Chapter 1
A Review on Gaming Effects on Cognitive Load for Smart Healthcare and Its Security

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ABSTRACT

Constructive and damaging effects of video game playing on the human brain have been emerging areas of study . It has been proved that playing a video game for a certain time also has some advantages like slowing aging, enhancing learning ability, improving hand-eye coordination, and even physical fitness can be improved by playing games associated with sports. However, there are many disadvantages if the player becomes addicted to a specific game. Unfortunately, many scientists proved that video games affect our mental and physical health negatively. It affects our attention, academic performance, and eyesight. Playing it on a daily basis causes aggression and continuously playing the game for a long time directly affects the human brain. Cognitive load is a mental process to detect the current situation of the human mind. The cognitive load is increased when brain complexity increases and vice versa. To detect the cognitive load, electroencephalography by placing electrodes of different positions on the scalp can be used.

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INTRODUCTION

Different adverse and positive effects of computer or video gaming on the human brain have been an active area of research in the last decade as in the present scenario; gaming habit has been increasing among young adults' day by day. Video games are very popular irrespective of the gender and age of the player, but like other enjoyable endeavors, (Das et al., 2020) they can have adverse consequences on the cognitive load resulting in the risk of video game addiction and aggressiveness. Adverse effects after occurring, tend to be comparatively minor and temporary, which gets solved by decreasing the habit of play. Different data acquisition, feature extraction, selection and classification techniques used in the existing literature have been reviewed in the present chapter.

The main aim is to develop a model to focus on the negative impact of games for teenagers and alert their parents to check the mental state of their children. Some of the dangerous games like Momo, Blue whale can control the human mind, and do crime by them. That's why the proposed system applies as cybersecurity (Das, Balmiki, Mazumdar, 2022) to parental control. Cognitive load and bias are two human behavioral aspects that have the potential for significantly increasing the effectiveness of cybersecurity (Pfleeger, 2012). Blue whale is a deadly online game, which changes human behavior and promotes victims (mainly teenagers) to self-harming and dangerous dare like suicide. That is why it is an illegal and unethical game (Mukhra et al., 2017). The cyber-physical system is developed for self-monitoring that controls and changes human behavior (Cena et al., 2015) which nowadays plays a major role in development and design of future systems. Recorded activities of some violent war game sometimes become the testing and validating tool for cyber defense and security models (Colbert et al., 2017).

Organization of the chapter are as follows: in section 2 discusses on basic concepts related to human, introduction to electroencephalography is discussed on section 3, preliminary ideas about healthcare and cyber security is described in section 4, in section 5 psychological effects of games are summarized, literature survey are discussed on section 6, and conclusion and future direction are addressed in section 7.

BASIC CONCEPTS RELATED TO HUMAN BRAIN

Our major organ is Brain inside the head consisting of billions of tiny cells and weighing about 1.5kg (Zhang, 2019). Human brain development is not bounded by the cognitive and social skills growth with environmental and social connection (Brito and Noble, 2014). Human mind is a dynamic store rather than a static store (Craik, 2020). To support cognitive functions and sensor motor, dynamic electrical and chemical waves are propagated to the cerebrum for different external behavior (Messé et al., 2014). Human brain (as shown in **Figure 1.** and **Figure 2.**) is a more complex system that interacts with multiple physical and functional levels (NIH Public Access, 2011). The brain structural connection is heterogeneous patterns supported by cognition and a wide range of behaviors (Lynn and Bassett, 2019). To develop brain connectivity within a distributed associative network (Das et al., 2014), structural and functional neural network, computational theory and complex analysis play vital roles to elucidate brain-structure and function relationship (Batista-García-Ramó and Fernández-Verdecia, 2018). Recent advancement in neuroimaging techniques measure brain activity using the following methods fMRI, EEG, MEG.