



Original Article

Anxiety and stress among anaesthesiology and critical care residents during high-fidelity simulation sessions^{☆,☆☆}



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ABSTRACT

Objectives: High-fidelity simulation (HFS) calls heavily upon cognitive capacities and generates stress and anxiety. The objectives of this prospective, observational study were to assess trait anxiety and fear of negative evaluation (FNE) in anaesthesiology and critical care residents and appraise their state anxiety levels and cardiovascular responses during HFS training sessions.

Subjects and methods: First-year anaesthesiology and critical care residents completed the French-Canadian adaptation of the State-Trait Anxiety Inventory (IASTA Y-1: state anxiety, IASTA Y-2: trait anxiety) and the French adaptation of the Fear of Negative Evaluation Scale (FNE). Their heart rate (HR) and blood pressure (BP) were assessed before and after the training session.

Results: Twenty-three residents (8 women, 15 men) were included in the study. IASTA Y-1 and Y-2 scores were low (respectively 40.2 ± 9.9 and 39.7 ± 8) and FNE scores were moderate (16.7 ± 5.5). HR measurements before and after the training sessions were significantly higher than at rest (respectively 78 ± 19 , 80 ± 17 and 63 ± 9 b/min; $P < 0.001$). BP measurements before and after the HFS sessions were not significantly different. The IASTA Y-2 and FNE scores of female residents were significantly higher than those of male residents (respectively $P = 0.004$ and $P = 0.049$).

Conclusion: First-year anaesthesiology and critical care residents had low trait anxiety and FNE. HFS training increased their HR but not their BP. Their state anxiety also remained low. Several differences between individuals were noted, particularly between men and women.

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^{**} This prospective observational study was performed to assess trait anxiety and fear of negative evaluation in anaesthesiology and critical care residents and to appraise their response to stress during a high-fidelity simulation training session.

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1. Introduction

High-fidelity simulation (HFS) for anaesthesiology training immerses learners in critical situations that are very demanding on cognitive capacities. The fear of failure and of negative evaluation by the instructor or by the group can generate stress [1].

Stress can be defined as an adaptive response by an organism to a stimulus or a task [2]. It calls upon the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis. Stress causes physiological and psychological modifications that in turn affect cognitive function [3,4]. An increase in heart rate is a reliable marker of the sympathetic nervous system's response to stress

[5]. Among the psychological aspects, fear is a normal emotion that occurs when the organism feels threatened and that manifests primarily as anxiety [6]. Anxiety may be described as a feeling of insecurity, apprehension or uneasiness due to an inability to predict or control a situation. Anxiety has two components: trait anxiety, which expresses a person's natural tendency to be anxious or not, and state anxiety, which describes a transitory emotional state caused by a temporary situation. Trait anxiety modulates the intensity and duration of state anxiety. An individual with high trait anxiety is at a greater risk of experiencing high state anxiety [7]. Fear of negative evaluation (FNE) is a type of social anxiety and therefore different from state anxiety. However, its intensity is positively correlated with trait anxiety [8,9].

For the present study, we sought to evaluate stress and anxiety in a population of first-year anaesthesiology and critical care residents who participated in HFS training sessions for the first time.

2. Subjects and methods

We conducted a prospective observational study at the Lyon Healthcare Simulation Centre (CLESS) at the Claude Bernard Lyon 1 University (Lyon, France) in order to assess anxiety and stress in the setting of HFS training. The protocol of the present study was reviewed by the local ethics committee CPP Sud-Est III (ref. QH 07/2013). Informed written consent was obtained from all participants.

2.1. Study subjects

We enrolled 25 first-year anaesthesiology and critical care residents (9 women, 16 men) who were scheduled to attend their first ever simulation training session on a high-fidelity mannequin. We determined baseline trait anxiety and FNE for the participants and analysed their sympathetic system responses via heart rate (HR) and blood pressure (BP) measurements and their emotional responses via the intensity of state anxiety under the stress of the HFS session. Exclusion criteria included concomitant use of medications affecting HR or BP and any psychoactive drugs.

2.2. Materials and training sessions

We used a SimMan Essential mannequin (Laerdal Medical AS, Stavanger, Norway) during the HFS sessions. The shared theme of the various scenarios was oxygen desaturation during intra-hospital transport of an intubated, sedated intensive care patient under mechanical ventilation. The residents executed their attributed scenarios in teams of two, each playing his/her role as a resident. The instructor played the role of a senior physician who could intervene directly or by phone. The training sessions were not filmed. The residents who did not directly participate were allowed to observe but were seated away from the acting residents and could not interact with them. The mean duration of the scenarios was 15 minutes. After each training session, all participants gathered together in another room for an approximately 40-minute debriefing.

2.3. Evaluation criteria

2.3.1. Anxiety

Anxiety was assessed using Gauthier and Boucharde's French-Canadian adaptation of Spielberger's State-Trait Anxiety Inventory (STAI) (French name: Inventaire d'anxiété situationnelle et de trait d'anxiété [IASTA]) (Table 1) [10]. The questionnaire comprises two forms, Y-1 and Y-2, evaluating respectively state and trait anxiety

Table 1

Evaluated parameters and their indicators.

Evaluated parameters	Indicators
Sympathetic response to stress	HR, BP
State anxiety	IASTA Y-1
Trait anxiety	IASTA Y-2
Fear of negative evaluation	FNE

HR: heart rate; BP: blood pressure.

(Appendices A and B). Scores range from 20 (lowest degree of anxiety) to 80 (highest degree of anxiety) and are most frequently categorized as follows: > 65 = very high anxiety; 56 to 65 = high anxiety; 46 to 55 = average anxiety; 36 to 45 = low anxiety; < 36 = very low anxiety. The participants completed the IASTA Y-1 just after the simulation training session, before the debriefing. The IASTA Y-2 was sent to the participants' homes by e-mail three weeks later. The participants were informed of neither the criterion being analysed nor the objective of the study.

2.3.2. Fear of negative evaluation

Fear of negative evaluation (FNE) was assessed using Musa et al.'s [9] French adaptation of Watson and Friend's Fear of Negative Evaluation Scale (French name: échelle de peur de l'évaluation négative, Appendix C). FNE scores range from 0 (lowest degree of FNE) to 30 (highest degree of FNE) with those greater than or equal to 20 considered as high and those less than or equal to 8 considered as low [11]. The FNE Scale was sent with the IASTA Y-2 using the same modalities.

2.3.3. Sympathetic nervous system response to stress

HR and BP were recorded to evaluate the sympathetic response to stress. HR was measured at three time-points: at rest by the student him/herself (in the morning before getting out of bed); before the training session; and after the training session (but before the debriefing). BP was measured before and after the training session (again before the debriefing session for the latter).

2.4. Statistical analyses

Quantitative variables were expressed as means \pm standard deviations (SD) and qualitative variables as numbers and percentages. The Shapiro–Wilk test was used to verify the normality of distributions. The Friedman test was used to compare HR measurements (paired samples when at least one variable was not normally distributed). Multiple pairwise comparisons were performed using the Student *t* or Wilcoxon tests for paired samples as appropriate. The Student *t* test for paired samples was used to compare BP measurements. Due to the small size of the study, the Mann–Whitney *U* test was used to compare quantitative variables according to sex and anxiety levels. Tests were two-tailed and $P < 0.05$ was considered as statistically significant except for multiple comparisons where Bonferroni corrections were applied. Analyses were performed using SAS 9.2 (SAS Institute Inc., Cary, NC, USA).

3. Results

Of the 25 residents initially recruited, 2 were excluded due to missing data, leaving 23 residents (8 women, 15 men) who were kept for the study analysis. Their mean age was 24 ± 1 .

3.1. Anxiety and fear of negative evaluation

Mean IASTA Y-1 and Y-2 scores were respectively 40.2 ± 9.9 and 39.7 ± 8 and the mean FNE score was 16.7 ± 5.5 (Fig. 1).

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