Assessing Nurse Learners' Stress Using Technology to Measure Physiologic Adaptation within Interprofessional Patient Care Simulation

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BACKGROUND

Interprofessional communication is pivotal for patient safety. Nurses continuously assess patients and then transfer important facts to key team members. Newly hired nurses especially, feel stressed during team reports. Many report being overwhelmed by a lack of team communication skills when building their practice competencies (AACN, 2016; IOM, 2011).

Interprofessional simulation education (SIM-IPE) is an effective teaching strategy that promotes learners' familiarity with the complex roles of the healthcare team while in a safe, realistic setting. SIM-IPE also gives learners practice in adapting to stress while developing teamwork attitudes and communication skills.

PURPOSE

This descriptive longitudinal study examined junior-year nurse Bachelor of Science in Nursing (BSN) learners' (n=57) biological stress adaptation during SIM-IPE patient care experiences through post-SIM peer-to-peer debriefings.

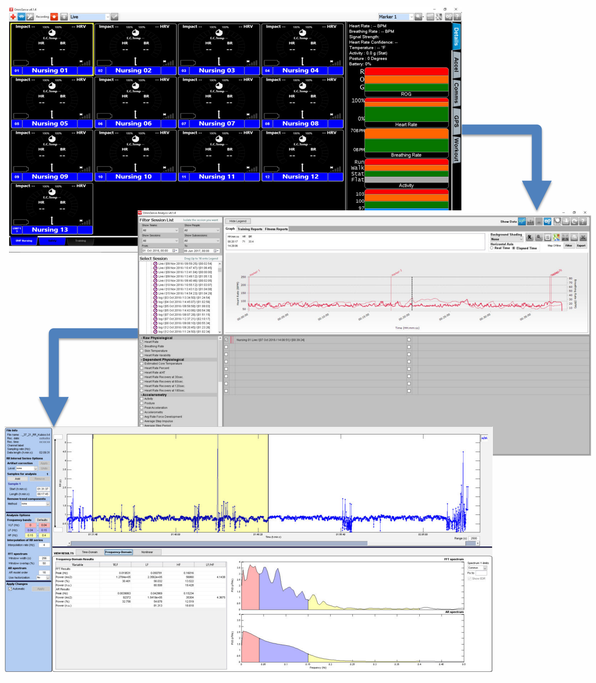
METHODS

Nurse faculty created and conducted the SIM-IPE scenarios. Exercise Science faculty monitored learner's stress indicators during the experience using Omnisense Live (version 4.1.4, Zephyr Technology, Annapolis, MD), applying time-stamp markers to define the scenario time of stress adaptation. The data was automatically recorded throughout the SIM-IPE experience and debriefing periods. Data was stored into a password-protected laptop, and backed up by a university lab password protected intranet.

Before SIM-IPE sessions, BSN learners were fitted with a Zephyr BioHarness™3 sensor harness (Medtronic ©, Annapolis, MD) that was worn beneath their uniform shirt, touching skin. It continuously senses the learner's physiologic indicators of stress adaptation (i.e., heart rate, heart rate variability, respiration rate, and trunk inclination level). The assessment of heart rate variability (HRV) allows for the inference of autonomic nervous system (ANS) control, which regulates vital involuntary functions of the body.

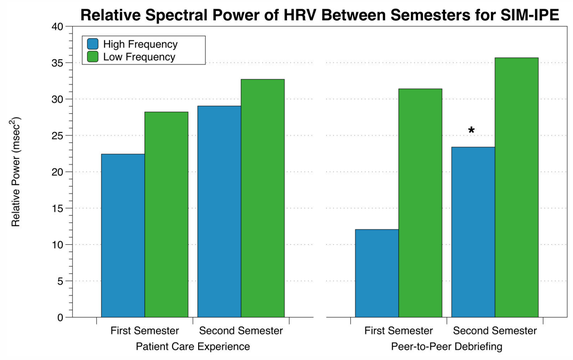
Each BSN learner completed 5 SIM-IPE experiences over 2 semesters, with roles randomly assigned. Learners' individual stress indicators were monitored 8 times throughout their first junior semester; and, continued 31 more times in their second semester. Learners' roles were carefully identified and recorded so faculty could analyze the scenario real-time changes in stress adaptation.

Sensor data were then post-processed by logging the marker time-stamps and exporting the HRV using OmniSense Analysis (version 4.1.4, Zephyr Technology, Annapolis, MD). HRV data were imported into Kubios HRV software (Version 2.2, Biosignal Analysis and Medical Imaging Group, University of Eastern Finland, Kuopio, Finland) and the time-stamp data was input to identify areas of interest (*patient care activity* and *peer-to-peer accountability debriefing*). Power spectral information relative to ANS frequencies was output from these areas of interest.



DISCUSSION

The Zephyr BioHarness™3 sensor data were analyzed collectively to determine when stress adaptations were more prevalent. Recall that the ANS system is divided into *sympathetic nervous system* (i.e., heart rate acceleration, blood vessel constriction, increase in blood pressure) and the *parasympathetic nervous system* (i.e., slows the heart rate, increases intestinal and gland activity and relaxes sphincter muscles). Researchers identified that when the sensor data demonstrated change in heart rate variability, the frequency bands demonstrated a change in neural influence from sympathetic to more parasympathetic controls, thus indicating stress adaptation.

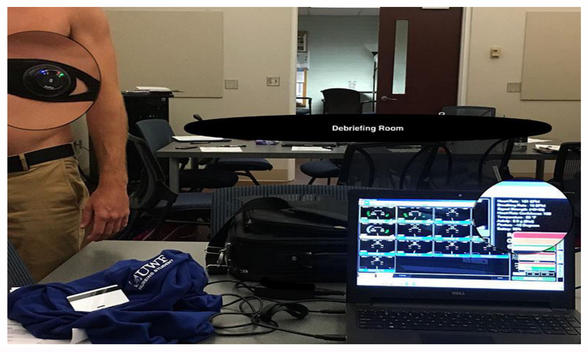


RESULTS

Findings revealed that during the semester's initial SIM-IPE sessions, nurse learners demonstrated an increase in stress indicators while involved in patient care activities. However, over the two semesters' time, and, after five (5) SIMs, patient care stress indicators were lower, indicating learners adapted to their stress, and, perhaps were more confident when performing the patient care activities. Learners, as the semesters progressed, appeared to adapt to stress during SIM-IPE *patient care activities*.

However, throughout both semesters, during all the post-SIM *peer-to-peer accountability debriefing* sessions, learners' physiologic stress indicators remained high. Analysis of time-stamp markers during the debriefing sessions found that these same learners displayed no changes in their frequency relative power, indicating that stress levels, brought on by peer-to-peer accountability, still remained high.

This study supports the SIM-IPE environment as a safe learning environment to reduce stress and promote teamwork communication.

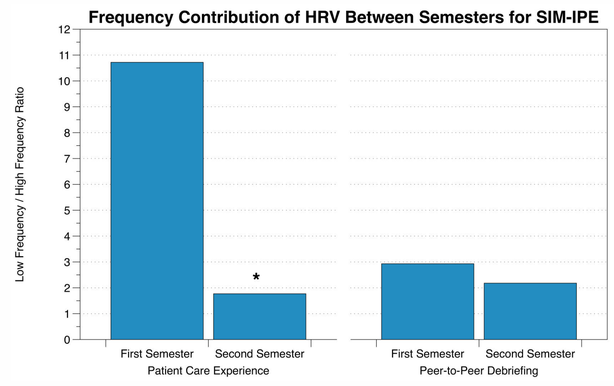


CONCLUSION

As time progressed, BSN learners

1. Adapted to stress during SIM-IPE patient care activities.
2. Maintained high, unchanged stress levels during post-SIM-IPE debriefing when peer-to-peer accountability required communicating their patient care decision-making.

More research is needed on learners' stress adaptation during peer-to-peer debriefing. SIM-IPE should be integrated across the learning continuum, where learners build knowledge, skills and positive attitudes across practice settings and professions (IPEC, 2016).



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