

# Monitoring Nursing and Midwifery Students' Stress level using Wearable Device during High-Fidelity Simulation: A randomized controlled intervention

## Introduction

High-fidelity simulation is an effective teaching method that enhances critical thinking and clinical decision-making skills among healthcare students [1,2]. However, the use of simulation can also result in increased stress levels, potentially affecting learning outcomes and satisfaction [3]. Therefore, it is crucial to monitor stress levels and assess the effectiveness of interventions in reducing stress during simulation.

## Aim(s)

The aim of this study was to monitor the stress levels of nursing and midwifery students during high-fidelity simulation using a wearable device (Empatica E4 wristband<sup>®</sup>) [5], with a focus on assessing the impact of a short debriefing intervention. Additionally, this study aims to assess nursing and midwifery students' satisfaction with the simulation experience, providing valuable insights into their perceptions and experiences related to the simulation and debriefing intervention.

## Methods

A randomized controlled intervention study [6] was conducted with 78 nursing and midwifery students ( $n_{\text{intervention}}=41$ ,  $n_{\text{control}}=37$ ) enrolled in a simulation course at the Erasmus Brussels University of Applied Sciences and Arts (EhB) during 2022-2023 academic year. The students were randomized into two groups. Before the simulation began, participants were asked to sit at rest for 30 minutes ( $T_0$ ). Before the commencement of the scenario, students were provided with a briefing regarding the specific situation and their designated roles. Subsequently, they proceeded to encounter and participate in the scenario ( $T_1$ ). During the debriefing phase, the intervention group received a short stress and satisfaction debriefing, including a discussion on stress, while the control group received a standard debriefing ( $T_2$ ). After the debriefing phase, participants were asked to rest for an additional 30 minutes ( $T_3$ ). Physiological stress parameters, including heart rate (HR), blood volume pulse (BVP), electrodermal activity (EDA), and skin temperature (Temp) were continuously assessed using an Empatica E4 wristband<sup>®</sup> [5,7], divided into four time periods:  $T_0$ ,  $T_1$ ,  $T_2$ , and  $T_3$ . Psychological stress levels [8] were evaluated at two different time points,  $T_0$  and  $T_3$ . Additionally, satisfaction with the simulation experience [4] was evaluated at  $T_3$ . Interviews with the intervention group were conducted during the  $T_2$  time period. Quantitative data were analyzed using IBM SPSS 28.0 software, while qualitative data were analyzed using thematic content analysis. The Empatica E4 wristband data were processed using a Python program<sup>®</sup>. Ethical approval was obtained from the Brussels' University Hospital and the Vrije Universiteit Brussel (VUB) committees. All participants gave their written informed consent before participation.

## Results

This study found that the intervention group had lower mean post-test scores in psychological stress when compared to the control group ( $p<0.05$ ). Moreover, the intervention group demonstrated higher mean post-test scores in satisfaction with the simulation experience compared to the control group ( $p<0.05$ ). When comparing debriefing time periods ( $T_2$ ), we observed the median values of EDA and HR in the intervention group were lower than those in the control group ( $p<0.05$ ). Additionally, most of the comments indicated the presence of stress during the simulation. However, students particularly valued the opportunity to discuss their emotions during the debriefing session.

## Discussion

The findings show that the use of a wearable device, the Empatica E4 wristband, for monitoring stress levels during simulation among students is a valuable approach. This also highlights the positive impact of a debriefing intervention on students' stress and satisfaction with the simulation experience. The observed patterns in EDA and HR parameters during the debriefing period ( $T_2$ ) provide valuable insights into the physiological responses of the students to the simulation training. Furthermore, high satisfaction reported by the students indicates the value of a debriefing intervention.

## Implications and future perspectives

Further research can explore the potential of real-time stress assessment to provide personalized feedback and tailored interventions. This has the potential to enhance the overall well-being and improve the learning satisfaction of nursing and midwifery students during simulation training.

## References

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