Title: Topographic Brain Mapping of Motion Sickness Using EEG and Virtual Reality

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T.C.
İSTANBUL AYDIN ÜNİVERSİTESİ
LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

EEG VE SANAL GERÇEKLİK KULLANARAK HAREKET
HASTALIĞININ TOPOGRAFİK BEYİN
HARİTALANDIRILMASI

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ABSTRACT
Topographic Brain Mapping of Motion Sickness Using EEG and Virtual Reality

Motion sickness is a complex symptom set in various travel conditions. This research has planned to understand the activation of motion sickness in the brain. The research was carried out with 47 (Research Group: 23, Control Group: 24) participants in the Virtual Reality laboratory of Acibadem University Center of Advance Simulation and Education. The research used real travel videos to simulate real life and create motion sickness. The stimulus videos were chosen from real travel videos on the YouTube VR platform, an accessible and wellknown platform. The research was planned in five steps to provide five different travel experiences in a single session. The videos are presented with virtual reality glasses. It was chosen as an EEG data collection tool due to its noninvasive, portable, and high reliability. Continuous EEG recordings were taken throughout the session. Subjective data were correlated with self-report reports collected during the experiment, and individuals with and without motion sickness were analyzed comparatively. Statistical analyzes were performed on EEG frequency bands (Theta- (4.0– 7.0 Hz) Alpha (7.0–13.0 Hz) Beta oscillation (13-20 Hz) most associated with motion sickness in the literature. Differences were observed in the alpha band. While the alpha wave appeared in the occipital region in participants with high motion sickness sensitivity (p= 0.0017), an increase in activation was found in the central alpha band in individuals who were adaptive and did not have motion sickness. This activation coincides with the Mu Rhythm, which indicates adaptability and information processing skills. The presence of occipital alpha when the eyes are open in individuals with high motion sickness susceptibility is compatible with the inhibition hypothesis and was evaluated as an indicator as an indicator of participants' coping efforts.

Keywords: Motion Sickness, Electroencephalogram, Virtual Reality, Occipital Alpha, Mu rhythm

Title: Virtual Reality-Based Advanced Life Support Serious Game

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VIRTUAL REALITY-BASED ADVANCED LIFE SUPPORT
SERIOUS GAME

by

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ABSTRACT:
Virtual Reality-Based Advanced Life Support Serious Game
This thesis investigates the development and learning outcome of an immersive virtual reality (VR) serious game designed to improve the training of medical professionals in Advanced Life Support (ALS) procedures. More than a million healthcare professionals partake in ALS training each year. This high demand for highly skilled healthcare providers proficient in time-sensitive emergency interventions necessitates innovative approaches to training. The software developed for this thesis aims to facilitate this training process while paying proper attention to non-technical aspects of ALS that are generally overlooked by similar training serious games. This serious game is developed in Unity game engine using C# for Unity scripts and plug-ins. The scores of users are sent to a database using Experience Application Programming Interface (xAPI) calls and stored using a Learning Management System (LMS) and a Learning Record Store (LRS). There are two training modes and a final test mode that scores the user. An initial study was conducted on 29 participants to compare the efficiency of VR training and conventional training. One group trained in VR and the other trained in a classroom setting, before all participants took the same test. Another follow-up study was conducted on 12 participants to check the correlation of the scores from the VR test mode and a more conventional hands-on manikin simulation where all participants took both tests to see if their results were statistically similar. The findings show that VR training is non-inferior to conventional training for the most part and that VR test scores correlate with conventional test scores. These findings combined with the advantages of being a self-service training software indicate that this serious game can be utilized effectively as an additional training resource, and even shows potential to replace classroom training in the near future.

Keywords: Advanced Life Support, Virtual Reality, Serious Game, Training Simulation.

Title: Evaluation of The Effectiveness of Simulation-Based Crisis Resource Management Training in Terms of Hypoglycemia For Senior Nursing Students

Publication Year: 2019

ABSTRACT

Evaluation of The Effectiveness of Simulation-Based Crisis Resource Management Training in Terms of Hypoglycemia For Senior Nursing Students

In this study, the effect of crisis resource managemnet training (C.R.M.) given to the nursing students in the approach to the patient who had an attack on hypoglycemia was examined. Experimental design with pre-test and post-test control group was used. The experimental group (N=30) and the control group (N=31) were selected via simple random sampling. All students were taught about hypoglycemia. The experimental group participated C.R.M. training. After the theoretical training, all students participated in the simulation scenarios. Demographic Information Form, Hypoglycemia Management Information Form, Hypoglycemia Scenario Control Form and Student Satisfaction and Self-Confidence Scale in Learning were used to collect data. Descriptive statistics, Shapiro Wilk test, Wilcoxon Signed Rank test, Mann Whitney U test, Chi-Square test, Spearmanaps rho correlation analysis and Intraclass Correlation analysis were used for analysis. The statistical significance level was determined as 0.05, MedCalc Statistical Software version 12.7.7 Program was used for analyzes. Data were collected from 61 (51.6%) female and 10 (16.4%) male students. There was a statistically significant difference between the groups in terms of pre-test and post-test mean scores and the posttest mean of all students was higher than the pre-test. In hypoglycemia scenario performances, the mean of Crisis Resource Management steps of experimental group was found to be statistically higher than control group (Mann-Whitney U p <0.05). There was a statistically significant positive correlation between satisfaction and self-confidence level in all students after simulation training. As a result, C.R.M. training is developing the ability to intervene before and during the crisis. The integration of C.R.M training to nursing training and repeated on a regular basis annually is recommended.

Key Words: Crisis resource management, Hypoglycemia, Nursing, Simulation based training

Title: Evaluation of Learning Levels of Laparoscopic Surgical Simulations by Electroencephalographic Signal Analysis

Publication Year: 2017

T.C.
YILDIZ TEKNİK ÜNİVERSİTESİ
FEN BİLİMLERİ ENSTİTÜSÜ

LAPAROSKOPİK CERRAHİ SİMÜLASYONLARINDA ÖĞRENME DÜZEYİNİN
ELEKTROENSEFALOGRAFİ SİNYAL ANALİZİ İLE DEĞERLENDİRİLMESİ

FUAT ÜCRAK

YÜKSEK LİSANS TEZİ
ELEKTRONİK VE HABERLEŞME MÜHENDİSLİĞİ ANABİLİM DALI
ELEKTRONİK PROGRAMI

DANIŞMAN
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YRD. DOÇ. DR. M. EMİN AKSOY

İSTANBUL, 2017

ABSTRACT

Evaluation of Learning Levels of Laparoscopic Surgical Simulations by Electroencephalographic Signal Analysis

Laparoscopic surgical procedures require more distinct and superior psychomotor skill than the open surgical methods. While quantitative determination of the skill level is difficult, the use of electroencephalography (EEG) in the measurement of new competency gaining has potential to create an unbiased criterion for determining the permanent performance of laparoscopic surgical simulation users. For this purpose, spectral and statistical evaluation of EEG data collected during laparoscopic surgical simulation training was performed in this study.

In the framework of the protocol approved by the ethics committee, 10 male (dominant right hand, 22 ± 2.43 years old) university students who had no previous experience in using laparoscopic surgical simulator participated in the experiment with written consequent. The peg transfer procedure, which is a laparoscopic surgical simulation training module, was performed on two separate dates, on a weekly basis. The process was performed for 3 times as nesting of 4 peg nests in each of the peg transfer. Spectral analysis of EEG data was performed using the NPX Lab program. The results were also statistically analyzed with SPSS program.

Changes in relative temporal power at two time points were found to be significant in the anterior temporal and frontal regions and anomalous changes in the frontal parietal regions. When the changes in the bands were examined, it was found that the differences from the bifurcations were mostly in the alpha and theta bands.

This study, the formation of laparoscopic surgical simulation training methods is the first and unique study in which more efficient quantitative criteria can be determined.

Keywords: Laparoscopic surgical simulation, electroencephalography, spectral analysis.

Title: Sustainability of Medical Simulation Centers in Universities: Stakeholder Perspectives

Publication Year: 2023

ABSTRACT

Sustainability of Medical Simulation Centers in Universities: Stakeholder Perspectives

In this study, the process of proliferation of medical simulation systems in universities, the hardware and training methods used, and how the method will evolve in the future were examined. The aim of this research was to identify the advantages and disadvantages of medical simulation systems currently used in universities, which face challenges in terms of sustainability due to high operational costs, and the education provided through these systems. This study was conducted between June 2021-July 2021 aimed to determine the stakeholder views and expectations regarding the applications of medical simulation systems being implemented at a foundation university. A total of 132 voluntary participants were included in the research. After obtaining ethical committee approval and personal consent from the participants, a survey was conducted targeting different participant groups who have received or are receiving training at the Acıbadem University CASE - Clinical Simulation and Advanced Laparoscopic-Robotic Surgery Center. The analysis of the collected data revealed a high level of satisfaction with simulation-based training and a widespread belief that simulation environments providing the opportunity for risk-free practice contribute significantly to learning. Based on these findings, it was concluded that simulation-based healthcare education is an extremely beneficial training model for the learners. Due to the high installation and operational costs of medical simulation systems, conducting accurate needs analysis is crucial for institutions to acquire the most suitable systems for their target audience. In the design phase, it is highly important to seek support from institutions or individuals with experience in this field. Considering the potential technologies that may emerge in the coming years, it is crucial to design the center in a way that it will have both the physical and other necessary infrastructures to meet future requirements effectively.

Keywords: Operational cost, medical simulation, healthcare education, risk-free environment, sustainability.