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Impacts of Violence Perpetrated Against Medical Students During Realistic Simulation: Lessons from a Pilot Project

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ABSTRACT

Introduction: Situations that represent academic violence are common in medical courses. The impacts affect mental health, student performance, and even patient care. Studies developed in the area usually have an observational methodological approach.

Objective: With the proposal of evaluating the impacts of a hostile learning environment with an experimental research model, this pilot aims to describe the strengths and possible adjustments in the proposed model.

Methods: Experimental study carried out in a realistic simulation environment. Two groups (control and intervention) of 5 students each one, were randomly distributed. All students were monitored with Polar Rs800® frequency meters. They participated in a simulated scenario containing a patient-actor with probable diagnosis of viral meningitis and a simulator for puncture and liquor collection. In the intervention group, throughout the scene, comments that characterized psychological harassment by the teacher were included. The data collection instruments analyzed in this pilot were: the images and sounds recorded during the scene and debriefing; the heart rate variability indices detected by the frequency meters; the student performance evaluation sheets; a questionnaire investigating the physical, emotional, and cognitive changes, in addition to the situation of harassment that occurred in the scenario.

Results: The capture of sound and images of the simulation and debriefing environments, the monitoring with frequency meters, and the harassment points inserted in the scene were considered adequate. And, with adjustment needs, the type of scenario and the questionnaires.

Final considerations: Performing the punctuated adjustments, an excellent performance is expected from all the collection instruments proposed by the methodology to be applied in the experimental study. In addition, with these adjustments we also hope to assess the impacts of academic violence, with the least possible damage to the participants.

Keywords: Violence; Mental health; Simulation; Medical Students

Introduction

Harassment or mistreatment among medical students is prevalent worldwide and has been pointed out since the early 1980s. A meta-analysis with inclusion of 59 articles, published in 2014, found a combined prevalence of harassment and discrimination among medical students of 59.6% [1]. The problem becomes more troubling when we consider the damage that such inappropriate and abusive behavior can cause to students. Such damage may appear in the short term or affect the lives of these students in the long term. They can interfere both in the mental health, well-being and learning of the student, as well as result in impairment, including, in the care of patients [2-4]. A review conducted by Barbanti, et al. [5] that included 20 articles published between 2005 and 2019 addressing the theme indicated that the research methodologies have been based on the analysis of questionnaires and/or interviews applied to the target population [5]. Some of the articles included in the review [2,6-8] pointed out important limitations related to the methodological strategy used, such as the nature of the study - both cross-sectional and longitudinal - and the presence of possible bias in the prevalence rates found.

So, based on the three important considerations made above (worryingly high and sustained prevalences; wide range of negative consequences, both short and long term; presence of methodological weaknesses of research conducted in the area so far), it is clear that a new approach is needed to study the impacts of the of a hostile learning environment on medical students. This research group decided to invest in an experimental research model, relying on a realistic simulation environment. Riskin, et al. [9] has already relied on this type of research to value the performance of medical teams in an environment with maltreatment [9,10]. However, we did not find similar research with undergraduate students. Because it is something relatively unprecedented in the area, with no reference to support us, a pilot project was carried out with the intention of foreseeing possible needs for adjustments and assisting in the definition of the ideal experimental model. This article aims to report on the pilot project, its provisional conclusions, and the lessons we were able to draw from it.

Methodology

Study Design / Population Studied / Data Collection

Experimental study conducted with 10 volunteer students of the last year of the medical course of a private institution located in the south of the country, in December/2021.Two randomized groups of 5 students each underwent theoretical training on care for a patient with suspected meningitis. A scenario was set up in a realistic simulation environment, with a responsive patient-actor, presenting signs and symptoms of meningitis. In addition to the actor properly oriented about his actions and speeches, the scenario also had the support of a stethoscope, sphygmomanometer, simulator and materials needed to collect csis (these were in a room next door and if the student suggested the diagnosis of meningitis and suggested the collection, they were taken s to the scenario). An initial script with the teacher reporting the general picture prior to the patient's arrival in the emergency room and other admission data were also part of the scenario.

Of the 5 students, 1 volunteered to enter the scenario and perform the proposed activity (leading student); the other 4 were observers of the scene. All were monitored with frequency meter (Polar Rs800®, Finland). The environment was monitored full-time by cameras that captured sound and image within the simulation environment. The researchers and observer participants had access to images and sounds in real time, because the simulation laboratory room has an inverted mirror (Figure 1).

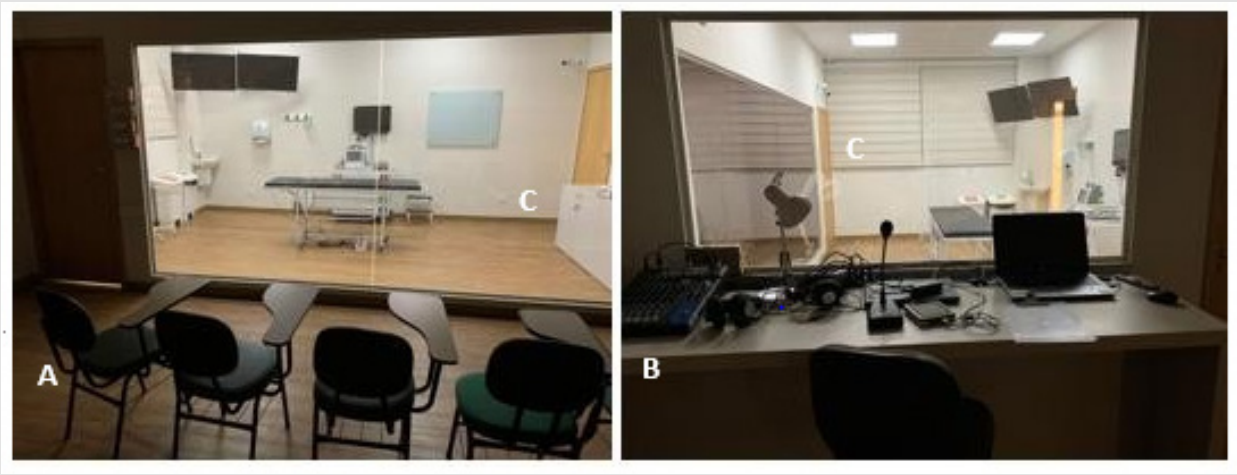

Figure 1: Image of the environment for performing the simulated scenario.
A. Observer student's view
B. Teacher's view
C. Place of realization of the scenario.

Group 1 (control) participated in the training without any attitude, considered inadequate within the sphere of academic violence being practiced by the teacher. Group 2 (intervention) did the same training, but throughout the activity, the teacher inflicted a situation of humiliation against the lead student at two different times. While the lead student performed the simulated scenario, the teacher filled out a performance evaluation form (Appendix). At the end of the scene, the 5 students met in another room with the teacher to perform the debriefing. The debriefing is the time for discussion of the team in order to make an overview of the scenario and point out the strengths and those that could have been better. Four commands were determined to the groups:

1. To sum up the case in 1 minute.

2. To point out the positive points of the scenario and those that could have been better.

3. To indicate what they would take home from today's scenario.

4. If they would have any criticism or consideration to do.

Throughout the discussion, the students continued to monitor the frequency meters and a psychologist followed the responses and reactions of the students via inverted mirror and the presence of microphone in the environment.

After the debriefing, the frequency meters were removed, and the students were invited to answer a questionnaire in the presence of the psychologist if they needed to clarify any doubts related to the items surveyed. The questionnaire applied to the control group addressed only the possible physical, emotional and cognitive changes that they had experienced during the execution of the scene. The questionnaire applied to the intervention group also addressed the group's perception of the presence of academic violence in the scenario and its possible impacts. Only at the time of answering the questionnaire was the intervention group was informed of the real intention of the study, which was to evaluate the impact of violence within the learning environment and asked if they would authorize their participation in pesquisa, with the signature and agreement of a second Informed Consent (TCLE-2).

Simulated Scene Script

Before starting the scene, the teacher read the general instructions of the case:

«Patient 40 years, arrives at the ER, where you will serve him, complaining of headache and fever. The patient's vital signs are recorded in the service form on the counter next to the stretcher where he is lying BP 120 x 80 mmHg; HR: 80 bpm; FR: 16 irpm; Sat. The2: 98% in ambient air; Axillary temperature: 38ºC (already measured at home); HGT: 95 mg/dL. You can start the call.»

The actor was duly instructed to give the following information if, during the anamnesis by the student, he was asked:

1. Report headache and nape for 2 days and 1 episode of vomiting onthe day to nterior; having had fever in the morning and not being able to go to work today and who has not presented any type of respiratory symptom in recent days.

2. Report that you have never been in the inpatients, have never operated, do not use continuous use medication and that you have already taken 2 doses of the COVID-19 vaccine.

3. Report that you live alone; is an only child; father and mother died when he was still a teenager; does not know how to report a history of chronic diseases in the family.

4. Report that you are a salesman.

5. The actor was also duly instructed about the physical examination, which soldierize me a finding of meningeal irritation:

6. Brudzinski's sign positive.

7. Kernig's sign positive.

8. Presence of stiffness and pain in the back of the head.

9. Remaining systems unchanged.

And immediately after the anamnesis and physical examination by the student, the actor was instructed to ask:

«What are you going to do to me, Doctor?»

The student was expected to answer:

«We're going to need to collect your liquor for diagnostic investigation.»

And then the teacher would say:

«Proceed with css if collection; consider yourself paramentado.»

At this point, a technician from the simulation lab would enter the scenario by pushing a cart containing a simulator (Figure 2) and materials needed for csqueeric puncture. Each of the students who performed the scene would be entitled to a maximum of 2 chances to perform the collection. If he could not after the second attempt, the teacher was instructed to speak:

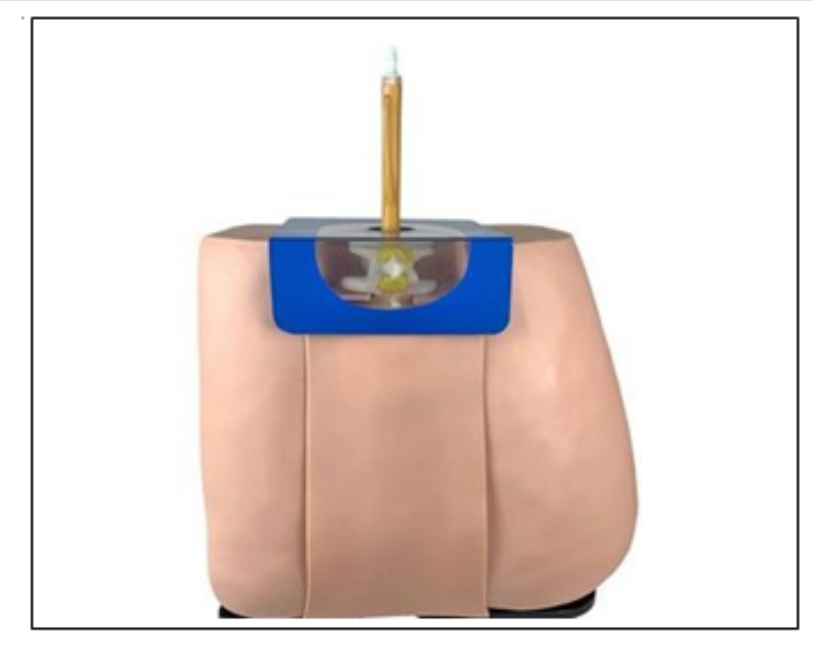

Figure 2: Image of cs1-punch simulator.

«Consider the liquor collected and now interpret the result that is encontra inside the envelope present in the cart.»

The report in the envelope presented the following results, characteristic of a picture of viral meningitis: Clear aspect; 200 cells (95% lymphomononuclear and 5% polymorphonuclear); Glucose 80 mg/dL; Protein as 50 mg/dL.

The actor was instructed, after 1 minute of the opening of the envelope by the student, to ask:

«What's up, do I have, DoC? Is it serious?»

The student was expected to promptly respond that it was a picture of meningitis.

Actor: «What kind of dr.? Am I going to have to use antibiotic air? Am I going to have to go to hospital?»

It was expected that the student would answer that it was a viral meningitis, and that the treatment is done with symptomatic, without the need for hospitalization and use of antibiotics At this point, the scenario was declared closed (Figure 2).

This scenario was performed in an equivalent way in both groups. However, in the intervention group, 2 points of psychological harassment were added. In the first, preceding the lead student's entry into the scene, the teacher fired:

«Come on!! It's hard with this class, huh? The classes of previous

years performed completely differently from the one I'm witnessing with you. They don't even look like sixth grades.»

And at the second point of harassment, after the student said that he would need to collect the patient's liquor, the teacher fired:

«At last gave one inside huh?! Thank God the patient is not me!».

Collection Instruments

Recorded images and sounds of the scenes and debriefings, frequency monitoring, student-leader performance assessment forms and questionnaires were used as data collection instruments. The evaluation form contained a checklist of the main points of action of the students, including anamnesis, physical examination, diagnostic suspicion, puncture procedure and css if collection, analysis of the report and therapeutic approach. The questionnaire applied to the control group consisted of three main sections. In the first session, data related to possible physical changes that could have occurred with the student during the execution of the realistic simulation scenario were collected. In the second session, one of those related to possible emotional changes and, in the third, data related to cognitive alterations were collected.

The questionnaire applied to the intervention group, in addition to these three sections, presented a fourth section that sought to investigate the harassment of harassment that occurred in the scenario.

Evaluation of Data

Because it is a pilot project, the main intention was to evaluate each of the main points of the suggested methodology. The scenario itself, the quality of the sound capture and image of the environment, the questions scored in the evaluation form of the execution of the scene, the monitoring by the frequency meters, the points of harassment, the type of harassment given and the questions inserted in the questionnaires were all points analyzed to verify the adequacyor need for adjustments for the subsequent performance of the experiment with a larger sampling. The analysis of a part of the methodology performed (scenario and points of harassment) is empirically based and was done through discussion among the researchers. On the other hand, the capture of sound and image was evaluated, in a much simpler and objective way, regarding sharpness.

The questionaries were evaluated by the ability to be self-explanatory and contemplate all the options of answers required by the participants. And the heart rate variability indices detected by the frequency meters were evaluated by the capacity of indicating students with higher and lower levels of stress and anxiety during the simulation. For this, the percentage variation of the mean of the indexes detected among the observers of the control and intervention groups, in the student-leader control and in the student-leader intervention, measured at rest and during the simulation, was calculated.

Ethical Considerations

The project was approved by the Research Ethics Committee involving human beings (registration no. 3,614,945). All students signed the TCLE-1 agreeing to participate in the research. They had already been informed that they would participate in a field with the intention of evaluating the generation of emotions and stress and the heart rate variability that possibly occur during a simulated scenario. The TCLE-2, which was a post-consenting term, was signed only by the students of the intervention group.

Results

The first scenario (control group) was randomly formed by 4 male and 1 female students, with one man as their leader. The second scenario (intervention group), by 4 female and 1 male students, and the leader was a woman. Despite all the discomfort and impacts generated in the student who suffered the episode of harassment, and, in the rest of the participants, who witnessed the situation, all 10 students understood the motivation of the research group to carry out the experiment and supported the initiative, reporting that they really are situations run them along their formations and that something needs to be done in an attempt to change this panorama. The capture of the images and sounds presented good resolution and quality, demonstrating that they would serve as support if, during the experiment, we needed to use them later for some kind of analysis or evaluation. All the frequency meters worked accordingly, and we could see that their presence on the wrist of the leading students did not hinder the performance of the scenario, not even during the lumbar puncture. Its use proved to be of great value as an instrument to verify the levels of stress and anxiety in the rticipantes pa during the simulation.

The degree of activation of the sympathetic nervous system, which represents a good predictor of the stress and anxiety levels generated, was significantly higher in the lead student of the intervention scene when compared to the leading student of the control scene and the observers of the intervention scene. And when comparing the mean basal heart rate of the lead student with that detected during the simulation, about 30% increase was obtained (Table 1). For the presentation of the other results, the detailed description of the execution of the scenarios, especially of the intervention group, is relevant both to justify the methodological adjustments that we deem necessary, and to emphasize the impacts of academic violence on the learning environment, even though it is not the last, the main intention of this pilot project. In the control group, the lead student performed better anamnesis and physical examination a little completer and more appropriate to the picture previously reported by the teacher, including the maneuver to verify nucal stiffness. He held Brudzinski's signal, but not Kernig's. The diagnosis of meningitis was suggested 5 minutes after the

beginning of the scene, which lasted a total of 13 minutes. Lumbar puncture and cscletin collection were correctly performed at the first attempt, despite the student's shaky hands. He interpreted correctly, but partially, the report of the liquor analysis. He replied to the patient that hewould need to int erna, but that probably, he would not need use antibiotics, who needed to wait for the result of blood count and blood culture.

Table 1: Basal heart rate variability indices and during simulation.

	Basal (at rest)				Simulation		D% (intervention leader)				
	Control		Intervention		Control		Intervention				
	Observers	Leader	Observers	Leader	Observers	Leader	Observers	Leader	Versus Observers	Versus basal	(Own leader) Versus control leader
Med RR (ms)	660,0 (124,8)	678	776 (89,6)	777	537,3 (95,8)	694	712 (97,7)	602	-15,4	-22,5	-13,2
With HR (bpm)	93,3 (18,6)	89	78 -9	77	113,6 (17,9)	86	85 (12,1)	100	17,6	29,8	16,2
Min HR (bpm)	81,3 (18,9)	77	65,3 (9,2)	70	88,6 (14,4)	69	69,6 (9,1)	78	11,9	11,4	13,0
Max HR (bpm)	105,3 (16,3)	98	91,3 (6,6)	89	134,6 (16,2)	116	114,6 (20,6)	138	20,3	55,0	18,9
SDNN (ms)	30,2 -12	31,8	44,3 (11,6)	37,3	15,1 (16,9)	69,2	48,9 (13,8)	44, 7	-8,7	19,8	-35,4

Note: Med RR: Mean RR interval; Med HR: Average heart rate; Min HR: Minimum heart rate; Max HR: Maximum heart rate; SDNN: Standard deviation of all normal RR intervals

The leading student of the intervention group, despite having managed to perform the scenario until the end, was more nervous and insecure, since its beginning. Upon entering the scene, even before finishing the anamnesis and physical examination of the patient, began to request several unnecessary examinations. At no time did he perform a maneuver to verify the presence of meningeal irritation (neither Brudzinski nor Kernig). The diagnosis of meningitis later was a date when compared to the control group student at 8 minutes, and the total time to perform the scenario was 17 minutes. The tremor in the hands was also noticeable during the cs and code puncture, but, despite this, it hit the first attempt. He could not correctly interpret the report of the liquor analysis, not identifying that it was a meningitis of viral cause and told the patient that the treatment would be based on the use of antibiotics and that it would need to commit him to intravenous therapy with ceftriaxone associated with metronidazole. In addition to these differences related to the performance of the leaders, the reactions of the student shocked all the observer students and the researchers involved in the research. As soon as the scene was declared closed by the teacher, it «collapsed».

She went to the next room, where the other colleagues were watching her and began to cry. The colleagues tried to comfort her, pointing out her correct answers, saying that the scene was intense stress and that, despite everything, she did well by assaging the meningitis hypothesis and properly performing the puncture procedure. But it didn't have much effect. The professor entered the room to perform the debriefing with the group and, even in her presence, she could not control the crying. The teacher, duly oriented, could not be sensitized to the situation and performed the debriefing in the usual way, including directing questions to the lead student. The duration was 12 minutes and the ch student prayedall the time; she couldn't face the teacher. Almost at the end, when asked what she would take home from the scenario she performed and whether she would have any criticism or consideration to do, she rummyally replied, «I don't know what I'm doing here, I shouldn't have volunteered to participate in this research! I didn't have to be going through this. I'm not taking anything positive home today!». At this time the teacher finished the debriefing, the frequency meters were turned off and 3 other members of the research team, including the psychologist, who were observing and listening to the group's discussion through the inverted mirror , entered the room and exposed the actual intent of the experiment. Even with the teacher apologizing and justifying that his attitudes were purposeful, that they were in the script of the scene, the student could hardly look at him.

The questionnaires were completed and the lunos of the

intervention group ended up staying in the room for approximately 1 h talking to the psychologist and the other researchers (in the control group the psychologist was not even triggered). That's when the harassed student said that the copious crying was not an exclusive result of that situation she had just experienced, but rather of several episodes that occurred throughout her training in medicine and that were being recalled by her. According to the report, he had already experienced situations in which he experienced verbal and psychological harassment within the course, however, more commonly practiced by classmates and male veterans. At one point in his graduation, he even wondered if he really had the aptitude to be a doctor. Based on these facts, the research team defined that the scenario of the standard experiment could not be that of meningitis. In order to minimize the possible damage that exposure to harassment could cause to the student who participated in the research, we defined that the scenario would need to have more

colleagues performing the care concomitantly and the presence of the actor should be replaced by that of a mannequin /doll. And, thinking about minimizing possible viese, we also defined that we should use a scenario that they had previously performed during their curricular activities in the simulation laboratory.

Regarding the points of harassment, it was defined that 2 moments were sufficient to destabilize the student(s) diretamented and be perceived as inadequate by the observers. It was essential to maintain the first point of harassment early on, when the teacher speaks the command of the scene and a second point, immediately before the leading student performs an important pro cedimento (which requires manual skill) within the scenario. Finally, on the adequacy of the questionnaires, the volunteers who participated in the project alerted us to the importance of including the answer option «I did not feel any of the alterations described above» in items 1, 2 and 3 of the questionnaires of both groups, control and intervention. And in item 7 of the questionnaire applied only to the intervention group, allow the student to indicate more than one answer option.

Discussion

The scarcity of studies on harassment against medical students using advanced methodologies as realistic simulation shows the need for research of this nature. The importance of this theme has shown the negative influence that harassment leaves on the academic life and quality of life of students. As far as we know, this pilot represents the first step towards the development of innovative research in the area. As a first major lesson, we reiterate that students are impacted in various ways in the presence of a hostile learning environment, whether they are directly harassed or those who witness the situation. Numerous self-reported studies have demonstrated such impacts [11-13]. Precisely for this reason, we decided to reduce the number of intervention groups to the smallest possible. For the experiment we defined that we would only make 1 intervention group if we found a result similar to the pilot; and if we felt that it would be possible, based on the students' reactions (since the scenario would be different), we would increase the sampling of the intervention group to a maximum of 2 or 3 repetitions of the scene containing the points of harassment.

In addition, we decided to insert a scenario where more students could participate in the scene and that did not have the actor present. First, because of the possibility of the actor reacting differently between the groups according to the course of the anamnesis and physical examination that each team performed, which could interfere and hinder the analysis of the results. Moreover, the public humiliation of a single individual in front of other colleagues and the patient-actor usually weighs much more than a collective humiliation and in the presence of a doll / mannequin. In 1986, the French sociologist Michel Maffesoli already point out that when these types of events relate more to the professional aspect of the teaching activity, involving a group, they do not configure situations as embarrassing and humiliating as those in which the teacher transfers the problems of the daily school for the level of attack on specific students [14]. The volunteers of this pilot emphasized that the feeling of being alone in the scenario greatly increases the nervousness and maximizes the dan of the probable situations of humiliation uttered by the teacher.

Still with regard to the scenario, we began to consider that it was one already worked with them throughout their activities at the boarding school. Thus, the level of stress generated and monitored by frequency meters would be more directly related to exposure to inappropriate behavior by the teacher and less related to contact with new content addressed in the simulation. This change in the scenario would also help in the certification that the prejuízo in performance has to do with the harassment itself and is not due to the student's lack of knowledge about the subject. It was then determined that, for the experiment, the simulation scenario would be a Cardiorespiratory Arrest (CRP) secondary to an Acute Myocardial Infarction (MEI). In this scenario, we have a doll and not an actor and a group of 5 students enter the scene to perform the simulation. In addition, it is already a known scenario of the students. The second great lesson was that we were addressing an extremely sensitive subject and that all steps should always be carried out with great caution and thinking about strategies of scientific support and ethical. At the end of the debriefing, when the research team went to justify the reason for that exposure and to collect the signature of the participants in the TCLE-2, it was extremely important to emphasize data already published, nationally and internationally, on the high prevalence of episodes of violence in the learning environment and the impacts that they can cause physical and emotional well-being and academic performance.

Students could perceive that academic violence is a widespread phenomenon, not restricted to their environment and that the results of the research could help end years of a hierarchical culture in medical courses that, as already said by Olasoji, confuses the concepts of learning under stress when stress is inherent in the situation (e.g. a patient at imminent risk of death) with that coming from an act that represents violence within the student environment, not being necessary for the training of a trained medical professional [15]. It was expected to find high levels of stress and anxiety, above those already generated by the characteristics of the simulated activity in the students who participated in the intervention scene. In addition, it was expected that these higher levels could interfere with academic performance. In this pilot, even without being able to infer statistical significance in the findings, this hypothesis was confirmed by heart rate variability indices detected by frequency meters and by the analysis of the evaluation form of the leading students.

Still within this context of ethical concern among researchers, the presence of the psychologist during the execution of the scenes, especially in the intervention group(s), was considered indispensable. The research team already knew the importance of their presence, but imagined that it would be more related, when necessary, to the support of some student. It was planned to collect more concrete and objective data from the analyses of the performance, frequency information and questionnaire responses. It was noticed, however, that in the intervention group, a group psychotherapy session ended up happening after the real purpose of the research was exposed and that many of the important ones could also be collected at this time. Bechelli, et al. [16] stated that the climate created by the group psychotherapeutic situation favors the self-revelation and discussion of themes that are common among the members of a group [16].

And another lesson, not least, was related to the questionnaires. Prodanov, in 2013, already warned of an important methodological flaw related to research that uses questionnaires as collection instruments [17]. Questionnaires should be prepared in such a way that they do not induce answers. As mentioned in the results, the participants of this pilot drew our attention to the absence of an answer option where the student can report that he did not feel any of the physical, cognitive and emotional changes researched. As unlikely as it may seem, in objective questions, the respondent should have the answer option. In a study that analyzed the impacts of mistreatment of medical students, Olasoji included responses with positive impacts and, surprisingly, found 37.5% of participants reporting that they felt stronger and more instigated to study [15]. Another essential point is that anonymity should be prioritized, and that the analysis of the collected data should be facilitated when working with a larger sampling. From these evaluations it was decided that, in the experiment, chrome books and links to the online questionnaires would be made available to students so that they could access and finalize the completion without the need to deliver any paper to the research team. As a part, the information collected would also be automatically organized into a digital database.

Final Considerations

With the changes and adaptations scored above, it is expected excellent performance of all the collection instruments proposed by the methodology to be applied in the experimental study on the impacts of academic violence on the learning environment of the physicians, with the least possible damage to the participants.

Declaration of Interest

The authors state that there is no conflict of interest in this study.

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Authors' Contribution Note

Patricia Costa Mincoff Barbanti contributed to the study design, research development, manuscript writing, critical review of the content and approval of the final version of the manuscript. Marcos Rogério Bitencourt, Mariá Rômânio Bitencourt, Ana Carolina Jacinto Alarcão and Sérgio Ricardo Lopes de Oliveira contributed to the study design, research development and approval of the final version of the manuscript. Bruno Ferrari Silva contributed to the interpretation and analysis of those collected by the frequency meters, critical review of the content and approval of the final version of the manuscript. Sandra Marisa Pelloso and Maria Dalva de Barros Carvalho contributed to the study design, critical review of the content and approval of the final version of the manuscript.

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