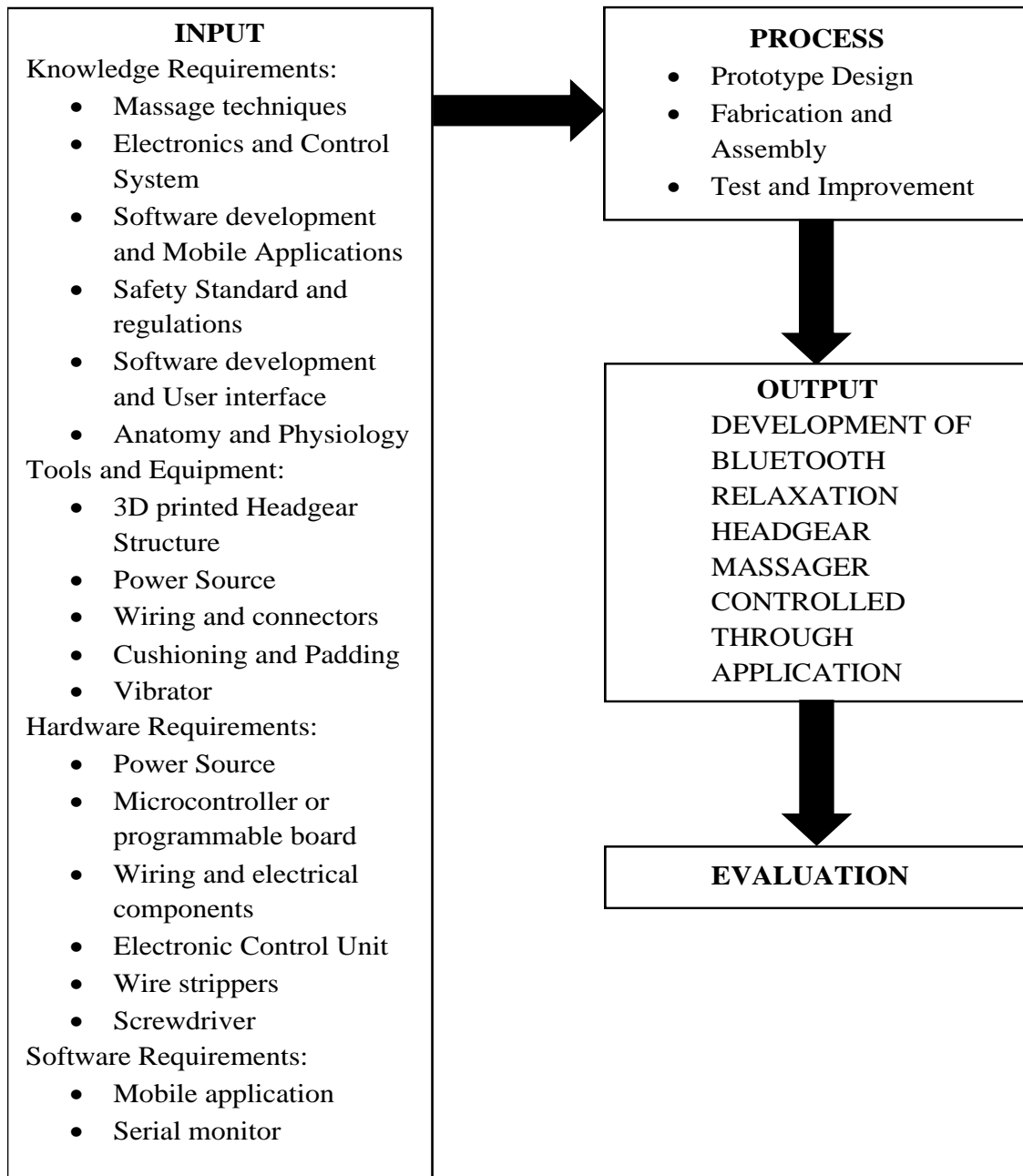


Figure 1: Conceptual Model of the Study

Operational Definition of Term

Stressor Refers to the routine events, tasks, or circumstances that individuals encounter in their daily lives that may lead to feelings of stress or tension.

DC Motor used to convert direct currents (DC) electrical energy into mechanical motion, generating rotational movement.

Lithium-Ion batteries support rapid charging, allowing users to quickly recharge the head massager and minimize downtime between uses.

Vibration where the massagers produces vibrations to stimulate the scalp and provide soothing effect.

Rollers a small rotating part that mimic the feeling of fingers massaging the scalp patterns.

Rechargeable battery powered and does not require a constant connection to a power source, offering more convenience and mobility.

3D Massage refers to the multidirectional movement of the massaging nodes, providing a more realistic massage experience

Ergonomic Design the shape and the structure of the headgear massager are designed to comfortably fit the size or the contour of the head.

Adjustable Intensity allow users to customize the strength and speed if the massage according to their preference.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter includes the project design of the system, such as drawing projection, block diagram, and the process following the concepts. The prototype components used for the design phase, development phase, testing phase and review phase. And lastly, the operation testing procedures and the evaluation procedures.

1. Project Design

The project is involved in designing to provide a soothing and relaxing experience to alleviate stress, tension and discomfort, offering a convenience to the users. This headgear will be comfortable and adjustable, integrating massager mechanisms for soothing variation of movements. The massager will help to relax the muscles, promoting a sense of calm which reduces the stress. It offers an accessible way to enjoy the benefits of the massager without seeking a professional masseuse and convenience especially in managing the demands of a busy lifestyle. This Bluetooth-enabled headgear massager will be controlled through the mobile application which will provide the ability to customize their massage experience by connecting the device to the headgear via Bluetooth adjusting the settings the intensity and speed according to their preference and comfort. Overall goal is to create user-friendly and effective solutions for personalized relaxation and well-being of the user. This may offer benefits individually but it still varies, it is still advised that if the user has any existing health conditions, they need to consult with a healthcare professional before incorporating themselves into using the headgear.



Figure 2: Headgear

The Bluetooth Relaxation Headgear Massager is designed to provide a soothing and relaxing experience to the user. The prototype design incorporates various materials and features to enhance comfort and usability.

- a. **3D-Printed Plastic Exterior:** The headgear's exterior is made of 3D-printed plastic, which helps to reduce the weight of the device while maintaining its structural integrity. This lightweight design ensures that the headgear remains comfortable to wear for extended periods.
- b. **Padding** The interior of the headgear is lined with a rubber material. This padding helps to create a gentle and pleasant sensation against the user's skin, enhancing their comfort during use. Additionally, the padding helps to prevent any irritation or discomfort that could be caused by direct contact with the plastic components.



Figure 3: Temple Rotation

This device is equipped with an innovative rotating mechanism specifically designed to target the temporal area of the head. By focusing on this region where tension and discomfort often occur, the headgear aims to alleviate stress, enhance blood circulation, and promote overall relaxation. With the integration of the rotating mechanism, the headgear can gently and smoothly rotate around the temporal area, delivering a soothing massage that combines the benefits of movement and pressure. This rotation stimulates the muscles and tissues, providing relief from tension, reducing headaches, and inducing a sense of calmness. The speed and intensity of the rotation can be adjusted to cater to individual preferences, and Bluetooth connectivity enables users to customize the settings according to their specific needs.

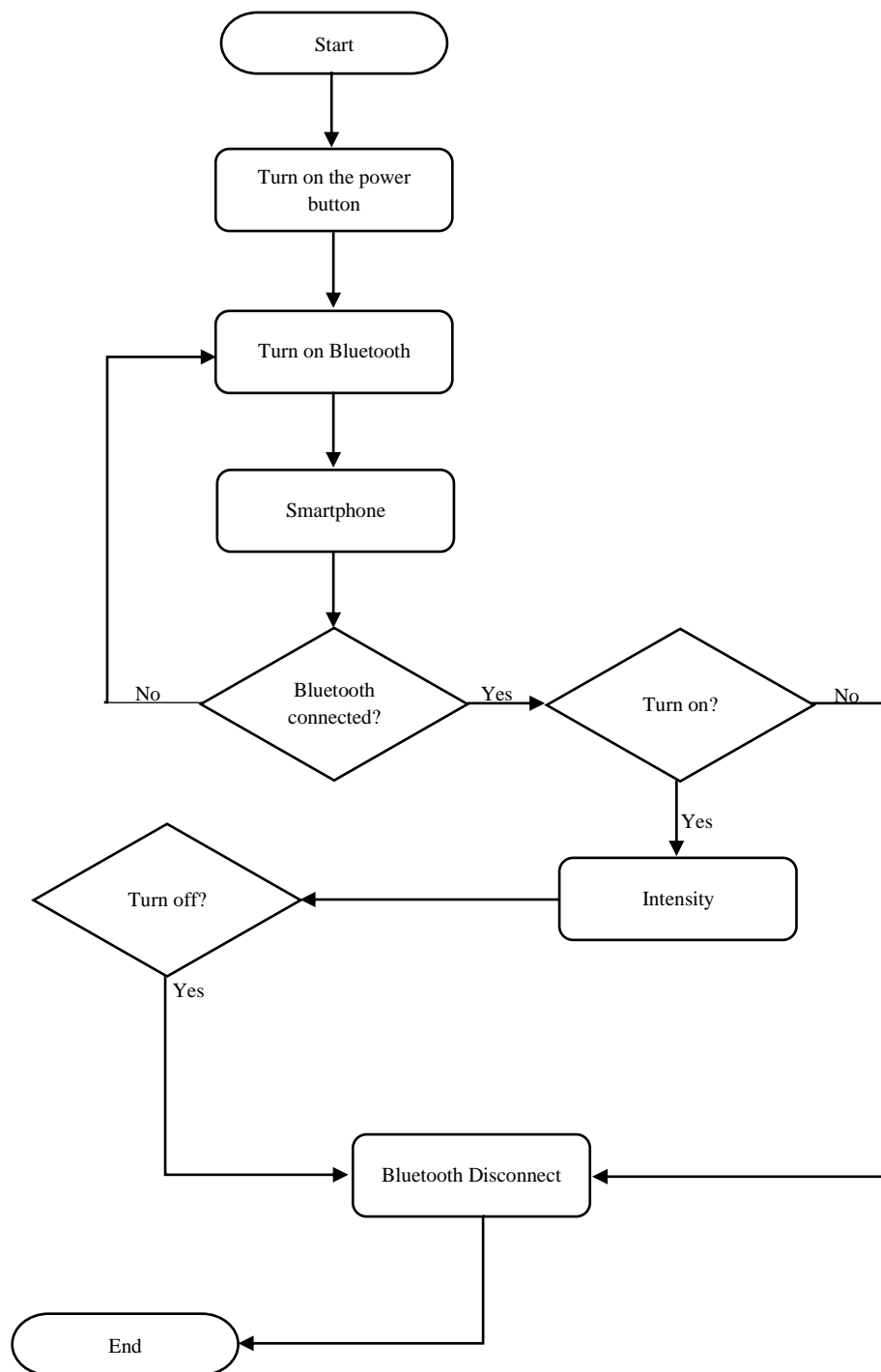


Figure 4: Flowchart of the Prototype

In the showcase the system flowchart of the prototype together with the mobile. On the figure it shows how is the prototype is working together with the use of the mobile application, for a person to be able to use the control prototype. The user is required to have the application first to be installed on the phone and then after that turn on the power button of the prototype. Next is to enable the Bluetooth on the user's phone so that the Bluetooth name of the prototype will show on the user's end.

Once the user connects to the mobile application already connected with the prototype, they can now control the intensity of the vibration and rotation while the person is using the headgear massager.

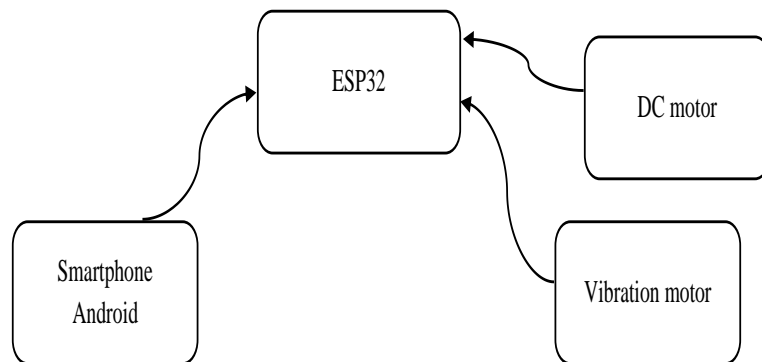


Figure 5: Block diagram

Prototype Components

A. ESP32WROOM is a Wi-Fi and Bluetooth-enabled microcontroller chip. It features a Wi-Fi connectivity allowing devices to connect to wireless networks and communicate with other devices or the internet., Bluetooth functionality enabling devices to communicate with other Bluetooth-enabled devices such as smartphones, tablets, or Bluetooth peripherals., and various peripheral interfaces.

B. DC Motor, short for Direct Current motor, is an electrical device that converts electrical energy into mechanical motion. It operates using the principles of electromagnetic induction, where a current-carrying conductor experiences a force in the presence of a magnetic field. DC motors are commonly used in various applications, including robotics, industrial machinery, automobiles, and household appliances, to provide rotational motion and control speed and torque. They can be powered by a direct current source such as batteries or power supplies.

2. Project Development

a. Design Phase

This is where the objectives, requirements, and conceptual designs of the device are defined. The system architecture is established, considering the integration of rotating mechanisms, roller movement, and Bluetooth connectivity. Suitable components are carefully selected, focusing on durability, size, and power consumption, and its cost effective and scalable for mass production. The mobile application interface is developed to provide users with intuitive control over the device, allowing customization of massage settings, speed, and intensity. A functional prototype is created, rigorously tested, and

refined based on user feedback, ensuring a versatile and customizable relaxation experience that promotes overall well-being and stress relief.

b. Development Phase

This is the implementation and realization of the designed system. It begins with the assembly of the necessary components, including the rotating mechanism, roller mechanism and Bluetooth module, ensuring their proper integration. The mobile application is developed, focusing on creating a user-friendly interface for controlling the device's settings and functionalities. The software is programmed to establish seamless communication between the headgear and the application, allowing users to customize massage parameters like the intensity and the speed of the roller. Thorough testing is conducted to verify the functionality, performance, and safety of the device, making necessary refinements based on the test results. This device will target those people who experience stress and headache. The development phase aims to transform the design into a fully functional Bluetooth Relaxation Headgear Massager ready for production and subsequent stages of manufacturing. This will be conducted with rigorous testing for safety, durability, and functionality before letting people to use the headgear massager, by seeking a professional opinion while in the process of developing.

c. Testing Phase

While in the process of testing the device, comprehensive evaluations are conducted to ensure the functionality, performance, and safety. There will be various tests that will be conducted for testing the safety and also to check the rotating mechanism, roller movement, and Bluetooth connectivity. The mobile application is thoroughly tested to

guarantee connection with the headgear, and for precise control over the massage setting, for the researcher in order to evaluate the overall comfort, effectiveness, and user experience of the relaxation functions, user feedback will also be collected, while in the process of testing the prototype. The performance of the prototype and the user satisfaction are improved by taking care of and improving any issue or problem that requires changes on the device. The testing stage attempts to verify the Bluetooth Relaxation Headgear Massager device's dependability and effectiveness, making sure it satisfies the necessary requirements and offers users a secure comfort and the effectiveness of the prototype.

d. Review Phase

During the review phase, assessment will be held to determine the project overalls success. To make sure that the goal and specifications have been fulfilled, the design, development, and testing phases are examined. The device usability, performance and usefulness are carefully evaluated, taking user recommendation into consideration. Any necessary refinements or improvements are documented for future updates. In addition to giving users a complete and customizable relaxation experience and a smooth integration with mobile application control, the review phase will be the last phase to check that the Bluetooth Relaxation Headgear Massager satisfies the user.

3. Operation Testing Procedures

The operational testing procedures for the development of the Bluetooth relaxation headgear massager and ear acupressure controlled through an application involve a comprehensive set of steps to ensure its functionality and effectiveness. Firstly, the hardware components of the headgear device will be examined for proper assembly,

durability, and comfort. This includes assessing the quality of the materials used, the reliability of the Bluetooth connectivity, and the overall ergonomic design. Secondly, the application interface will be tested to ensure seamless communication between the user's smartphone and the headgear, allowing for convenient control and customization of the massaging and acupuncture settings. Compatibility with various operating systems and devices will also be evaluated. Furthermore, the massaging and acupuncture functions will be thoroughly assessed, considering factors such as intensity levels, patterns, and targeted pressure points for relaxation and stress relief. The effectiveness and user experience will be measured through subjective feedback and objective metrics such as heart rate variability and stress levels. Overall, the operational testing procedures aim to validate the functionality, usability and benefits of the Bluetooth relaxation headgear massager, ensuring a high-quality product for users seeking relaxation and well-being.

4. Evaluation Procedures

The researchers will have at least 25 individuals who have been experiencing headaches and stress. Participants may come from diverse backgrounds, ages, and even professions, reflecting the wide range of impact of stress related headaches on various populations. Determining processes, the confidentiality and privacy of the participants, ensuring that their personal information remains protected throughout the research process. This will need consent for the protocol to be followed, an outline of the purpose of the study and the rights of the participants. The participants will take part in advancing the understanding of the stress and headaches, contributing to the development. The data gathered will be evaluated via Likert scale shown on Table 1. Descriptive interpretation of the meaning is shown on Table 2.

Table 1*Likert Scale*

Numerical Scale	Descriptive Rating
5	Excellent/Highly Acceptable
4	Very Good/Very Acceptable
3	Good/Acceptable
2	Fair/Fairly Acceptable
1	Poor/Not Acceptable

Table 2*Descriptive Interpretation of the Mean*

Numerical Scale	Interpretation
4.51 – 5.00	Excellent/Highly Acceptable
3.51 – 4.50	Very Good/Very Acceptable
2.51 – 3.50	Good/Acceptable
1.51 – 2.50	Fair/Fairly Acceptable
1.00 – 1.50	Poor/Not Acceptable

CHAPTER 4

RESULT AND DISCUSSION

This chapter covers the different aspects of the system, such as its description, structure, capabilities, and limitations. The following sections also discuss the testing and evaluation results of the project.

Project Description

This project involves the design and development of a Bluetooth-enabled headgear massager that can be controlled via a mobile application. The primary objective is to create a user-friendly and customizable massaging device aimed at alleviating stress, improving blood circulation, and relieving headaches and muscle tension. The headgear massager will incorporate various massage modes, including kneading and vibration, each of which can be adjusted in intensity to suit individual preferences. The prototype is adjustable fit in different head sizes and able to connect to Bluetooth using its application; therefore, Bluetooth is the key to adjusting the intensity of the massages, such as the kneading and vibration of motors. In terms of power, the headgear is rechargeable, allowing the user to use it anywhere, and it can also be used while plugged in.

Project Structure

The main system components that follow in this study are from the project design. Its structure is meant to provide a systematic approach to the project, covering every

necessary component from early planning to final implementation and testing of the project. Delivering an efficient, mobile, and user-friendly gadget that satisfies contemporary consumers' demands for stress relief and wellness.

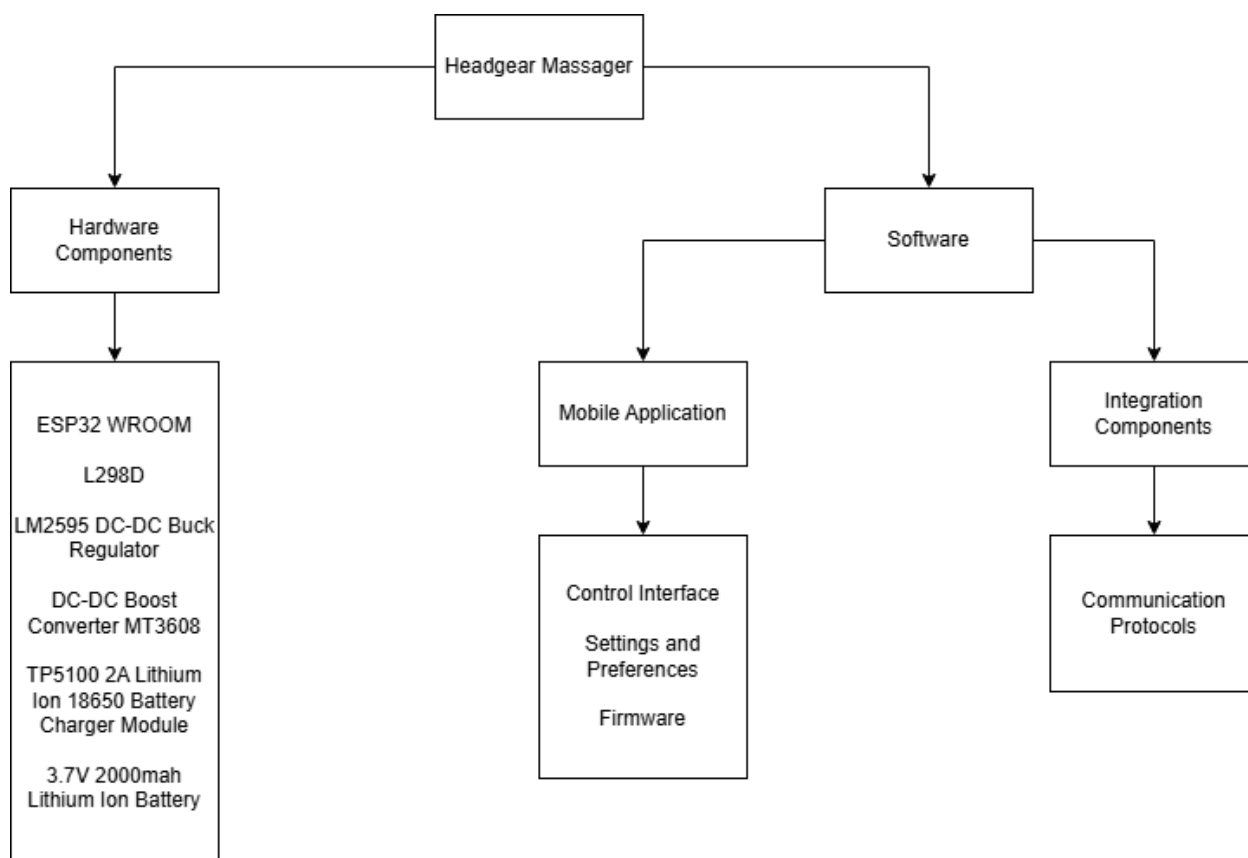


Figure 6: Project Structure of the Prototype

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head_gear - B4A
File Edit Designer Project Tools Debug Windows Help
Main x Starter
Process Globals
30 Private Connected As Boolean = False
31 Private Stream As AsyncStreams
32 End Sub
33
34 Sub Activity_Create(FirstTime As Boolean)
35 Activity.LoadLayout("home")
36 Serial.Initialize("Serial")
37 End Sub
38
39 Sub Activity_Resume
40 GuiUpdate
41 SbSpeed_ValueChanged(SbSpeed.Value, False)
42 End Sub
43
44 Sub Activity_Pause (UserClosed As Boolean)
45 End Sub
46
47 Private Sub SbSpeed_ValueChanged (Value As Int, UserChanged As Boolean)
48 LblSpeed.Text = $"Speed: ${Value}%"$
49 SendData
50 End Sub
51
52 Private Sub Switch_ValueChanged (Value As Int)
53 SendData
54 End Sub
55
56 Private Sub BtnConnect_Click
57 If BtnConnect.Text = "Connect" Then
58 Dim PairedDevices As Map
59 PairedDevices = Serial.GetPairedDevices
60
61 Dim l As List
62 l.Initialize
63
64 For i = 0 To PairedDevices.Size - 1
65 l.Add(PairedDevices.GetKeyAt(i))
66 Next
67
68 InputListAsync(l, "Bluetooth Device", -1, True)
69
70 Wait For InputList_Result (Index As Int)
71
72 If Index <> DialogResponse.CANCEL Then
73 Serial.Connect(PairedDevices.Get(l.Get(Index)))
74 End If
75 Else
76 Stream.Close

```

Figure 7: Mobile Application Code

A mobile application created with B4A (Basic4Android) can be developed, using the code as a strong foundation. The program sends data over the Bluetooth link, manages user input, and keeps an open connection with a Bluetooth device. The essential elements include managing UI interactions, managing Bluetooth connections, and adapting the UI based on connection state. This setup offers a foundational structure for further modifications and tweaks, enabling users to tailor the application to their specific needs and add new features as required.



Figure 8: Circuit Connection

Figure 1 shows the ESP32 WROOM microcontroller. This serves as the main core processing unit and is responsible for maintaining several components; enabling them to communicate with a mobile application.

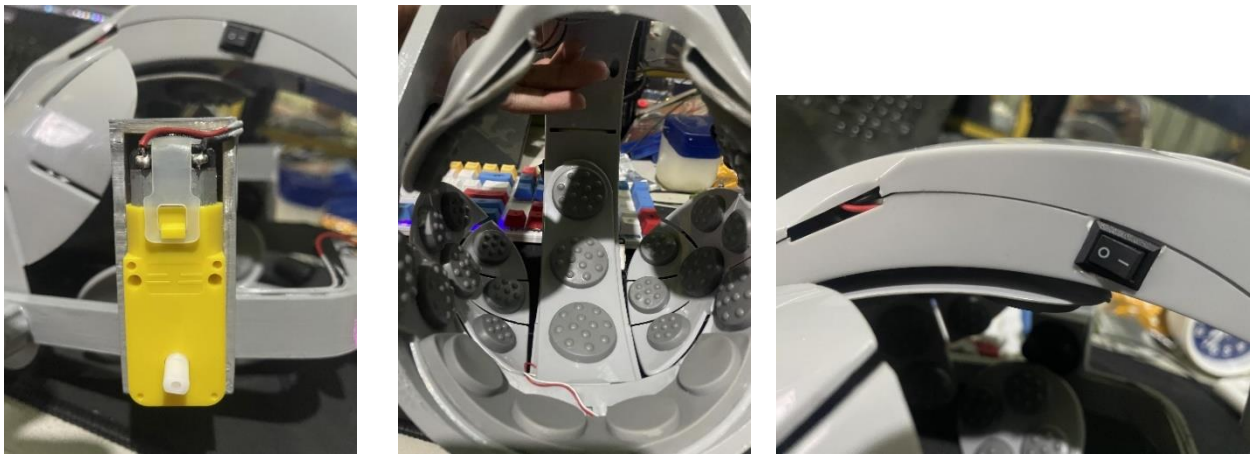


Figure 9: Motor Driver and Power Management

Figure 2 illustrates the motor driver and power management mechanism. The DC plastic gear motor is controlled through the L298D motor driver, which enables accurate massage level adjustments. The system also includes a DC-DC Boost Converter (MT3608) and a DC-DC Buck Regulator (LM2595) to guarantee a steady voltage supply

to the motor and other parts. These regulators are essential for preserving reliability and shielding the parts from variations in voltage.



Figure 10: Battery Charging Module

Figure 3 illustrates the battery charging port, which includes a 3.7V 2000mAh Lithium Ion Battery and a TP5100 2A Lithium Ion 18650 Battery Charger Module. The battery depends on the charger module to prevent overcharge and overheating; thus, it ensures the battery's lifespan and reliability. When full charged, the battery supplies power to all the components, allowing them to use wirelessly and enhancing user's comfort.

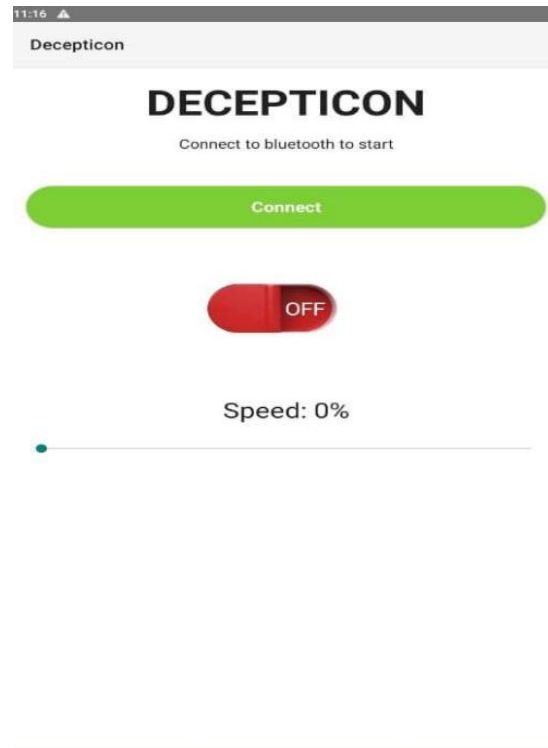


Figure 11: Home page of the Mobile Application

a) Home Page

The home page of the system is the only interface a user will see when accessing the app. This publicly accessible page enables users to connect and disconnect the head massage device. The home page includes controls for changing the speed and turning the device on and off. The figure below shows the interface as it appears on a smartphone.

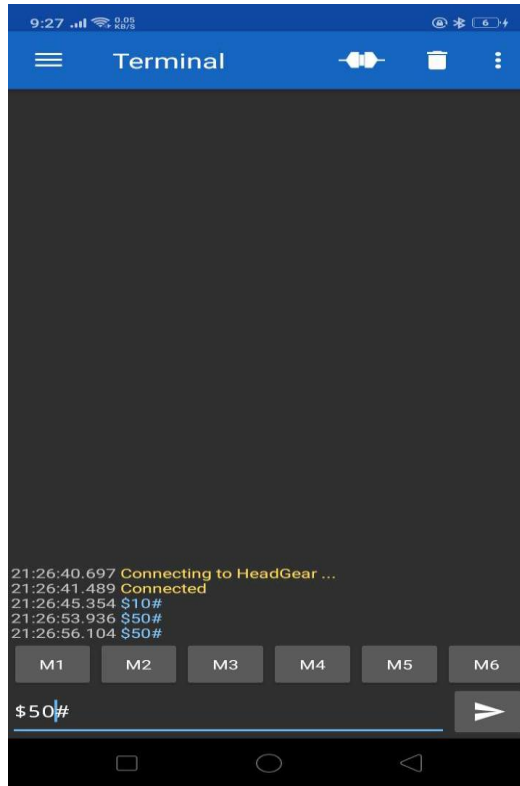


Figure 12: Serial Monitor

In figure it will show to test the connectivity of the prototype to the user's mobile phone. This application will be useful if the user wants to check and supervise if it is connected correctly.

Project Test Results

The result of the system's testing and the recommendation made by the expert is included in this section. It contains the general evaluation of the prototype.

A number of testing for has been conducted while on the process of making the prototype. The researchers were able to test the prototype to the professional experts to make sure that while using the headgear the users don't have to worry for their safety.

Hardware Testing

It comprises the testing coverage made while the prototype is in the process of fabrication, while includes the evaluation for the components used.

Microcontroller Testing

It is a critical phase in the development process, ensuring that the embedded systems perform reliably under varied conditions. This delves into the methodologies for both functional and non-functional testing of microcontrollers. We explore techniques such as unit testing, where individual components are rigorously tested, and system-level testing, which evaluates the microcontroller's performance within the broader system. Emphasis is placed on the use of automated testing frameworks and simulation tools, which expedite the identification of defects and validation of design specifications. Additionally, we cover endurance testing, which assesses the microcontroller's robustness over time and under extreme conditions, ensuring it meets the durability and reliability requirements essential for real-world applications.

Table 3

Hardware Testing

Components Connected	Working	Not Working
ESP32WROOM	Yes	
L298D	Yes	
LM2595 DC DC Buck Regulator	Yes	

DC-DC Boost Converter MT3608	Yes	
TP5100 2A Lithium Ion 18650 Battery Charger Module	Yes	
3.7voltage 2000mah Lithium ion Battery- Lithium ion polymer	Yes	
Dc Plastic Gear motor	Yes	

Software Testing

This involves testing the mobile application using different mobile operating system to test the compatibility for mobile application.

Table 4

Device Model used for connecting

Device Model	Remarks
Huawei Y9 Prime 2019	The app operates without any error and was able to use the application smoothly while controlling the intensity.
OPPO a37	The app operates without any error and was able to use the application smoothly while controlling the intensity.

Project Capabilities and Limitations

The following are the capabilities of the project.

1. Wireless Control via Bluetooth – seamless connectivity wirelessly to the user's smartphone through Bluetooth ensuring hassle-free operation without the need for physical connections.
2. Multiple Messages Modes – In kneading simulates a deep tissue massage by applying pressure and circular motion while in Vibration provides gentle or intense to soothe muscles and enhance relaxation.
3. Adjustable Intensity Levels - Users can adjust their comfortable intensity if the users want standard or extreme intensity.
4. Ergonomic Design – Adjustable strap and flexible design to accommodate various head size

5. Comfortable materials – Utilizes soft padding and breathable design to ensure comfort during prolong use.
6. Portable and Rechargeable – Equipped with TP5100 2A Lithium Ion 18650 Battery Charger Module allowing for use without being tethered to a power outlet. In addition, it has long battery life provide extended usage time.

The following are the limitations of the project.

1. Bluetooth Range - The massager's wireless control via Bluetooth may be limited by the range of the Bluetooth connection, which could restrict the distance from which users can operate the device.
2. Limited Massage Modes - While the massager offers multiple massage modes such as kneading and vibration, it may not provide the full range of massage techniques available in professional massage therapy sessions.
3. Intensity Range - While users can adjust the intensity levels to their comfort, the range of intensity settings may not cater to individuals who require extremely high or low levels of intensity for effective massage therapy.
4. Fit and Comfort - Despite its ergonomic design and adjustable straps, the headgear massager may not fit all head sizes and shapes comfortably, leading to discomfort or inconvenience for some users.
5. Durability - Depending on the quality of materials used in its construction, the massager may have durability issues over time, especially with frequent or heavy use.

6. **Battery Life** - While portable and rechargeable, the battery life of the massager may not be sufficient for extended use, especially at higher intensity levels or when using heat therapy features.
7. **Charging Time** - Users may experience inconvenience due to the time required to recharge the battery fully, especially if they need to use the massager urgently.

Project Evaluation Results

25 students selected assessed this method. A detailed description of the participants and outcomes may be found in the appendix.

The researcher's evaluation study showed the findings in particular for comfort, usability, effectiveness and the user's overall experience. The assessment instrument aggregates the numerical ratings.

Table 5

User's comfort

CRITERIA	WEIGHT MEAN	DESCRIPTIVE RATING
Is the Headgear massage device comfortable when worn for extend periods?		
Does the headgear device cause any discomfort or pressure points on your head?		
Is the weight of the headgear massage device appropriate for extend use?		
Is the material of the headgear comfortable against your skin?		
Have you experienced any irritation or discomfort due to the headgear's fit or materials?		

TABLE 6*Usability*

CRITERIA	WEIGHT MEAN	DESCRIPTIVE RATING
How easy was it to set up the headgear massage device the first time you used?		
Is the application interfere user-friendly and intuitive?		
How easy is it adjust the settings on the device via the application?		
Have you encountered any issues with connectivity between the headgear and the application?		
How convenient is it to use the headgear massage device as part of your daily routine?		

TABLE 7*Effectiveness*

CRITERIA	WEIGHT MEAN	DESCRIPTIVE RATING
How effective do you find the massage functions of the headgear in relieving stress or tension?		
How daily do you feel the benefits of the massage after using the device?		
Are the massage settings (intensity, duration, patterns) effective in meeting your needs?		
How could you rate the performance of the headgear device compared to other massage devices you've used?		
Have you noticed any long-term benefits from using the headgear massage device regularly?		

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

Summary of findings

The findings of our study provide valuable insights into the functionality and potential enhancements of the Development of Bluetooth Headgear Massager Controlled through Application. Given the scope and duration of this research, it is essential to interpret the results with care. The following recommendations are proposed for future research and development:

1. Bluetooth Range Enhancement – Upgrade to a Bluetooth module with an extended range, such as Bluetooth 5.0, which offers improved connectivity and distance. Additionally, consider integrating a Wi-Fi module for control over a greater distance using a home network.
2. Expansion of Massage Modes - Incorporate additional massage techniques such as tapping, rolling, and Shiatsu. Collaborate with professional massage therapists to design modes that replicate a wider range of massage styles, enhancing therapeutic effectiveness.
3. Wider Intensity Range - Expand the intensity settings to include more granular adjustments, allowing for both milder and stronger massage experiences. Implement a digital control system for precise intensity management.

4. Improved Fit and Comfort - Develop a more adaptive design using memory foam and adjustable components to ensure a snug and comfortable fit for a wider range of users. Consider offering different size options or a fully customizable fitting service.

5. Enhanced Durability - Utilize high-quality, durable materials for construction, such as reinforced plastics and metals. Conduct rigorous testing to ensure long-term durability and consider offering a warranty to instill confidence in the product's longevity.

6. Battery Life Optimization - Upgrade the battery capacity and efficiency, potentially using advanced battery technologies such as lithium-polymer (Li-Po) batteries. Implement energy-saving features such as automatic shut-off when not in use.

Conclusions

The objectives of the study were in aligned, and the assessment's findings supported the following conclusions:

The creation of the head massager that can be operated via smartphone app has successfully addressed the increasing need for useful and effective wellness solutions in the modern world. The evaluation results led to the project promises, by creating a prototype that mixes together. Mobile application control with user-friendly design, users can effortlessly achieve relaxation and stress reduction. With features for connecting and disconnecting the device, adjusting the speed, and turning it on and off, the system is incredibly useful and simple to use.

Users have access to a wide range of options to customize their massage experience thanks to the integration of real-time monitoring and configurable massage settings. Furthermore, the smooth Bluetooth connection between the head massager and the smartphone app improves user accessibility and engagement. The device's microcontroller efficiently controls hardware parts and data transmission to guarantee seamless functioning.

The head massager that is controlled by a mobile app has the potential to greatly enhance user relaxation and well-being, as demonstrated by its effective implementation and favorable user reviews. The project shows how well it works at giving users the tools they need to manage their stress and relaxation effectively and confidently. Through the mobile app, users could get timely information and receive real-time feedback on the state and operation of the device, which improved user awareness.

Multiple users can be accommodated by the mobile app, guaranteeing a customized experience for each person. Easy access to functions including massage control, status monitoring, and massage setting customization is made possible by this capability. In today's fast-paced world, the project offers a handy and adaptable alternative for stress relief, highlighting the successful combination of technology and wellness.

Recommendation

These recommendations provide a strategic blueprint for future research and development efforts, focused on enhancing the functionality, usability, and capabilities of the Bluetooth headgear massager controlled via an application. By implementing these enhancements,

we aim to deliver a superior user experience, ensuring that the device meets a diverse range of user needs with greater efficiency and effectiveness.

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Parenthetical, (View of Relax App: Designing Mobile Brain-Computer Interface App to Reduce Stress Among Students, n.d.-b)

Wolny, S. (2012b). The Influence of Operating Loads on the State of Stress and Strain in Selected Load-Bearing Elements of a Tower-Type Headgear Structure in the Light of the Experimental Data / Wpływ Obciążeń Eksploatacyjnych Na Stan Naprężenia Oraz Przesunięcia Elementów Nośnych Konstrukcji Basztowej Wieży Szybowej W Świetle Przeprowadzonych Eksperymentów. *Archives of Mining Sciences*, 57(4), 831–842. <https://doi.org/10.2478/v10267-012-0054-x>

Parenthetical, (Wolny, 2012b)

Narrative, Wolny (2012b)

Wong, K., Lei, K., U, S., & Martins, R. (2008b). A 1-V 90dB DR audio stereo DAC with embedding headphone driver. <https://doi.org/10.1109/apccas.2008.4746231>

Parenthetical, (Wong et al., 2008b)

Narrative, Wong et al. (2008b)

Yang, X., Zhou, Z., Ye, X., & Xiao, M. (2006b). Simulation and experimental studies on a piezoelectrically actuated microdiaphragm air pump. *Journal of Micro-nanolithography Mems and Moems*. <https://doi.org/10.1117/1.2198839>

Parenthetical, (Yang et al., 2006b)

Narrative, Yang et al. (2006b)

APPENDIX A

GANNT CHART

[illegible]

APPENDIX B

SAMPLE EVALUATION INSTRUMENT

EVALUATION INSTRUMENT FOR THE STUDY ENTITLED "DEVELOPMENT OF BLUETOOTH HEADGEAR MASSAGER CONTROLLED THROUGH APPLICATION"

Dear Participant

We are the 4th year students from **Technological University of Philippines, Manila Campus**. As part for our requirements in our Project Development subject, we would like your participation in our studies regarding the effectiveness, comfort, usability, and overall experience of the Development of Bluetooth Headgear Massager Controlled through Application.

This letter intends to help us validate your qualification as a participant and we humbly request that you answer the survey questionnaire patiently. It will only take 5 to 10 minutes of your time.

Please be reminded that all of the information you provided will be kept confidential. As under **RA 10173 or the Data Privacy Act of 2012**, all personal and/or sensitive information solicited and disclosed from this questionnaire shall be only used for the study alone. Thank you for taking the time to give responses. God Bless!

Respectfully,
The Researcher

Project Description

This project involves the design and development of a Bluetooth-enabled headgear massager that can be controlled via a mobile application. The primary objective is to create a user-friendly and customizable massaging device aimed at alleviating stress, improving blood circulation, and relieving headaches and muscle tension. The headgear massager will incorporate various massage modes, including kneading and vibration, each of which can be adjusted in intensity to suit individual preferences. The prototype is adjustable fit in different head sizes and able to connect to Bluetooth using its application; therefore, Bluetooth is the key to adjusting the intensity of the massages, such as the kneading and vibration of motors. In terms of power, the headgear is rechargeable, allowing the user to use it anywhere, and it can also be used while plugged in.

Name (Optional)

lyong sagot

Gender *

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

Age *

lyong sagot

COMFORT

Is the Headgear massage device comfortable when worn for extend periods? *

☐ Yes

☐ No

Does the headgear massage device cause any discomfort or pressure points on your head? *

☐ Yes

☐ No

Is the weight of the headgear massage device appropriate for extended use? *

☐ Yes

☐ No

Is the material of the headgear comfortable against your skin? *

☐ Yes

☐ No

Have you experienced any irritation or discomfort due to the headgear's fit or materials? *

☐ Yes

☐ No

USABILITY

(Scale:

1 = Very Ineffective, 5 = Very Effective)

How easy was it to set up the headgear massage device the first time you used *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is the application interface user-friendly and intuitive? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How easy is it to adjust the settings on the device via the application? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Have you encountered any issues with connectivity between the headgear and the application? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How convenient is it to use the headgear massage device as part of your daily routine? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

EFFECTIVENESS

(Scale:

1 = Very Ineffective, 5 = Very Effective)

How effective do you find the massage functions of the headgear in relieving stress or tension? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How quickly do you feel the benefits of the massage after using the device? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are the massage settings (intensity, duration, patterns) effective in meeting your needs? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the performance of the headgear massage device compared to other massage devices you've used? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Have you noticed any long-term benefits from using the headgear massage device regularly? *

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

OVERALL EXPERIENCE

How satisfied are you with the overall experience of using the headgear massage device? *

Your answer

Would you recommend the headgear massage device to others? Why or why not? *

Your answer

How would you rate the quality and durability of the headgear massage device? *

Your answer

What improvements or additional features would you like to see in future versions of the headgear massage device? *

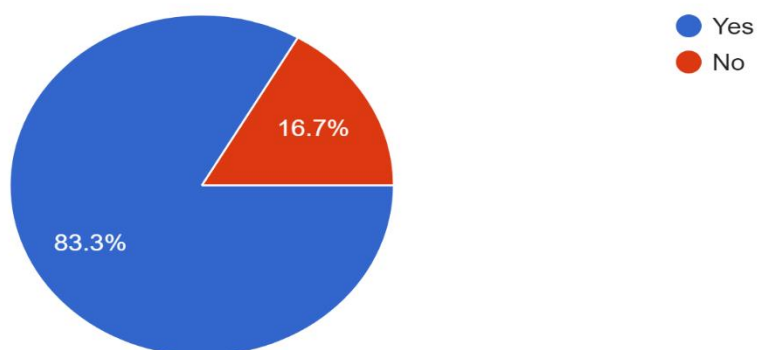
Your answer

APPENDIX C

ACTUAL EVALUATION RESULTS

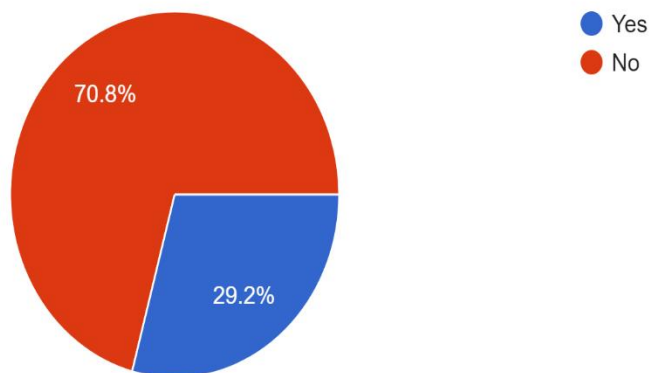
Is the Headgear massage device comfortable when worn for extend periods?

24 responses



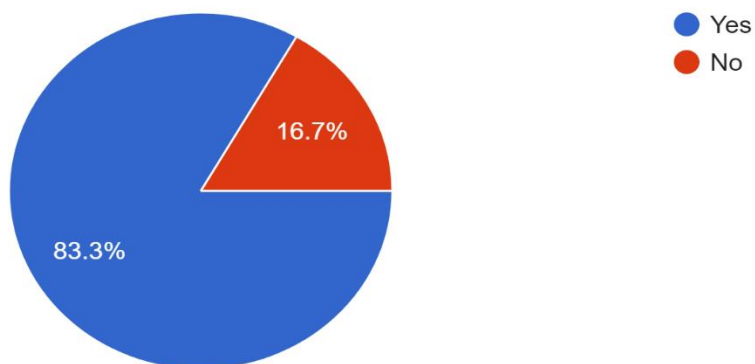
Does the headgear massage device cause any discomfort or pressure points on your head?

24 responses



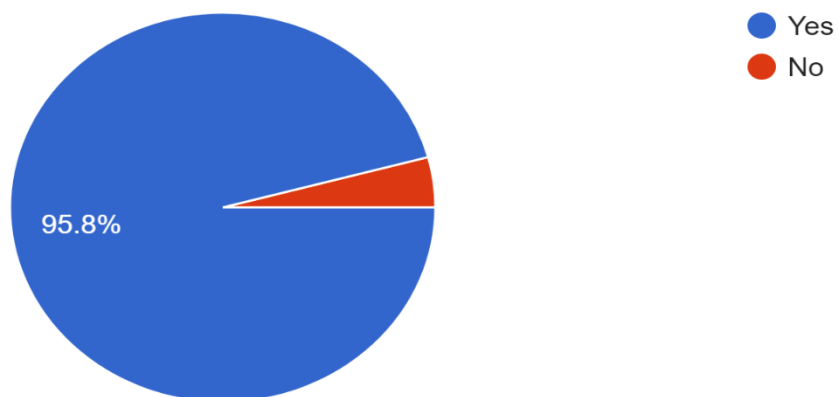
Is the weight of the headgear massage device appropriate for extended use?

24 responses



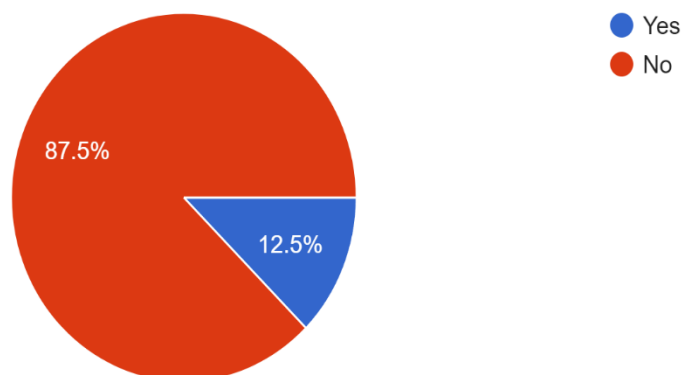
Is the material of the headgear comfortable against your skin?

24 responses



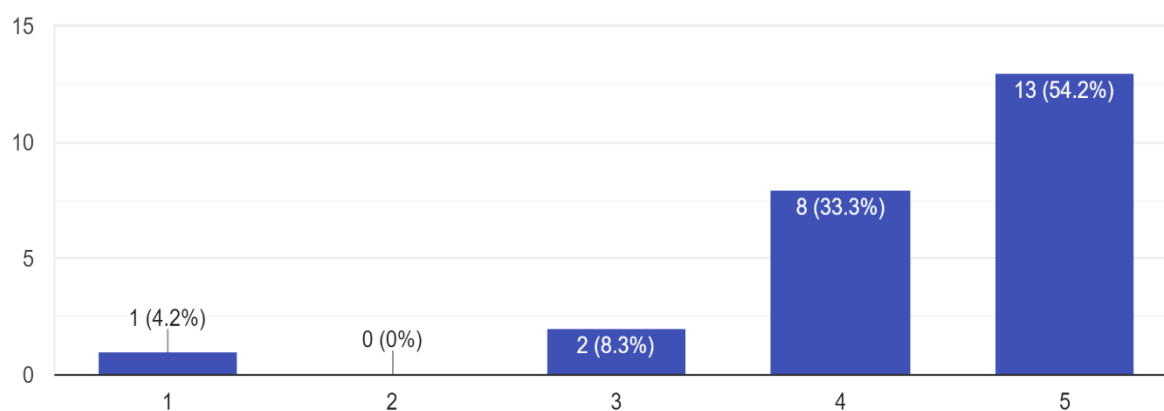
Have you experienced any irritation or discomfort due to the headgear's fit or materials?

24 responses



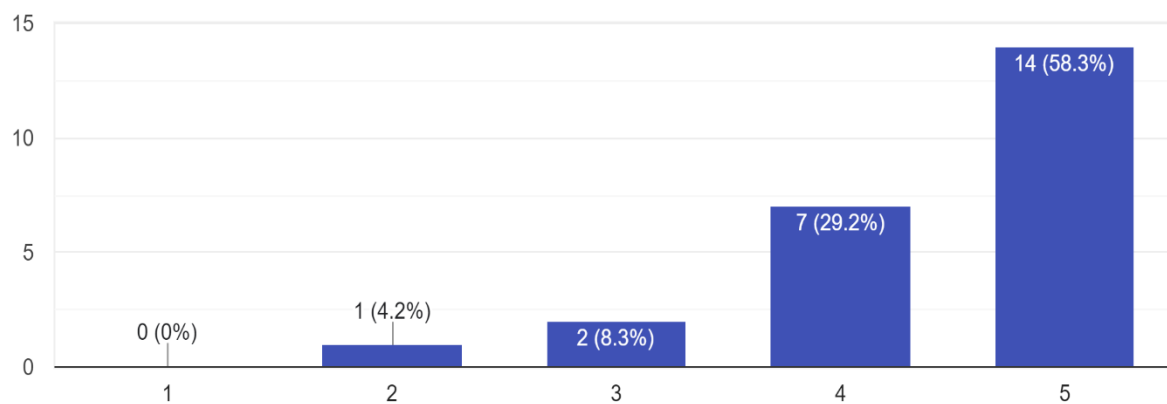
How easy was it to set up the headgear massage device the first time you used

24 responses



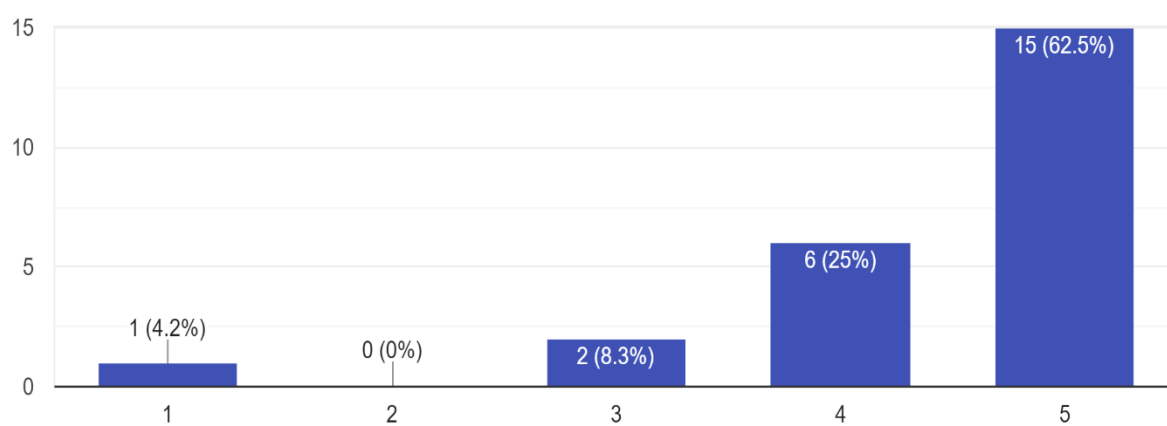
Is the application interface user-friendly and intuitive?

24 responses



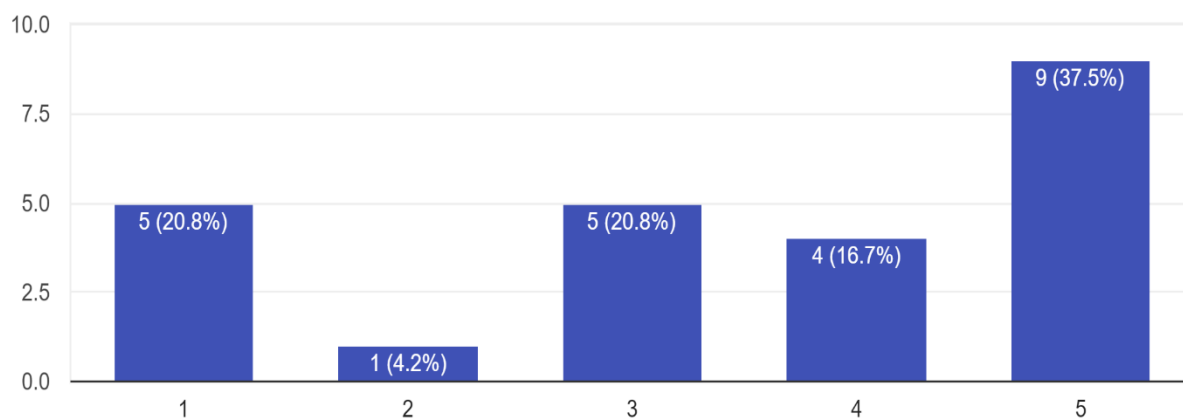
How easy is it to adjust the settings on the device via the application?

24 responses



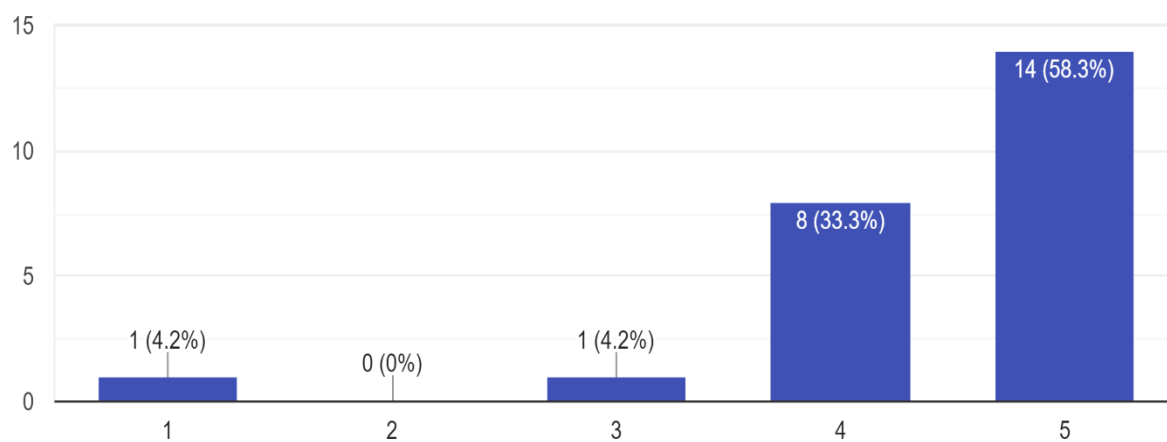
Have you encountered any issues with connectivity between the headgear and the application?

24 responses



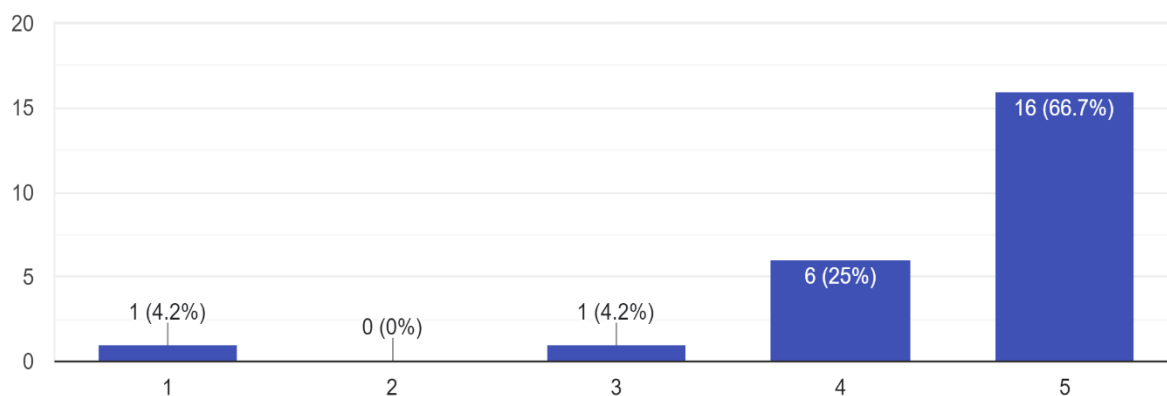
How convenient is it to use the headgear massage device as part of your daily routine?

24 responses



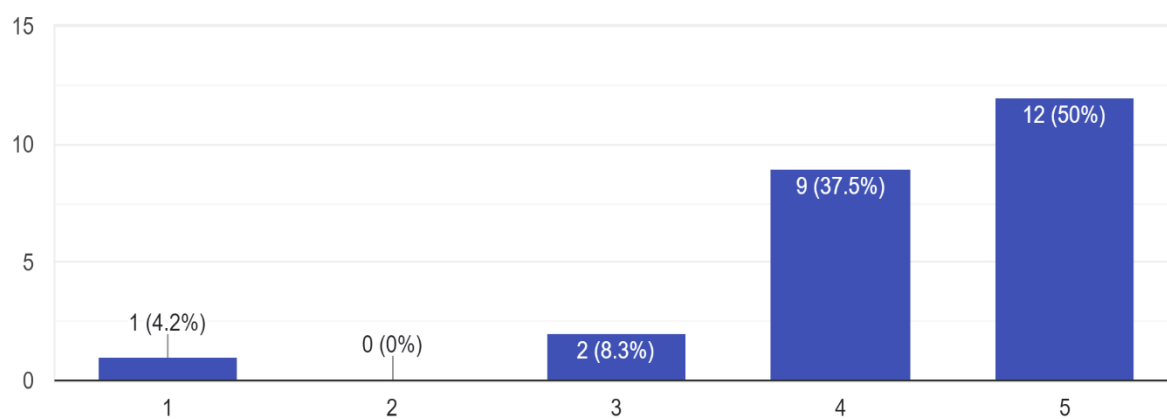
How effective do you find the massage functions of the headgear in relieving stress or tension?

24 responses



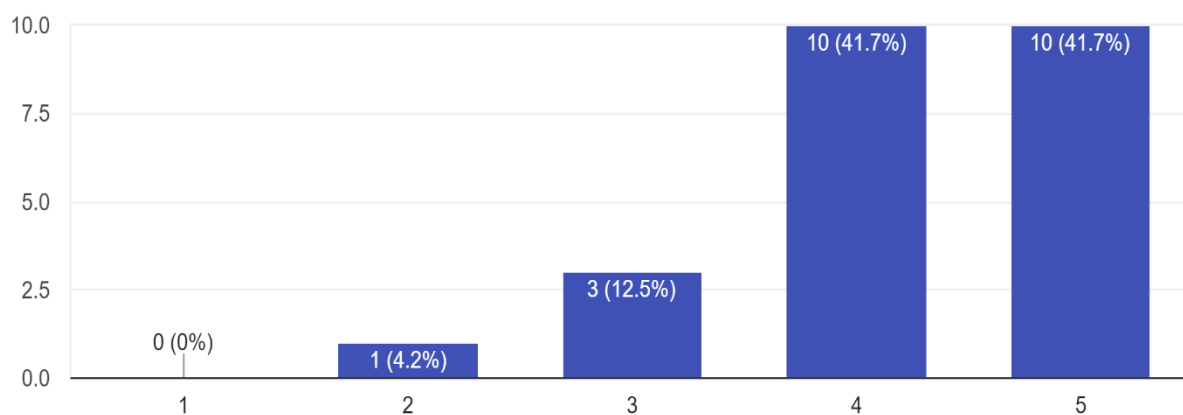
How quickly do you feel the benefits of the massage after using the device?

24 responses



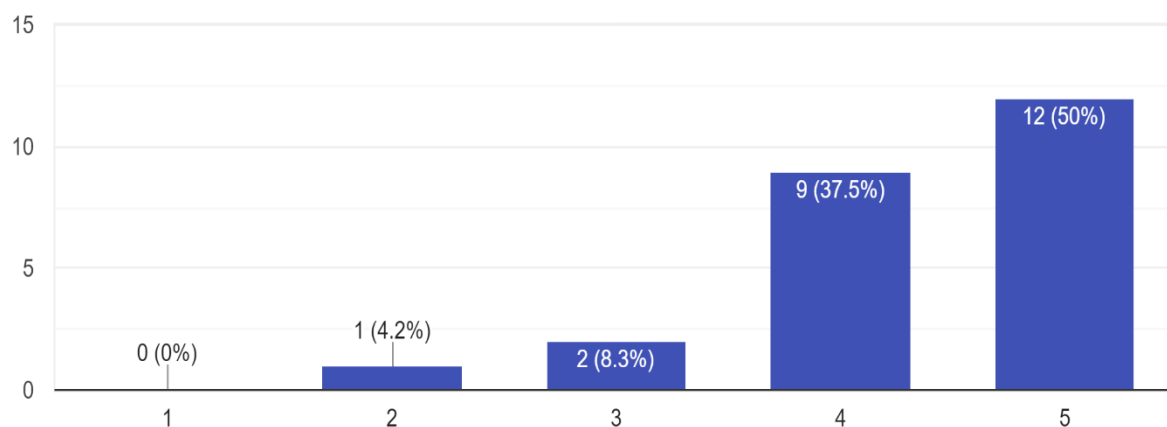
Are the massage settings (intensity, duration, patterns) effective in meeting your needs?

24 responses



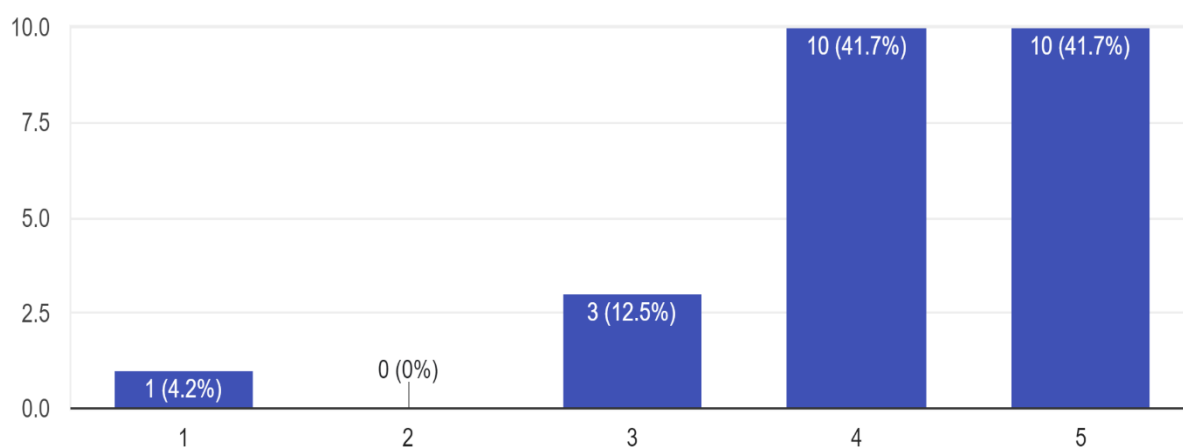
How would you rate the performance of the headgear massage device compared to other massage devices you've used?

24 responses



Have you noticed any long-term benefits from using the headgear massage device regularly?

24 responses



How satisfied are you with the overall experience of using the headgear massage device?

24 responses

Very satisfied

very satisfied

The headgear was light itself. And it's very functional since you can easily adjust the intensity.

Very satisfied, makes me sleep easier too.

Very Satisfied

10/10 very useful!

Highly satisfied

very satisfied

I am generally satisfied

very

satisfied enough to feel relax

I am extremely satisfied

10/10

8/10

very satisfied.

Very satisfied!

A 96%. The headgear performed well on it's operation, however there's a need for futher improvement in terms of adjustability, to accomodate all kinds of headshape and size. To effectively target specific accupressure spots on the side of the skull.

Would you recommend the headgear massage device to others? Why or why not?

24 responses

yes

Yes. Helps relieve daily stress.

Of course, headaches are a common thing for us adults and I don't have a problem in sharing or recommending something beneficial.

Yes, using it made me very relax and comfortable.

Yes, I would recommend this device especially to those people working from home

Yes ofcourse, it is comfortable

Yes, it's very sufficient when it terms of being a massager

Yes because it's great

ves. because it helps to relieve stress and headache effectively

Yes, it's a great experience

Absolutely, as my experience it provide relief and the application is easy to use

yes. so they can have the same experience as me

make it lighter weight

i would as i believe that everyone should at least experience this gear at least once in their lifetime

Yes. It's very relaxing.

Yes! I would recommend this to my classmate who is in need of relieving his stress after hours of brainwork and stress in problem solving questions. If this headgear is suited for his head size, he can run the headgear with no discomfort while solving his daily problem set simultaneously, simulating his brain reducing his stress overall.

Yes

How would you rate the quality and durability of the headgear massage device?

24 responses

10/10

8/10

Quality: 8/10, Durability 6/10

I think it can be more impressive overtime if the researchers decided they would like to keep working on it.

99%

It's very durable and high quality!

97% out of 100

Satisfied

very durable

on a scale of 1-10. ill rate is as 9

A hundred percent.

I will rate 9/10

It is good,

10

8 out of 10

11/10

A 95%. The quality feels like it's made from a sturdy material thus the snug fit couldn't accomodate for the plastic to flex when there's a need for allowance space.

It scored 9 out of 10 for durability. Its strong internal mechanics, outstanding build quality, dependable battery life, and use of long-lasting materials, all contribute to its high ranking.

What improvements or additional features would you like to see in future versions of the headgear massage device?

24 responses

Maybe they can add other sizes of the headgear, although it's adjustable.

A more closed up version and a different color

None

None so far.

No idea

None so far

n/a

more refined version

the settings or the app that connect both phone and the device

So far none since it is user friendly and easy to use.

-

none

get wire less massage device

a mini tv

I want the headgear massage to have a rgb lights next time.

I would like to see an adjustable feature running along the headgear to better fit all headsize to maximise targeted accupressure points and prolonged usage comfortability.

Provide a range of colors, enhance portability, and implement wireless charging to do away with cords and improve the convenience of recharging.

APPENDIX D

CORRESPONDENCE

Dear [Recipient's Name],

I hope this letter finds you well. I am writing to formally inform you about the status of Development of Bluetooth Relaxation Headgear Massager Controlled through Application, as discussed during our recent meeting.

Our team has meticulously crafted this proposal to address the key objectives outlined during our discussions. We believe that our approach combines innovation with practicality, ensuring that the project's goals are met effectively and efficiently.

Attached to this email, you will find a detailed breakdown of our proposed plan, including timelines, budget estimates, and deliverables. We have also included case studies and references from previous projects that demonstrate our capabilities and commitment to excellence.

We are confident that our proposal aligns closely with your vision for Development of Bluetooth Relaxation Headgear Massager Controlled through Application, and we are eager to collaborate with you to bring this vision to fruition. Should you have any questions or require further information, please do not hesitate to contact me directly.

Thank you for considering our proposal. We look forward to the opportunity to work together on this exciting project.

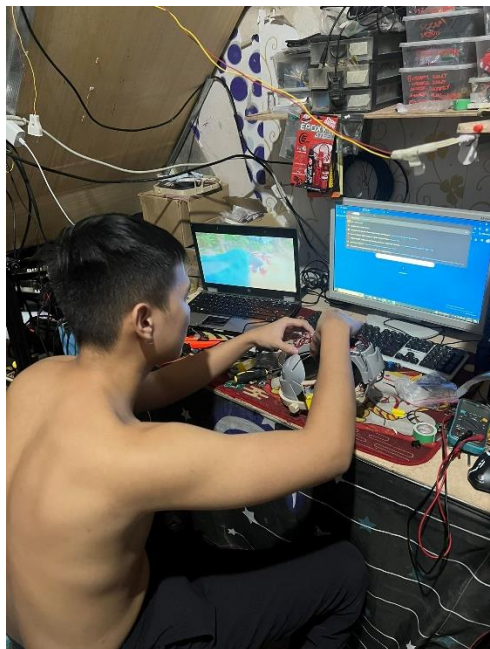
Warm regards,

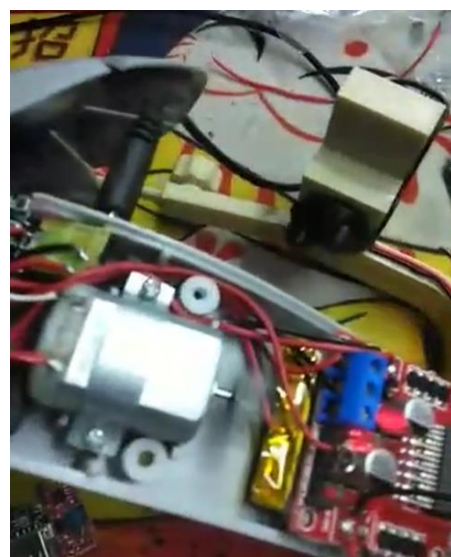
Mary Lin Peñascosa

Research Leader

APPENDIX E

PICTURES TAKEN DURING FABRICATION





APPENDIX F

BUDGETARY REQUIREMENTS

ITEMS	Qty.	AMOUNT
Esp32	1pc	Php 342
L298D	1pc	Php 105
LM2595 DC DC Buck Regulator	1pc	Php 140
DC-DC Boost Converter MT3608	1pc	Php 30
1 TP5100 2A Lithium Ion 18650 Battery Charger Module	1pc	Php 45
3.7voltage 2000mah Lithium ion Battery	1pc	Php 400
Dc Plastic Gear motor	2pcs	Php 50
Rocker switch	1pc	Php 29
DC 12V Micro N20 Strong Vibration –	1pc	Php 70
Dc1.5v-3v Coreless Vibrator Vibrating Vibration	31pcs	Php 297
Low voltage wire	11pc	Php 40
Silicon pad	1pc	Php 47
TOTAL		₱ 1595

APPENDIX G

FUNCTIONAL TEST CASE (1/5)

Test Suite ID	MA-FT-01
Test Case ID	MAF
Test Case Summary	Mobile Application Functionality
Related Requirements	None
Prerequisites	None
Test Procedure	<ol style="list-style-type: none"> 1. Installation, verify installation without any errors and test compatibility with difference devices an 2. Test each features performance 3. Test response 4. Evaluate user experience and navigation and gather feedback
Test Data	Adjustable intensity
Expected Result	The mobile application work smoothly for any device model, and all features perform intended functions correctly.
Actual Result	Every feature performed as expected and handled errors appropriately. The application performed without noticeable lag, with respectable reaction times and optimum resource utilization.
Status	Passed
Remarks	The system's response while adjusting the intensity
Created by	The researchers
Date of Execution	May 31,2024
Test Environment	

FUNCTIONAL TEST CASE (2/5)

Test Suite ID	HG-FT-01
Test Case ID	HG-F
Test Case Summary	Headgear Functionality
Related Requirements	None
Prerequisites	None
Test Procedure	<ol style="list-style-type: none"> 1. Turn on so that the Bluetooth will be enabled 2. Once the Bluetooth is already connected to the Mobile phone the headgear can be adjustable 3. Can adjust the intensity depends on the users' desire
Test Data	Maintain a user-friendly interface
Expected Result	The prototype will be easily compatible with the user's phone as long as the application is installed.
Actual Result	A series of procedures were taken to test the input validity of the headgear massager. Before the researchers try to let the other used the prototype it was test first by the professionals. The prototype is lightweight and is easy to use
Status	Passed
Remarks	Test numerous times to ensure the safety and let the professional check it first.
Created by	The researchers
Date of Execution	June 1, 2024
Test Environment	

APPENDIX I**CERTIFICATE OF SIMILARITY INDEX USING TURNITIN**

RESEARCHERS PROFILE

RESEACHERS PROFILE

Peñascosa, Mary Lin D.

Sitio Manalite 2 Brgy. Bagong Nayon, Antipolo City

09510157664

marylinpenascosa@gmail.com



WORK EXPERIENCES

- Customer Service Representative at VXI global Solution **August 2023 – April 2024**
Robinsons Giga Tower, C5 Eulogio Rodriguez Jr. Ave,
Quezon City, 1110 Metro Manila

EDUCATIONAL BACKGROUND

- Bachelor of Engineering Technology **2020 - Present**

Technological University of the Philippines

- Senior High School **2018 – 202**

Gardner College Cainta, Rizal

- Junior High School **2014 - 2018**

Antipolo National High School, Antipolo, Rizal

- Primary School **2008 - 2014**

San Diego Elementary School, Burauen Leyte

RESEARCH CONDUCTED

- *Title of Research: “Development of Bluetooth relaxation headgear massager and ear acupressure controlled through Application”*

CONFERENCES/ SEMINARS/TRAINING ATTENDED

- Career choice and responsibilities, January 21, 2021

Professionalism and Leadership

Technological University of the Philippines

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- N/A

RESEACHERS PROFILE

Pontiveros, King Aaron R.

Brgy. North Fairview Phase 8, Quezon City

09951629010

kingaaronpontiveros@gmail.com



WORK EXPERIENCES

- Customer Service Representative (CSR), Concentrix. April 2022 – May 2022

University of the Philippines Diliman, U.P. Ayala Land Techno Hub, 1101

Commonwealth Ave, Diliman, Quezon City

Responsibilities:

1. Troubleshooting and Technical Support: Assisting customers in resolving technical problems or issues they encounter with products or services.

Troubleshooting common issues and escalating complex problems to the appropriate department, if necessary.

2. Providing Product or Service Recommendations: Understanding customer needs and preferences to offer appropriate product or service suggestions or alternatives that align with their requirements.

3. Handling Customer Complaints: Listening attentively to customer complaints, empathizing with their concerns, and finding appropriate solutions to resolve issues. Escalating complaints to supervisors or managers, if necessary.

EDUCATIONAL BACKGROUND

- Bachelor of Engineering Technology **2020 - Present**

Technological University of the Philippines, Manila, Philippines

- Senior High school **2018 - 2020**

Our Lady of Fatima University, Quezon City, Philippines

- Junior High School **2014 - 2018**

Sta. Lucia Highschool, Quezon City, Philippines

- Primary School **2008 - 2014**

San Gabriel Elementary School, Quezon City, Philippines

RESEARCH CONDUCTED (Please start with the latest information)

- *Title of Research: “Development of Bluetooth relaxation headgear massager and ear acupressure controlled through Application”*

CONFERENCES/ SEMINARS/ TRAININGS ATTENDED

- Free Elective 3B Career Talk 2020 **February 6, 2020**

“IOT: Internet of Thing for a Smart City”

OLFU, Esperanza St., Hilltop Lagro, Novaliches Quezon City

Our Lady of Fatima University

- Free Elective 3B Career Talk 2020 “AR vs VR” **February 6, 2020**

OLFU, Esperanza St., Hilltop Lagro, Novaliches Quezon City

Our Lady of Fatima University

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- N/A

RESEARCHERS PROFILE

Mundo, Jake Russell J.

#71 Papa Pio St. SAV 12 Brgy. San Isidro Paranaque City

09974953635

mundojake@yahoo.com



WORK EXPERIENCES

- Remote On-call Purchaser, VEX, July 2022 – June 2023

San Jose, Antique, Philippines

Responsibilities:

1. Procurement Planning: Collaborating with various departments within the organization to identify their purchasing needs and develop procurement plans accordingly. This involves analyzing inventory levels, monitoring usage patterns, and forecasting future demands.
2. Supplier Selection: Identifying and evaluating potential suppliers based on criteria such as price, quality, reliability, and delivery time. On-call purchasers may conduct market research, solicit bids or quotes, negotiate contracts, and establish relationships with suppliers.
3. Order Processing: Placing purchase orders with selected suppliers, ensuring accurate specifications, quantities, and delivery dates. They may use procurement software or enterprise resource planning (ERP) systems to manage and track orders.
4. Supply Chain Management: Monitoring the supply chain to ensure timely delivery of goods and services. This involves tracking orders, coordinating with suppliers and logistics providers, and resolving any issues or delays that may arise.

5. **Cost Management:** Negotiating favorable pricing and terms with suppliers to optimize costs and achieve cost savings. On-call purchasers may also be involved in cost analysis, budgeting, and cost control measures.
6. **Contract Management:** Managing supplier contracts, including reviewing terms and conditions, monitoring contract performance, and addressing any contractual disputes or issues that arise.
7. **Compliance and Documentation:** Ensuring compliance with company policies, procedures, and relevant regulations. On-call purchasers may maintain procurement records, documentation, and files related to purchases, contracts, and suppliers.
8. **Continuous Improvement:** Identifying opportunities for process improvement within the procurement function and implementing best practices to enhance efficiency and effectiveness. This may involve streamlining processes, implementing automation tools, or exploring new sourcing strategies.

EDUCATIONAL BACKGROUND

- Bachelor of Engineering Technology **2020 - Present**
Technological University of the Philippines, Manila, Philippines
- Senior Highschool **2018 - 2020**
Olivarez College, Paranaque City, Philippines
- Junior Highschool **2015 - 2017**
University of Perpetual Help System Delta, Las Pinas City, Philippines
- Primary School **2008 - 2014**

Blessed Luisa School, Paranaque City, Philippines

RESEARCH CONDUCTED

- *Title of Research: “Development of Bluetooth relaxation headgear massager and ear acupressure controlled through Application”*

CONFERENCES/ SEMINARS/ TRAININGS ATTENDED

- N/A

RESEARCHERS PROFILE

Salandanan, Dan Paulo L.

Phase 4 flovihome, tonsuya, malabon city

Mobile No.: +639100462971

danpaulo.salandanan@tup.edu.ph



WORK EXPERIENCES

- N/A

EDUCATIONAL BACKGROUND (Please start with the latest information)

- Bachelor of Engineering Technology **2020 - Present**

Technological University of the Philippines, Manila, Philippines

- Senior Highschool **2018 - 2020**

STI College Caloocan, Philippines

- Junior Highschool

Tañong Integrated School, Malabon City, Philippines **2017 - 2018**

Mambugan National Highschool, Antipolo City **2014 - 2017**

- Primary School **2008 - 2014**

Tonsuya Elementary School, Malabon City, Philippines

RESEARCH CONDUCTED

- *Title of Research: "Development of Bluetooth relaxation headgear massager and ear acupressure controlled through Application"*

CONFERENCES/ SEMINARS/ TRAININGS ATTENDED

- Python Online Course Programming “Python Fundamentals” June 29, 2023

Via MS Teams

- STI Seminar “Future Innovation” September 3, 2018

STI Academic Center, Samson Road corner Caimito Road, Caloocan City, 1400 Metro Manila

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- N/A