Chapter 5
Reducing Pain Through Affective Computing

Luca Bondin
University of Malta, Malta

Alexiei Dingli
University of Malta, Malta

ABSTRACT

For a long time, the primary approach to control pain in patients involved the use of specially designed drugs. While these drugs have proved to be sufficient to reduce the perception of pain in patients of all ages, they do not come without any potential side effects. The prolonged use of such drugs can have adverse effects on the health of a patient. This research proposes a shift away from such practices and proposes the use of technology as an adjunct tool to help patients cope with pain. Through the adoption of affective computing, this research presents Morpheus results obtained at the time of writing confirm that the approach presented by this research is indeed useful and can achieve results that are in line with the set out as part of this study. The authors firmly believe that the approach presented in this research can lay the foundations for the research and development of similar applications in pain reduction scenarios.

INTRODUCTION

Pain is one of the most urgent concerns for patients undergoing any treatment procedure. Caused by injury, disease or invasive medical procedures, pain offers an experience that is generally exhausting and affects individuals both physically

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and psychologically. A variety of methods were explored to help treat patients in pain. However, for years, the primary approach to reducing pain in patients involved exclusive medicine and pharmaceuticals. As of 2014, pain medications were the third most written prescriptions, and few pain prescription drugs achieved acceptable pain relief in more than 50% of treated patients (Wiederhold et al., 2014).

The use of medicine and pharmaceuticals for an extended period may also lead to other issues that might have undesired effects on the health of the patient receiving treatment. For example, prolonged use of a particular drug leads to what is known as Tolerance. Tolerance is a person's diminished response to a drug, which occurs when used repeatedly. This causes the body to adapt to the continued presence of the drug, thus reducing its effects. For example, when morphine is used for a long time, larger doses must be taken to produce the same effect. Tolerance develops because the drug's metabolism speeds up, or the strength of the bond between the receptor and the drug decreases. Prolonged use of a drug may also lead to patients' Resistance that refers to the ability of microorganisms or cancer cells to withstand the effects of a drug. The development of Tolerance and Resistance is also compounded by the possibility that drug response is also subject to differences between patients' ages. Creating active drugs across a broad population while ensuring that the risks of developing Tolerance and Resistance are kept to a minimum is challenging. Pain is very much a private emotional experience that varies from one individual to another (Osterweis et al., 1987).

In light of this, we are now witnessing a shift in how professionals are looking at new and novel approaches to help patients cope with pain symptoms. Researchers, amongst others, are exploring psychological methods for reducing pain, such as cognitive-behavioural procedures and hypnosis. Others have turned to technology to provide the answer. Among the technology-based approaches, researchers have started looking at adopting Affective Computing to take healthcare to the next step.

The research presented in this chapter focuses on using Affective Computing and other easily accessible technologies to provide a coping mechanism for patients undergoing painful treatment procedures. We aim to tackle issues that commonly arise when creating such applications, namely the lack of readily available datasets, through the introduction of Federated Learning. More importantly, the research aims to provide a coping mechanism that is enjoyable and safe from any side-effect on the patient's health. This chapter intends to describe the methodology we adopt and discuss the experiments' results as part of this research.