DESIGN AND DEVELOPMENT OF ERGONOMIC HAND STAND FOR PROLONG PLAYING GAME FOR SMARTPHONES USER

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DECLARATION

I declared that this Choose an item. entitled "Design And Development of Ergonomic Hand Stand for Prolong Playing Game for Smartphone Users" is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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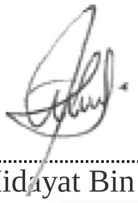
APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.

Signature : 

Supervisor Name : Mohd Hidayat Bin Ab Rahman

Date : 28/01/2022

DEDICATION

This powerful report is dedicated to my beloved family, particularly for their endless support, love, and encouragement. To my supervisor, Sir Mohd Hidayat bin Ab Rahman, who guided me through this journey until I managed to complete my project, Thank you for all of your support and guidance in getting this project done.

ABSTRACT

Nowadays, a smartphone is a must-have thing that must be brought with you at all times. Not only is the phone useful for emergencies, but it may also be used to pass the time for introverts. People use their phones for a variety of purposes, including reading news, looking for information, keeping up with social media, and playing games. When we use our phones for lengthy periods of time, it has an effect on our bodies. The effect are some parts of our bodies will be in pain and causing discomfort for the user. The existing device for supporting the hand of a smartphone user or gamer is insufficient in terms of providing comfort and safety while using the device. For individuals who use the gadget for an extended amount of time, the existing device will cause ergonomic risks. Identify the current hand stand device and make an innovation on the current hand stand support to prevent from pain and injury are some of the suggestion way to help the gamers. The ergonomics hand stand support that good in preventing hand pain will solve the gamers problem. The present hand stand support device will be examined to see what is causing the pain when it is used. The dimensions and material will be the most important considerations. The new ergonomics hand stand support will be developed to solve the gamers problem.

ABSTRAK

Pada masa kini, telefon pintar adalah perkara wajib yang mesti dibawa bersama setiap masa. Telefon tidak hanya berguna untuk keadaan kecemasan, tetapi juga dapat digunakan untuk meluangkan masa untuk introvert. Orang menggunakan telefon mereka untuk pelbagai tujuan, termasuk membaca berita, mencari maklumat, mengemaskini media sosial, dan bermain permainan video. Apabila telefon digunakan dalam jangka masa yang panjang, ia memberi kesan kepada tubuh badan. Kesannya adalah beberapa bahagian tubuh badan akan berada dalam kesakitan dan menyebabkan ketidakselesaan kepada pengguna. Peranti yang sedia ada untuk menyokong tangan pengguna telefon pintar atau pemain permainan video tidak mencukupi dari segi memberi keselesaan dan keselamatan semasa menggunakan peranti tersebut. Bagi individu yang menggunakan telefon untuk jangka masa yang panjang, peranti yang ada akan menyebabkan risiko ergonomik. Kenal pasti alat pegangan tangan semasa dan melakukan inovasi pada sokongan pemegang tangan semasa untuk mengelakkan kesakitan dan kecederaan adalah beberapa cadagan untuk membantu pemain. Sokongan pegangan tangan ergonomik yang baik dalam mencegah sakit tangan akan menyelesaikan masalah pemain. Peranti sokongan pemegang tangan sekarang akan diperiksa untuk melihat apa yang menyebabkan kesakitan semasa digunakan. Dimensi dan bahan akan menjadi pertimbangan yang paling penting. Sokongan pegangan tangan ergonomik baru akan dicipta untuk menyelesaikan masalah pemain.

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LIST OF SYMBOLS AND ABBREVIATIONS

MSD	—	Musculoskeletal Disorder
WMSD	—	Work-Related Musculoskeletal Disorders
RSI	—	Repetitive Strain Injuries
RMI)	—	Repetitive Motion Injuries
CTD	—	Cumulative Trauma Disorders
IPMS	—	Integrated Product Materials Selection
VES	—	Video Entertainment System
VCS	—	Video Computer System
NES	—	Nintendo Entertainment System
CPU	—	Central Processing Unit
SEBT	—	Star Excursion Balance Test
HSEBT	—	Hand Reach Star Excursion Balance Test
RULA	—	Rapid Upper Limb Assessment
BDP	—	Bachelor Degree Project
FTKMP	—	Fakulti Teknologi Kejuruteraan Mekanikal Proses
CATIA	—	Computer-Aided Three-Dimensional Interactive Application

APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction Background

Technology nowadays can be access anywhere as long as we have gadget in our hands. The easier yet compact gadget nowadays is smartphone. Handphone had been used for decades. Technology for handphone back then is a basic communication for people. From calling to texting then facetiming. With the passage of time, handphone had been upgraded to a smartphone. Technology on smartphones nowadays is beyond our mind. What had been created by the technologist are something to be thankful in this super busy day. Smartphone never gave unexpected result to the user. Too much activity that someone can do with a smartphone.

Nowadays game is a must for a smartphone users. As we can see, games or e-sport right now had been an international tournament. The gamers can earn a living using games and some earn more than a living. Playing games in a smartphone is much easier for the gamer to practice their skill because smartphone is easy to carry without feeling burdened. Unlike laptop that having a hard situation when the battery drop, we have powerbank to keep on the smartphone. The users can safely use the device while charging.

From my search, there’s no product or device that can support the gamer to play game in a long period of time. The existing product only help the gamer to feel more excited while playing online gaming. The gamers still having the problem such as neck pain, back hurt and waist cramp. This will cause the gamer to lose focus.

Nevertheless, to gain smartphone user attention of the new and helpful product is not easy because the existing product advertisement always mislead with the original concept of the product. Unbearable body and finger position will lead to gaming injuries. Studies from Harvard Health Blog, repetitive stress injuries, or overuse injuries, are injuries that come from activities that involve repeated use of muscles and tendons, to the point that pain and inflammation develop. If these injuries are allowed to progress, numbness and weakness can come out, and permanent injury is the outcome. Overuse injuries of the hands and arms are pervasive among gamers.

One common syndrome is carpel tunnel syndrome, which many gamers evolve. Carpal tunnel syndrome, often seen in office workers, involves swelling of a nerve in the wrist, which causes pain and numbness. Gamers can also get tennis elbow, a painful inflammation of the place where the tendon inserts into the bone on the outside of the elbow.

"PlayStation thumb" or now known as "Gamer thumb" arises when the tendons that move the thumb become swollen. The medical phase for this is called Quervain's tenosynovitis, and it can lead to lump and limited movement. Gamers are also at risk for trigger finger, or stenosing tenosynovitis, which is when a finger gets stuck in the bent position due to chronic inflammation.

Research from the American Academy of Orthopaedic Surgeons, carpal tunnel syndrome is a common syndrome that causes common condition of pain, numbness, swelling and inflammation in the hand, wrist and arm. The affliction crops up when one of the major nerves to the hand which is the median nerve is squeezed or compressed as it travels through wrist.

In most patients, early diagnosis and treatment are important because carpal tunnel syndrome gets worse over time. Early on, symptom can often be relieved with simple measures like wearing a wrist splint or avoiding certain activities.

For some patients who the pressure on the median nerve continues, it can lead to nerve damage and worsening symptom. To forbid everlasting damage, surgery to take pressure off the median nerve may be recommended.

This project is focusing on how to design a device that will preventing the smartphone users or most importantly a gamer to focusing on the game for hours without having pain or damage. The data for this project will collecting by the people who active playing games and the improvement will be made after collecting the data.

1.2 Problem Statement

Based from the observations and explaining video from eSports therapy YouTube channel and reading the journal from the American Society for Surgery of the Hand, it can be sure that an ergonomic design of an ergonomics adjustable controller hand support is salient in findings comfortable and safety while enjoying the game in a long time without having any ergonomics risk factor and injuries.

Market controller that the gamer usually use for their phone while playing games does not provide safety for the phone and comfortable for the user. This will cause ergonomics risk factors for those who play games in a long period of time such as, carpal tunnel syndrome, repetitive stress injuries, tennis elbow, Quervain’s tenosynovitis and stenosing tenosynovitis.

1.3 Objective

The main objective of this research is to advocate a design and to generate a new ergonomics adjustable hand stand support for smartphones users especially smartphone gamers. To confirm this project success, these objectives will be rough out as follows:

a) To study the current device for hand stand support for smartphone user and gamers from the market place.
b) To make an innovation on the device to prevent from pain or injury.
c) To develop new ergonomics adjustable hand stand support for gamers that good in preventing hand and wrist pain.

1.4 Scope

This project studies on the journal of finger pain and injury wrist of gamers from the worldwide, collecting data. The collection data includes the current controller and the pain that the gamers faced while and after playing games in a long period of time. The following task will be done in this project which includes:

a) Studies and searching the injury and pain faced by the gamers after playing the video games in a long period of time.
b) Analyze what cause the pain.
c) Develop and optimize solutions of ergonomics adjustable hand stand support according to the injury and analyzed by using CATIA software.
d) Enlargement of ergonomics adjustable hand stand support using CATIA software.

1.5 Expected Result

The expected result for this project is to design and develop a new ergonomics adjustable hand stand support for smartphone users and gamers.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The goal of this chapter is to compiled and edit information from a variety of publications, books, and journals that pertain to this study, with a focus on ergonomics. This chapter contains a literature review based on past studies as well as theoretical readings based on ergonomic concepts, particularly in the areas of sitting, lying, and playing games postures, which may be understood via ergonomic studies and past researches. There is also information on human-body studies that are relevant to engineering design or human factor design considerations. The majority of the literature evaluations are based on media social complaining, online databased journals like Jstor, BioMed Central, Google Scholar, Mendeley, EZproxy, SCI HUB and internet search engine. In the references section, all of the data that was found will be mentioned.

2.2 Definition of Ergonomics

Ergonomics can be derived into few definitions. However, the fundamental definition which is used internationally is derived from the Centre for Occupational and Environmental Health. University of Manchester. Economic and Political Weekly (COEH, 2020). Table 2.1 shows the numerous meanings of ergonomics.

Table 2.1 Definition of ergonomics

No.	Author/Resources	Year	Definition
1	Dohrmann Consulting. (Dohrmann Consulting, 2014)	2014	Ergonomics is the process of designing or arranging workplaces, products and systems so that they fit the people who use them. Ergonomics applies to the design of anything that involves people workspaces, sports and leisure, health and safety.
2	International Ergonomics Association (International Ergonomics Association, 2015)	2015	Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimise human well-being and overall system performance.
3	Centre for Occupational and Environmental Health. (COEH, 2020)	2020	Ergonomics is the study of how humans interact with manmade objects. The goal of ergonomics is to create an environment that is well-suited to a user's physical needs. Ergonomics it is commonly applied to the workplace environment.

With all of the criteria, we can conclude that ergonomics is concerned with the fulfilment of the workplace, ensuring that the environment is well-organized and safe. A well-balanced between end-task user and demands may be implemented with effective work system design and ergonomics. This can help workers enhance their performance, their safety, and their emotional and physical well-being. Users experience discomfort, agony, and inefficiency