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Expert system for determining the level of stress before pediatric dental treatment

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Abstract

The paper is focused on finding a solution based on an expert system designed to ease the dentist's treatment decision by evaluating the patient's anxiety and stress status.

To identify the requirements and functionalities of this system there was performed an extensive research based on psychological questionnaires and the use of a powerful device made to determine body energy and stress variables.

The experimental results were summarized and conclusions related to the proposed solution were discussed.

Then we presented the software specially designed to establish the opportunity of clinical intervention considering the patient's stress and anxiety.

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1. Introduction

Before initiating any dental treatment it is relevant to evaluate the clinical cooperation of the patients [1]. Getting a successful result in pediatric dentistry needs a good communication with the young patient. This is not possible when fear intervenes in the confrontation with the doctor [2].

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Less compliance could be easily associated to the person's fear. Any dentist could expect a certain anxiety or fear from the young patient but these become a problem when they are exaggerated [1, 2]. Many patients faced with unpleasant or painful past experiences consequently manifest an unjustified fear when confronted with the doctor, the dental equipment, different smells of the dental office or sounds produced by dental drills. Exaggerated fear can lead to poor collaboration with the dentist, a difficult treatment, bad results and undesirable events [3, 4].

The goal of the study was to determine the exact anxiety level in patients using a computer program specially designed for this purpose. This software establishes the opportunity of medical intervention considering the patient's anxiety and related symptoms.

2. Theoretical background

Anxiety includes state anxiety which is defined as "a transitory emotional condition that varies in intensity and fluctuates over time" whereas "trait anxiety is a personality trait that remains relatively stable" [5]. It refers to the tendency to be anxious without external stress. First, we determined the patient's anxiety level by using a psychological questionnaire, Spielberger's State-Trait Anxiety Inventory - STAI - which has been approved and validated in many studies [6]. We have adapted this questionnaire in order to better match our study. The Romanian translation of the questionnaire was used.

STAI is composed of two scales, A-state and A-trait, measuring distinct anxiety concepts: state anxiety (how someone is feeling in a certain condition) and trait anxiety (common fear of someone). "Both scales consist of twenty items for which a person rates anxiety on a scale from one (almost never) to four (very much so)" [5].

It has been shown that A-state scores increase after various kinds of stress and decrease after relaxation training [7]. Therefore, this scale can be used to measure changes in the intensity of the anxious condition occurring in certain situations.

Generally, those who score high in A-trait will show increases in A-state more frequently than individuals who score low in A-trait because they tend to react to a large number of cases, judging them dangerous or threatening [8].

State anxiety is a transitory emotional state or condition of the body characterized by subjective feelings, consciously perceived tension and fear and increased activity of ANS-Autonomic Nervous System [9].

This nervous system controls vital functions such as heart activity, blood pressure, digestion, salivation, perspiration and exchanges between body and environment [10].

The sympathetic nervous system plays a role in stress situations with all aspects of increased secretion of adrenaline: peripheral vasodilatation, acceleration of heart rate, rise in blood pressure, sweating, hyper salivation; skeletal muscles are well supplied with blood at the expense of internal organs, the pupil of the eye is increased, the whole body being in a state of alarm.

The second step of the study was to determine the stress status of the patient with a powerful device used in traditional Chinese medicine and homeopathy [11] approved in E.U. Over the last decades scientists have shown that electromagnetic fields govern biological systems.

The device measures the energy level of the whole body shown by Energy parameter which is the average of energy values determined in 24 energy points located on the skin surface of hands and feet, corresponding to various organs and systems.

It also evaluates the stress status of the autonomic nervous system associated with symptoms and gives us indications of potential risks for the body health when these values are increased [12].

3. Research methodology

In order to investigate the correspondence between the values given by anxiety questionnaires and those shown by device's parameters we formulated the following hypotheses:

Research hypotheses:

- We assume that changes in the normal values of trait anxiety can lower the body energy shown by Energy parameter of the device and lead to diseases;

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