



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INVESTIGATION ON THE EFFECT OF COGNITIVE ERGONOMIC ON FINAL YEAR STUDENT WORKLOAD

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.

by

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Workload

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I hereby, declared this report entitled Investigation on The Effect of Cognitive Ergonomic on Final Year Student Workload is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as partial fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Product Design) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Ergonomik kognitif melibatkan aktiviti atau proses mental seperti persepsi, ingatan, pemikiran, dan tindak balas motor, kerana ia mempengaruhi interaksi antara manusia dan sistem elemen-elemen yang lain. Ergonomik kognitif lebih kepada aktiviti-aktiviti mental manusia dalam melaksanakan tugas kognitif. Tugas kognitif memerlukan pemahaman yang menyeluruh bukan sahaja tuntutan situasi kerja, tetapi juga strategi dalam melaksanakan tugas kognitif dan batasan dalam kognisi manusia. Dari kajian ini, diberi tumpuan kepada ergonomik kognitif terhadap pelajar kolej dalam bagaimana ia memberi kesan kepada manusia dengan aktiviti dan prestasi mereka di kolej. Pelajar dari empat kursus yang berlainan akan dibandingkan untuk dapat melihat kesan pelajar-pelajar yang mempunyai beban kerja yang berat terhadap ergonomik kognitif. Ia amat penting untuk pelajar mengurus atau mengawal beban mereka memandangkan semua peserta berada di tahun akhir. Pelajar yang tidak dapat mengawal beban mereka akan menyebabkan perihai yang tidak sihat kepada mental dan fizikal. Tugasan ini dijalankan selama 10 minggu dan semua data akan direkod menggunakan soalan kaji selidik dan kaedah ergonomik kognitif iaitu ukuran prestasi (ujian Stroop), ukuran subjektif (NASA-TLX & HADS) dan ukuran fisiologi (nadi & tekana darah). Dari kajian ini, aktiviti tidur telah direkod menggunakan diari tidur. Pada akhir minggu ke-10, semua data yang dirakam sedikit berubah dari minggu 1 hingga minggu 10 yang menunjukkan kesan ergonomik kognitif terhadap beban kerja pelajar.

ABSTRACT

Cognitive ergonomics is concerned with mental action or process as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system. Cognitive ergonomics is more to human mental activities in performing a cognitive task. Cognitive tasks require a thorough understanding not only of the demands of the work situation but also of strategies in performing cognitive tasks and of limitations in human cognition. From this study, the cognitive ergonomic have been a focus on college students in how it impacts to human by their activities and performance in college. Students from four different courses have been compared by which it had a heavy workload that effects cognitive ergonomic on students. It is important to a student to manage or control their workload since all participates are in their final year. A student who cannot manage their workload will cause an unhealthy circumstance to their mental and physical. This study is measured for 10 weeks and the data will be recorded by using survey questionnaire and cognitive ergonomic method analysis which is the performance measure (Stroop test), subjective measure (NASA-TLX & HADS) and physiological measure (pulse & blood pressure). From this study, the participate sleep activities have been recording by using sleep diary. By the end of week 10, all the recorded data a slight changed from week 1 until week 10 which shows the effect of cognitive ergonomic towards students workload.

DEDICATION

To my beloved parents

Mohd Pauzi Bin Mohd Pauzi
Zuwita Soloma Binti Md Kadar

Thank you for all supports, sacrifices and patients that have been shared with me.

To my honored supervisor and co-supervisor

Puan Umi Hayati Binti Ahmad & Puan Nurul Ain Binti Maidin

Thank you for always giving me guidance to complete this thesis project.

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LIST OF ABBREVIATIONS

ANS	Automatic Nervous System
BEEI	Bachelor of Electrical Engineering Technology (Industrial Power) with Honours
BMMD	Bachelor of Manufacturing and Mechanical Engineering Technology (Product Design) with Honours
BMMH	Bachelor of Manufacturing and Mechanical Engineering Technology (Refrigeration and Air-conditioning System) with Honours
BMMP	Bachelor of Manufacturing and Mechanical Engineering Technology (Process and Technology) with Honours
NASA-TLX.	NASA-Task Load Index
SWAT	Subjective Workload Assessment Technique
BP	Blood Pressure
DBP.	Diastolic Blood Pressure
SBP	Systolic Blood Pressure
DASS	Depression, Anxiety & Stress Scale
MWL	Mental Workload
MSD	Musculoskeletal Disorders
mmHg	millimeters of mercury
bpm	beat per minute

CHAPTER 1

INTRODUCTION

1.0 Introduction

This section will talk about background research and the objectives of this project. Briefing and description of the problem statement for the project. After that, elaboration of the scope to accomplished the project expectation.

1.1 Background Research

Malaysia is one of developing nation and still new in the cognitive field. In this study, it is all about an issue that student faced from their daily life as a college student. The main focus is to see how can the cognitive ergonomic can be effective to the student workload.

According to (Kim, 2016) cognitive ergonomic consist of work stress, human reliability, human-computer interaction, skilled performance, decision making, mental workload and training as related to human-system design. All of the element is related to the student to perform their activities in college. Therefore, this study is made to view from the previous studies what kind of method that has been used that suitable to this study to identify the outcome of the impact on the student workload.

1.2 Problem Statement

In a college, it is important to the student to manage or control the workload at every each of their activities. It is to enable to all of the activities that they working it is going smoothly. Because this study involved the students, so everything that related around student is important to include in this study.

A student who cannot manage their workload will cause an unhealthy circumstance to their mental and physical even to their surroundings like their activities can be affected. This study is not only studies about student activities in the college but also conclude student activities outside the college such as a student who is working as a part-time. Every subject that student take is also considered as a student workload that can affect cognitive ergonomic like how many subjects in one course that student take and how tough the subject is.

1.3 Objectives

The objectives of this research were as follow:

- i. Study the relationship between cognitive ergonomic and the impact on the final year students of BMMD, BMMP, BEEI and BMMH.
- ii. To apply cognitive ergonomic methods to assess task performance in detail.

1.4 Scope of Research

This study will focus on the effect of cognitive ergonomic final year student workload. In this project there are 20 students participate from difference courses which is Bachelor of Manufacturing and Mechanical Engineering Technology (Product Design) with Honours (BMMD), Bachelor of Manufacturing and Mechanical Engineering Technology (Process and Technology) with Honours (BMMP), Bachelor of Manufacturing and Mechanical Engineering Technology (Refrigeration and Air-conditioning System) with Honours (BMMH) and Bachelor of Electrical Engineering Technology (Industrial Power) with Honours (BEEI). This study is measured from the beginning of the semester until the end of the semester where the students need to finish up all final projects and preparing for presentations and exams. The data will be collected by using survey questionnaire and method analysis. The data will show whether the cognitive ergonomic can affect student workload or not from all participate.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This section will talk about the task that has been recognizing by different researchers. It consists of study and material presented of research for example journals, thesis, technical document, specialized record, book analyses and online library. Broadly, the target of their view is to investigate basically a part of a distributed learning through the outline, classification, their project approached, a technique they used in their study, literature review and theoretical project. This section also concludes the topic that relevant and related to this project. In addition, other studies from past researcher will be concluded in this chapter for the reader to understand this project.

2.1 Type of Ergonomic

(Araújo et al, 2015) has stated that ergonomic can broadly be defined as a science that is connected to the outline of machines, gear, system, and occupations, with the point of enhancing the security, health, comfort, and productivity during the work. It likewise can be said that ergonomics is a logical subject that reviews the connections of humankind with different components of the system, making use of the hypothesis, principles and Project methods, with the plan to enhance the human well-being and the worldwide performance of the system. In the activities of work and everyday circumstance, Ergonomic spotlight on students. The dangerous conditions, insalubrity, uneasiness, and inefficiency are dispensed with by their adaption to the physical and mental limits of students.

Another study state that ergonomic may be defined as discovering and applying data about human behavior, abilities, limitation, and different attributes to the design of tools, machines, system, assignments, employment, and situations for profitable, safe, comfortable, and human utilization (Jones, 2009). According to (Jones, 2009), ergonomics comprise three main field of research which is physical, cognitive and organizational.

2.1.1 Physical Ergonomics

Physical ergonomics is like they related to physical activity that linked to the human anthropometric and physiological characteristic (Jones, 2009). As stated by (White, 1999), physical ergonomic is related to the human body's response, this study argues that if the ergonomic principles are neglect in the working environment, musculoskeletal disorders (MSD) are potential to get. An ergonomist ass the risk factors is given employment brings that can be characterized comprehensively into physical attributes and ecological characteristic. The most commonly reported musculoskeletal disorders that affected the lumbar is lower back, neck and shoulder pain. With some estimate being 84% high, approximately 80% of the general population is affected by musculoskeletal disorders at a certain point during their lifetime (Shariat et al., 2016).

As noted by (Junior, Pereira, & Silv, 2015), a role factor in the advancement of the musculoskeletal issue is identified with higher-end work, for example, high tedious, high quality and intellectual effect. Repetitive activity was demonstrated experimentally by electromyography, in his study showed that repetitive exercises of short cycles for times of one hour heads to muscles exhaustion and end up one of the static load factors (Bosch, as cited in Junior et al., 2015).

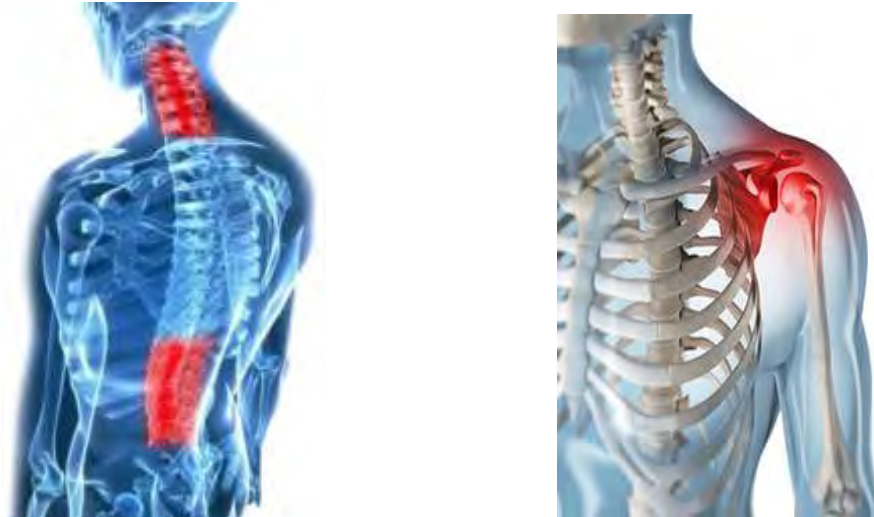


Figure 2.1: Lower back, neck pain & Shoulder pain

2.1.2 Cognitive Ergonomic

Cognitive ergonomic can be mean to focus on mental processes as they influence connections with people and different components of a system, for example, perception, memory and information processing (Jones, 2009). In a study conducted by (Schiltewolf et al., 2017), it was shown that research has provided evidence of cognitive deficits in individuals with chronic pain that have been led in the course of recent years. There had around 45% to 50% of patients report cognitive explicit such as minor accidents (23.1%), forgetfulness (23.4%), difficulty finishing tasks (20.5%) and trouble in maintaining attention (18.7%). Cognitive load theory can be broadly be defined as based on the general architecture of human cognitive that contain three processors and a memory element (Kumar & Kumar, 2016). In a study of (Kumar & Kumar, 2016) and (Kumar & Kumar, 2016) state that, there is three type of cognitive processing in cognitive load namely intrinsic, extraneous and germane. This type is in a different type of level of cognitive load that leads to growth in difficulty.

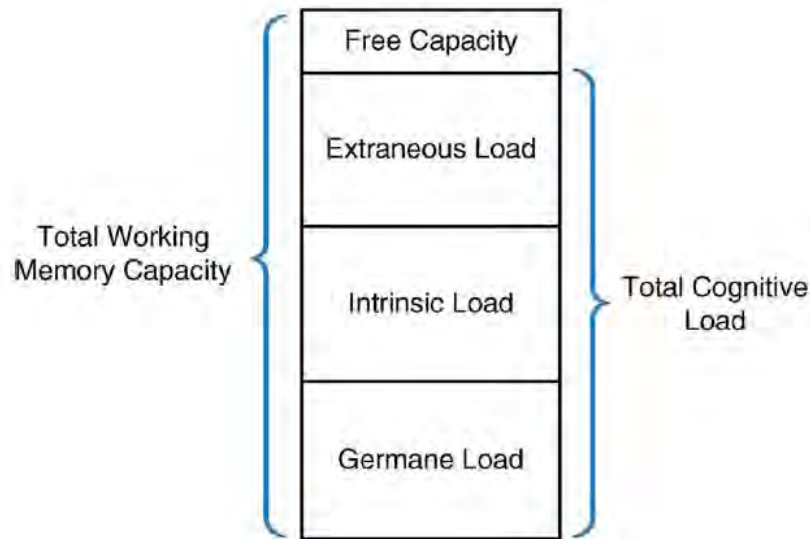


Figure 2.2: Components of cognitive load theory

2.1.3 Organizational Ergonomic

Organizational ergonomics may be defined to sociotechnical systems optimization consist of organizational structures, policies, and processes (Jones, 2009). Organizational ergonomics also knew as macroergonomics. In the field of macroergonomics show that ergonomic it is not just how a person interacts to an item but it also shows how people in the group cooperate with each other in an environment of work in the macroergonomics main. Besides, organizational ergonomics can be related to communication, work plan, collaboration, team resource, management, teleworking, shift work, safety society, work fulfillment and inspiration. The target of macroergonomics is to make work system fully harmonized as a result of job satisfaction and commitment of employee.



Figure 2.3: Organizational Characteristic

Figure 2.3 shows the basic balance element model that interact with each other. The goal of the element is to balance all the elements of the system to achieve cost saving or cost avoidance. Any effect to either one of the element will change the whole system that may lead to safety, productivity, efficiency or quality problem (White, 1999).

2.2 Mental Workload

According to (Byrne et al., 2010), the involvement of measure of mental effort in playing out any given task can be depicted as the importance the psychological workload. For any individual, given that there is an utmost to the mental workload where the extent of the limit being utilized as a part of time any point and will differ contingent upon playing out the performance by the person. Due to its suggestions for safety, team size and the impacts of automation the estimation of mental workload is viewed as critical in some high-chance situations.

Another study also states that mental workload can be defined as a deterioration in the psychobiological cause of mentally demanding task for a long time. Limited remaining