Impacts of Stress and Emotional Competencies on the Flow Experience during Simulation-Based Learning

Background

Flow refers to a mental state of deep involvement and absorption in which the person is engaged and feels a positive emotion towards the activity performed (Bartholomeyczik et al., 2023 ; Csíkszentmihályi, 2008 ; The European Flow Researchers Network (EFRN), 2014). During a state of flow, the person is driven by a strong motivation to continue and repeat the activities (Peifer et al., 2022). The efficiency and effectiveness of learning are modulated by the state of flow in simulation (Yoo & Kim, 2018). This state helps students immerse themselves in the activity and enables them to mobilize the skills required in this type of learning situation (Jung & Roh, 2022).

Nursing science educators must implement pedagogical methods that prepare students for their future profession (Reaves et al., 2024; Servotte et al., 2019) . To enhance the didactic effects of simulation-based learning, it is necessary to focus on factors that may promote this psychological state during a complex learning situation (Yoo & Kim, 2018). Studies show that stress, level of education, level of support, problem-solving ability, and the fidelity of the environment influence flow (Kim & Park, 2018; Yoo & Kim, 2018).

Beyond these factors, emotional competencies could represent a new factor to consider. This distinctive attention stems from the fact that emotional competencies predict a person's ability to adapt to a new situation and achieve better job performance (Gendron, 2017; Strugar Jelača et al., 2022). The profile of emotional competencies is defined as the way an individual identifies, understands, regulates, and uses their own emotions or those of others (Aghabarary

& Khedmatizare, 2025). To our knowledge, no studies have yet examined the impact of emotional competencies on flow.

This study explored how emotional competencies and stress influence nursing students' flow experience in simulation-based learning. Flow state was the dependent variable. The specific objectives of the study were:

1. Identify the relationship between emotional competencies and flow as well as between stress and flow
2. Examine the distinct effects of emotional competencies and stress on the flow state
3. Analyze interactions between all variables: stress, flow state and emotional competencies

Methods

Sample and Setting

A power analysis indicated that the current sample size of 89 participants enabled a statistical power higher than 0.90 to detect an effect size of 0.15 (Faul et al., 2007; Matthay et al., 2021). After excluding one participant with incomplete responses, 101 third-year nursing students were included in the final analysis.

The simulation was part of a professional integration activity within the cardiological emergency course, conducted at the end of the second semester. Students participated in groups of six to eight for a full day of simulation, which included four distinct scenarios. In each scenario, two different students acted as nurses, while the remaining four to six observed. Each scenario lasted between 10 and 18 minutes.

Prior to the simulation day, students were required to complete a preparatory activity consisting of a theoretical review of the assessment and management of cardiological emergencies. On the day of the simulation, a prebriefing session lasting between 15 and 30 minutes was conducted to establish a psychologically safe environment, in accordance with best practice guidelines (Watts et al., 2021). At the end of each scenario, a debriefing session was held with two facilitators. The care scenario focused on the clinical assessment of a patient with acute pulmonary edema caused by left heart failure. This scenario also included a medical report and a prescription for oxygen and medications. The simulation involved two students and lasted between 10 and 18 minutes.

Survey Instruments

Given that the students are French-speaking, the questionnaires used in this study were administered in French. To ensure the relevance of the data collected, only the two students who took on the role of nurses during each scenario were invited to complete the questionnaires.

Emotional Competencies

The emotional competencies of the participants were measured using the "Profile of Emotional Competence" (PEC) (Brasseur et al., 2013), a validated questionnaire comprising 50 items rated on a 5-point Likert scale (from 1 = strongly disagree or never to 5 = strongly agree or very often). The PEC examines how individuals identify, express, understand, use, and regulate their own emotions and those of others (Mikolajczak, 2014).

Stress Level

Stress level was measured using the Mental Readiness Form (MRF), adapted and validated for clinical immersion simulation (Krane, 1994). It consists of three 11-point scales that assess participants’ perceived levels of cognitive, affective, and physiological stress.

Flow State in Educational Context

EduFlow-2 is a validated French-language questionnaire designed to measure the level of flow in an educational context (Heutte et al., 2021). This questionnaire comprises 12 items rated on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). The educational context was specified to the participants. This questionnaire includes four dimensions: (1) cognitive control, (2) immersion and altered perception of time, (3) lack of concern about oneself, (4) autotelic experience.

Data collection

Data were collected from February to April 2024, in a Belgian University College. The PEC was completed by students before the simulation. MRF and EduFlow-2 were completed immediately after the simulation scenario.

In this study, the Cronbach's alpha coefficients for the PEC, the adapted MRF, and the EduFlow-2 demonstrated good internal consistency, with values of 0.82, 0.89 and 0.84 respectively.

Ethical Considerations

This study was approved by the Ethics Committee of the University of Liège under reference: 2223-094. According to the University College review board, participants were provided with both oral and written information about the study with a detailed explanation. This information was provided 15 days before the day of the simulation. At the end of this presentation, they had choice of whether to participate in the study. If they agreed, they signed an informed consent form before completing the PEC questionnaire.

To prevent bias and avoid any sense of coercion among participants, researchers were excluded from the simulation activities. These were conducted by trainers from the simulation center.

Data Analysis

Results were exported into SAS software (version 9.4.10). First, relationships between the variables were explored using Pearson's correlation test. Then, simple linear regression analyses were conducted to examine the distinct effects of stress and PEC on the state of flow. Finally, to examine the effects of stress and emotional competence on flow, a two-factor analysis of variance (ANOVA) was performed, with stress (low vs. high) and PEC (low vs. high) as the independent variables, and flow as the dependent variable.

Results

Table 1 summarizes the sociodemographic parameters for gender and age as well as stress, Flow and PEC levels. The majority of participants were women aged predominantly between 18 and 24 years. Stress levels, assessed using the Mental Readiness Form, had a median value of 20.0 (14.0–24.0). The flow state exhibited a median score of 53.0 (42.0–63.0), while the PEC showed a median of 162.5 (148.0–177.0)

Insert Table 1 here

Table 2 presents the results of the Pearson correlation analyses, linear regression models, and ANOVA conducted to examine the relationships between stress, flow, and the Profile of Emotional Competence (PEC).

Insert Table 2 here

The Pearson's correlation test showed a statistically significant positive correlation between the PEC and flow ($r = 0.25$, $p = 0.012$), indicating that higher levels of emotional competencies are associated with increased flow. Conversely, a statistically significant negative correlation was found between stress and flow ($r = -0.34$, $p < 0.001$).

The simple linear regression revealed that stress is a predictor of flow, explaining 27% of the variance observed in flow ($F = 18.31$, $p < 0.0001$, $R^2 = 0.27$). The obtained regression coefficient indicates that an increase in stress is significantly associated with a decrease in flow ($\beta = -0.56$, $p = 0.003$). On the other hand, the linear regression analysis between PEC and flow did not show significant results ($p > 0.05$). However, further analyses suggest that when an effect is observed, PEC positively influences flow, with a regression coefficient of $\beta = 0.45$, $p = 0.005$, explaining 12% of the variance in flow ($R^2 = 0.12$). Although these results are not statistically significant, they indicate a trend suggesting that higher PEC may be associated with increased flow under specific conditions.

The two-factor analysis of variance (ANOVA) showed a significant effect of stress on flow ($F(1, 97) = 12.03$, $p < 0.001$, $\eta^2 = 0.11$) indicating that stress level significantly influences average flow scores. A significant effect was also observed for the PEC, suggesting that emotional competencies play a significant role in flow attainment ($F(1, 97) = 8.32$, $p = 0.005$, $\eta^2 = 0.08$). The results show no significant interaction between stress and PEC ($F(1, 97) = 0.73$, $p = 0.397$, $\eta^2 = 0.007$).

Discussion

This study demonstrates how stress and emotional competencies interact to affect the state of flow in simulation-based learning. The results show that stress influences the state of flow, confirming other studies in nursing sciences (Kim & Park, 2018) and in work sciences (Weintraub et al., 2021). Stress accounts for a significant portion of the variance in flow, indicating that higher stress levels hinder students' immersion in simulation activities. Conversely, emotional competencies are positively correlated with flow. To our knowledge, this study is the first to establish a link between emotional competencies and the state of flow in simulation. The analysis of variance demonstrated that students with higher emotional competence profiles experience better states of flow during simulation.

Furthermore, the findings highlight the significant impact of stress on the flow state during simulation-based learning, with a moderate effect size according to Cohen (Cohen, 1988). This underscores the importance of addressing stress level to enhance flow experiences. Additionally, the results confirm that students with higher levels of emotional competencies tend to experience higher levels of flow, regardless of their stress level. The adjusted means analyses of stress level and PEC scores further confirm that mean scores differ significantly, although these effects do not combine to create an interaction effect. This suggests that stress and emotional competencies independently contribute to the flow state. Therefore, it is crucial to consider the separate contributions of stress and emotional competence when analyzing flow, as both factors play distinct roles in influencing this psychological state.

The following steps ensured the consistency of the simulations : 1) the INACSL Standards of Best Practice for Simulation were used to design the simulations (Decker et al., 2021; Watts et al., 2021) , 2) four experts validated the scenarios and simulation design, and 3) facilitators were trained before simulation. Nevertheless, it appears necessary to incorporate stress-reduction strategies into the prebriefing phase, or even to implement stress management activities prior to the simulation. The Standards of Best Practice also emphasize the importance of pretesting simulations. This pretest should not solely aim to validate the scenarios, but should also include assessments of stress and flow, thereby ensuring that students reach adequate levels of flow during the simulation.

Moreover, three educational perspectives can be drawn from these results: 1) It is advisable to consider students' stress levels before the simulation. Depending on the student's stress level, certain elements of the simulation scenario could be removed or added; 2) By measuring stress, as done with the MRF tool, the instructor could propose simulations that match the students' stress level; 3) The instructor could also measure students' emotional competencies. Similarly, the instructor could develop tailored training based on the PEC results. For example, it would be possible to work on these competencies before exposing students to clinical immersion simulation activities. Indeed, other studies (Sánchez-Álvarez et al., 2020) demonstrated that working on emotional competencies in more vulnerable groups could increase academic success.

Another perspective arising from the results of this study concerns the interindividual variability of flow. While students were immersed in the simulation in the same way, they exhibited very different flow scores. Thus, individual characteristics could influence the variation in flow. Although this has not yet been demonstrated in the context of simulation-based learning, similar data can be found in other contexts (Nielsen & Cleal, 2010; Tse et al., 2020).

The next steps for research and pedagogical method improvement can be identified based on these results. Further research is needed to explore: 1) the distinct contributory roles of stress and emotional competencies in achieving a state of flow; 2) additional internal and external factors influencing whether learners attain flow; and 3) the robustness of the proposed pedagogical perspectives.

Limitations

The participants were from a single higher education institution in Belgium. Additionally, the data were self-reported, which poses a risk of social desirability bias. Another limitation lies in the discrepancies between the methods of measuring flow (Moneta, 2021). In our study, flow was self-reported retrospectively to avoid altering it. Complementing the measurement of flow with data collection of a different nature could be interesting for future research.

Conclusion

This study highlights the importance of considering stress and emotional competencies in the development of simulation-based learning. It is necessary to ensure that the type of simulation is appropriate based on each student's stress level and emotional competencies. In other words, it is essential to develop clinical simulation learning experiences tailored to students. Finally, incorporating a module into student training to develop their emotional competencies could be a relevant avenue for research and education.