


CHALLENGES IN THE TEACHING OF NEUROLOGY: PERCEPTIONS OF PROFESSORS AND STUDENTS OF A BRAZILIAN MEDICAL COURSE

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Fabíola Cristina Santos Tavares¹, Janaína de Souza Aredes² and Antonio Toledo Jr.³

ABSTRACT

Neurology is often considered the most challenging medical specialty, contributing to a phenomenon known as neurophobia, characterized by the fear and insecurity of students and physicians when dealing with neurological topics. This exploratory qualitative study investigated the perceptions of professors and students of a Brazilian medical course about the teaching of neurology, with the objective of identifying challenges and proposing strategies for improvement. The research was carried out in a public course with a spiral modular curriculum. Focus groups were used for data collection, bringing together 16 participants (10 students and six professors). The data were analyzed using the content analysis technique. The results showed difficulties related to the integration between theory and practice, condensed contents, and the lack of practical exposure to neurological patients. Professors reported insecurity when approaching content outside their specialization, while students demonstrated low confidence in performing neurological exams and in the management of neurological complaints. The lack of integration between neuroscience and clinical neurology professors was also highlighted as a detrimental factor to learning. As proposals for improvement, the need for greater exposure of students to clinical cases (real or simulated), the use of active methodologies and greater integration between basic and clinical contents emerged. This study points to the relevance of educational strategies aimed at minimizing neurophobia and improving the teaching of neurology, contributing to the formation of more confident and qualified physicians. Future studies may expand these approaches to other institutions and contexts.

Keywords: Medical Education. Neurology. Teaching. Teachers. Pupil.

¹ Neurologist

Master in Health Education - UNIFENAS

Federal University of São João Del-Rei, UFSJ, Campus Centro Oeste, MG, Brazil

E-mail: fabiolatavares@ufsj.edu.br

ORCID: <https://orcid.org/0000-0002-2113-8135>

LATTES: <http://lattes.cnpq.br/2576055854926534>

² Social Scientist

Postdoctoral Fellow in Social Innovation in Health

René Rachou Institute. Oswaldo Cruz Foundation. Belo Horizonte, MG, Brazil

E-mail: janainaaredes@gmail.com

ORCID: <https://orcid.org/0000-0002-4147-2405>

LATTES: <http://lattes.cnpq.br/2224992368919938>

³ Infectious Disease Physician

Dr. in Tropical Medicine and Infectious Diseases

Master's Degree in Health Education - UNIFENAS, Belo Horizonte Campus, MG, Brazil

Email: toledoac@task.com.br

ORCID: <https://orcid.org/0000-0001-8912-2589>

LATTES: <http://lattes.cnpq.br/2192040830710780>

INTRODUCTION

Neurology is pointed out as the most difficult clinical specialty by both doctors and medical students. Newly graduated students and physicians also consider that it is the area of knowledge with the greatest gaps during the training process, often described as "poor teaching", indicating the deficiency in the face of the students' needs to understand the theme (FLANAGAN; WALSH; TUBRIDY, 2007; GUPTA et al., 2013; MCCARRON et al., 2014).

Several studies indicate that the contents of neuroanatomy and neurophysiology per se are considered points of difficulty in the education of students (CONWAY; TUBRIDY, 2018; SCHON; HART; FERNANDEZ, 2002). The lack of integration between neurosciences and clinical practice is also pointed out as a factor of difficulty in understanding neurology (SCHON; HART; FERNANDEZ, 2002; ZINCHUK et al., 2010). Another factor reported is the insufficiency or absence of care for patients with neurological complaints or diseases (MCCARRON et al., 2014; PAKPOOR et al., 2014; SÁNCHEZ-JORDÁN et al., 2017; ZINCHUK et al., 2010). It is also observed that teaching is often done by teachers who are not specialists in neurosciences or neurology or there are insufficient numbers of them (KAM et al., 2013; SANYA; AYODELE; OLANREWAJU, 2010). In addition, the complexity of the neurological examination and the wide variety of clinical diagnoses represent additional barriers to learning the content (SCHON; HART; FERNANDEZ, 2002).

These factors can cause a phenomenon called neurophobia. This term was used for the first time in 1994 by Józefowicz (JOZEFOWICZ, 1994). Despite the suffix "phobia", it is not a psychiatric illness or an unbridled aversion to neurology. It represents the fear or insecurity of students and physicians (especially generalists) in the care of neurological patients or contact with issues related to neuroscience. Unfortunately, 30 years later, the problem persists, being the object of study especially at the international level (MATTHIAS et al., 2013; SANTOS-LOBATO et al., 2018; YOUSSEF, 2009).

In 2002, in England, for the first time, a study quantified the presence of neurophobia among medical students, newly graduated physicians and more experienced general practitioners (SCHON; HART; FERNANDEZ, 2002). Several other researchers, in different countries, have based themselves on the instrument created by Schon and collaborators to assess neurophobia among students and physicians (CONWAY; TUBRIDY,

2018; FLANAGAN; WALSH; TUBRIDY, 2007; MCCARRON et al., 2014; SANYA; AYODELE; OLANREWAJU, 2010; YOUSSEF, 2009).

It is observed, however, that most of the studies carried out are limited to the identification of neurophobia and its triggers, based on cross-sectional quantitative methodological designs carried out by the application of multiple-choice questionnaires (FLANAGAN; WALSH; TUBRIDY, 2007; MATTHIAS et al., 2013; MCCARRON et al., 2014; SANYA; AYODELE; OLANREWAJU, 2010; YOUSSEF, 2009). There are few qualitative studies that attempt to better understand the problem in order to minimize it and improve the teaching of neurology (CONWAY; TUBRIDY, 2018; FANTANEANU et al., 2014; MCCARRON et al., 2014; PAKPOOR et al., 2014; SANTOS-LOBATO et al., 2018). Although some studies open up the possibility for interviewees to express themselves more openly, in addition to closed questionnaires, only Fantaneanu and collaborators interviewed their volunteers (medical students) (FANTANEANU et al., 2014).

In 2007, Ridsdale et al. published an unprecedented study with an interventionist design through the active participation of medical students in the process of adapting neurology education (RIDSDALE; MASSEY; CLARK, 2007). In this study, after increasing the duration of the neurology internship and through formative evaluations, it was possible to modify the students' perception of the specialty, improving student satisfaction and confidence. On the other hand, it is curious to note that even with the intervention guided by student feedback and with the change in students' perspective on the theme, neurology still continued to be considered the most difficult specialty by the participants (RIDSDALE; MASSEY; CLARK, 2007).

In the literature review, no study was identified that evaluated the perception of neuroscience and neurology professors on this topic. It can also be considered that the accumulated knowledge about the students' difficulty is insufficient to support educational actions that can overcome this difficulty. In view of this scenario, the main objective of this study was to analyze the perception of medical students and professors about the teaching and learning of neurology in a Brazilian educational institution.

METHODOLOGY

An exploratory qualitative study was carried out to understand the relationships between people, their context and their actions (MINAYO, 2017). The population consisted of professors and students of the Medicine course at the Federal University of São João

Del Rei, Midwest campus (UFSJ-CCO), located in the city of Divinópolis, Minas Gerais, Brazil.

Teachers who teach content related to neurology in activity at the time of study data collection and students of both sexes, who were duly enrolled in the course, were included. Students who entered UFSJ-CCO from other higher education institutions through an external transfer selection process were excluded. All participants who signed the Informed Consent Form (ICF) prior to their inclusion.

The strategy of snowball recruitment by digital means (emails and social media) was used due to the covid-19 pandemic. As this is a qualitative study, the sample size calculation was not performed, and recruitment was interrupted by the criterion of empirical data saturation. In it, the interruption of data collection is defined based on successive analyses that occur simultaneously with its collection (MINAYO, 2017).

Data collection occurred through focus groups. The focus group is a qualitative research technique that consists of the discussion of a certain theme, stimulated and guided by generative questions, conducted from a semi-structured script. It is used in studies that aim to apprehend perceptions about specific themes, through discursive interaction between participants (KIND, 2004). In addition, the interaction between them makes it possible to bring to light, during the discussion, other aspects about the central theme not yet conjectured by the researchers. Focus groups also allow interlocutors to be more comfortable being among their peers, which can reduce the inhibition in reporting certain information on the topic studied (MINAYO, 2017).

The focus groups were composed as follows: three or four participants (students and teachers in separate groups); a moderator (principal investigator), responsible for stimulating and focusing the discussion towards the main objective of the study; and a rapporteur, who had the function of observing the dynamics. The rapporteur did not participate directly in the moderation, but helped the moderator identify items relevant to the discussion during the meetings (KIND, 2004). The meetings were held in a remote format, through Google Meet, due to the isolation imposed by the covid-19 pandemic. The meetings were recorded using Google Meet's own resource and the Ocam® application (<https://ocam.softonic.com.br/>), to record the meetings.

Data analysis took place simultaneously with collection, a fundamental premise for conducting qualitative empirical studies (FONTANELLA; RICH; TURATO, 2008; KIND, 2004). Initially, the speeches were transcribed through the Tactiq® application, which

automatically transcribes audios to Google Documents®. Subsequently, a researcher checked the transcription based on the recording made by Ocam® and made the necessary corrections. The final versions of the speeches were recorded in Microsoft Word® files. The data were analyzed using the classic content analysis technique, which consists of three phases: pre-analysis, exploration of the material and treatment of the results (BAUER; GASKELL, 2015; CAMPOS, 2004).

For each interviewee, a caption was created to identify the excerpts from the speeches in the presentation of the results. The legend was defined as follows: order of the focus group (represented by "GF"); followed by the category of the interviewee (A for student, P for teacher); sex (F for female and M for male); age (in years) and corresponding period of the course (for students only).

The main researcher performed the pre-analysis right after each focus group and then began the exploration of the material. In this phase, the categories were preliminarily defined. Independently, a second researcher, who moderated the groups, did their pre-analysis and structuring of the categories. Next, the two categorizations were compared. There was a moment of reflection and discussion about the categories and with a better structuring of these to proceed with the final phase of processing the results. To mediate the analysis of the results, the theoretical-methodological framework of hermeneutic anthropology was used (GEERTZ, 1981).

This study was approved by the Research Ethics Committees of the Prof. Edson Antônio Velano University (CAAE 51621821.6.0000.5143) and the São João Del Rey University (CAAE 51621821.6.3001.5545). The research is in accordance with the norms and guidelines contained in Resolution 466/2012 of the National Health Council.

RESULTS AND DISCUSSION

A total of 16 individuals were recruited, six teachers and ten students, who were divided into five focus groups, two for teachers and three for students. The data was collected between April 26 and May 27, 2022. Among the teachers, four were women, with ages ranging from 35 to 48 years, none of them were doctors. Among the students, six were women and their ages ranged from 22 to 32 years. Four were in the second period, three in the eighth and three in the eleventh period.

Three categories of content common to teachers and students were identified, two exclusive to teachers and four exclusive to students (Chart 1).

Table 1 - Content categories identified according to population group

Categories	Teachers	Students
Approach to neurology and integration in classes throughout the undergraduate course	X	X
Knowledge in neurology for professional practice	X	X
Resistance to neurology: implications of neurophobia in student training and professional practice	X	X
Resistance on the part of students in relation to subjects related to neurology or neurosciences	X	
Difficulty on the part of teachers in teaching the subject	X	
Experience in the care of neurological patients		X
Safety to perform neurological physical examination		X
Difference in the care of patients with neurological complaints in relation to patients with other complaints		X
Neurology and related subjects: content with greater difficulty		X

Source: prepared by the authors

APPROACH TO NEUROLOGY AND INTEGRATION IN CLASSES THROUGHOUT THE UNDERGRADUATE COURSE

The students' perception of the integration of disciplines in undergraduate medical courses varies according to the type of curriculum adopted. At the researched institution, the spiral curriculum and modular organization integrate basic, clinical, and practical theory. Teachers and students perceive this curricular format with its strengths and limitations:

All this time that I've been here, this difficulty that I perceive in having integration, that it is the objective of the pedagogical project, but we have this difficulty in making this integration (G4, P2, M, 40 years old)

(the content) It is not (integrated) in some parts. We are feeling this in neurophysiology. We had motor control, at the same time, as we had muscles in anatomy. In neurophysiology, we experienced this integration of the curriculum more (GF3, A4, F, 22 years old, 2nd p)

I believe that even a certain part has (integration), but we see more neurophysiology and neuroanatomy in the second period. In the first period, it's more this 'reflex' part (physical examination). We kind of end up understanding how the reflex works (physical examination), only in the second period, we don't know in the first period the issue of the reflex and things like that, you know? So I think there is this time difference between seeing the practice in the first period and seeing its physiology and anatomy in the second period (GF3, A2, M, 21 years old, 2nd p)

Despite this integration, the discontinuity in the teaching of interrelated contents, such as neurological physical examination and neurophysiology, compromises understanding and practical applicability, which are fundamental for adult learning (NEWBLE; ENTWISTLE, 1986; PAZIN FILHO, 2007).

The continuous review of content is considered crucial for the consolidation of learning and should be done in order to maintain the interest of students, avoiding repetitions:

After the sixth period it becomes a thing of a lot of revision, it starts to repeat material, many classes are the same, they are identical, they are the same classes that we have already seen. It turns out that we start to not value it so much anymore (G2, A2, F, 29 years old, 11th p)

This observation indicates that it is essential to adjust the content to the students' previous knowledge, approaching it differently and more deeply, to promote extrinsic motivation and effectiveness in learning. Repetition per se, as noted, becomes demotivating (PAZIN FILHO, 2007).

The students, as well as some teachers, also report that the teaching is very condensed:

I think they are a little scary because there is a lot of content in two hours (G5, P2, F, 41 years old).

I think sometimes it's too condensed into one period. And then there is nothing in the other. For example, we have (neuro) in the first period and then the fifth. I think that if it started a little later and was more gradual, it would be better. The neurophysiology part, basically the second period comes down to this and then we just forget about it (G1, A3, F, 26 years old, 8th p)

In the seventh (period) there were extensive classes, they were good topics. I really liked the themes of the seventh, but we saw a lot of things in the module (at once). Together with the surgery, it took a lot of time, we couldn't dedicate it because the surgery was heavy (G2, A3, F, 24 years old, 11th p)

The excessively dense syllabus makes it difficult to assimilate and discourages persistence in the study of the theme (SYLWESTER, 1994). The multidisciplinary integration and spacing of the content, interspersed with other specialties, can favor the learning of diseases and clinical reasoning, by creating opportunities for comparison between different diseases that may present similar clinical conditions.

The lack of contextualization, the difficulty in integrating the disciplines, the mismatch between the content and previous knowledge, are problems observed by the students:

I don't remember having seen any patient with any complaint that we needed to do some kind of test (neurological exam). I don't remember having seen a patient who

we had to apply what we learned, for example in the first period (of neurological physical examination). I miss him (G1, A1, F, 23 years old, 8th p)

I think it (neurology) is a little misapplied because in PIESCs we don't have much involvement with Neurology. We see it (the physical exam) in class, but we really need to do it to fix it to understand which neurological test I do in which situation. Because you can't do the whole script all the time, right? I think that this (theoretical-practical) correlation is missing (G1, A2, M, 22 years old, 8th p)

Contextualization and immediate applicability are key factors of andragogy and directly interfere in the teaching-learning process (ALLEN, 2012). Added to this, the limited workload and excessive content are factors that hinder the consolidation of learning (PAZIN FILHO, 2007; RIDSDALE; MASSEY; CLARK, 2007). These factors can demotivate students and make it difficult to handle complex topics, such as neurology, contributing to the development of "neurophobia" (CONWAY; TUBRIDY, 2018).

KNOWLEDGE IN NEUROLOGY FOR PROFESSIONAL PRACTICE

Students recognize the importance of general practitioners having basic knowledge in neurology:

I think that (neurology) plays a fundamental role in the training of doctors. As colleagues had commented, neuro plays a role in all body systems. So, I think that without neuro, you can't graduate as a doctor. And then you need to be aware of all systems, especially neuro, which integrates all of them. I think neuro is the most difficult and the most important in the course as well (GF3, A1, M, 32 years old, 2nd p)

It is important not to refer anything, we know that the health service is overcrowded. And then it doesn't make sense, for example, to refer a headache that we can treat at the center to a neuro, you know? (G1, A3, F, 26 years old, 8th p)

This knowledge enables the effective management of prevalent neurological diseases, including emergencies, avoiding unnecessary referrals and reducing the burden on specialized services (BUONANOTTE *et al.*, 2016; MATTHIAS *et al.*, 2013).

Non-medical faculty can enrich teaching by offering multiple perspectives:

I go to a book, so I found a book that calls it 'Neurology that every doctor should know'. And then, I base myself on it to get a sense of what the general practitioner has to know. And I do my best, but for sure the real knowledge of what they really need, I don't know (G5, P1, F, 48 years old)

However, the lack of practical experience of these teachers makes it difficult to apply theoretical concepts in clinical contexts, which is perceived by students as a lack of integration between theory and practice, impairing teaching-learning (NEWBLE; ENTWISTLE, 1986; PAZIN FILHO, 2007), as can be seen in the following comments:

Not having any clinical professional experience, this has always bothered me. We don't know in detail. So, one thing that I think would be very desirable is for us to have more conversation among teachers, we are doing an integrated subject just because we see the title of the other teacher's class. We are not talking, exchanging slides or watching each other's classes (G5, P1, F, 48 years old)

Correcting this difficulty requires close collaboration with physicians to ensure that the contents are applicable in clinical practice (GUPTA *et al.*, 2013). However, students report a lack of communication between neuroscience and clinical neurology professors. Thus, the contents, although correlated and interdependent, are not integrated, and the neurosciences lose practical applicability, compromising effective reviews and learning (ALLEN, 2012).

CARE FOR NEUROLOGICAL PATIENTS AND THE PERFORMANCE OF THE NEUROLOGICAL PHYSICAL EXAMINATION

The students report insecurity when dealing with complaints and neurological diseases: I am not very confident yet (G2, A1, M, 26 years old, 11th p).

Studies indicate that both students and general practitioners feel less confident when managing patients with neurological complaints, compared to other specialties (FLANAGAN; WALSH; TUBRIDY, 2007; ZAMBRANO, 2014; ZINCHUK *et al.*, 2010).

Students attribute this insecurity to limited contact with neurological patients. Although they see patients with neurological diseases in primary care, these are not, in most cases, the main focus of consultations:

Patients don't even get there with this complaint, they are going there for another reason, but when you collect his clinical history you see that he has that chronic neurological condition (G1, A1, F, 23 years old, 8th p)

Another relevant factor is perception bias, which affects the safety of students when caring for neurological patients. Even though they are common in primary care, neurological complaints are often misidentified by students, reinforcing the idea that such conditions are always complex. Common complaints, such as low back pain, are

mistakenly seen as orthopedic. Many students perceive neurological diseases only as rare and highly complex.

During the service, the students show insecurity in performing the neurological physical examination:

I think the general physical exam is well consolidated for us because we have been practicing since the first period. And the neurological (exam) we rarely did, a muscle strength test or sensitivity assessment, very few times. So I don't feel safe to do it alone. I'm not sure what I'm evaluating (G1, A1, F, 23 years old, 8th p)

The neurological examination is often performed in addition to the general physical examination, when neurological diseases are suspected (AMINOFF, 2017). The lack of familiarity with this test is due to the limited practical exposure to neurological patients during training, leading to the forgetting of skills learned in theoretical classes and laboratories, evidencing the lack of integration between theory and clinical practice. Routine performance of a reduced neurological examination in clinical medical consultations and family and community medicine could help to overcome this deficiency.

Gupta et al. observed that 31% of newly graduated physicians consider exposure to neurological patients during graduation to be insufficient, contributing to insecurity in the management of these conditions (GUPTA *et al.*, 2013). The literature confirms that this insecurity negatively affects the perception of neurology (ABULABAN *et al.*, 2015; MORÍNIGO *et al.*, 2017; SCHON; HART; FERNANDEZ, 2002; YOUSSEF, 2009). In addition, insecurity in the management of neurological complaints can lead to diagnostic errors, unnecessary tests, and inappropriate referrals (BESSOLO *et al.*, 2015). Ridsdale and colleagues noted that increasing neurology internship time can improve student confidence and reduce these problems (RIDSDALE; MASSEY; CLARK, 2007).

DIFFERENCE IN THE CARE OF PATIENTS WITH NEUROLOGICAL COMPLAINTS IN RELATION TO PATIENTS WITH OTHER COMPLAINTS

Students observe that professors and preceptors who are not specialists in neurology demonstrate insecurity when dealing with neurological complaints:

I think that the preceptors, they have some difficulty in attending to neurological patients (G1, A2, M, 22 years old, 8th p)

I feel it too, I think that because we have little contact with these complaints, we see a lot of diabetes, hypertension and such, it ends up that with these (neurological) complaints, we feel a little difficulty. We feel this in our preceptor (G1, A1, F, 23 years old, 8th p)

This may be related to the low frequency of consultations of this nature and the loss of practical skills. This inability may reinforce the misperception that only specialists can manage these conditions (RIDSDALE; MASSEY; CLARK, 2007).

Students feel safer when attending diseases with which they are more familiar, acquired through repeated care during internships:

I think there are things that we simply saw many more times, for example, Pediatrics, today I stayed the whole morning and there were 15 cases of URTI. If I don't know how to do anything, it's not possible, you know? This does not happen in the neuro at any time. I saw in the outpatient clinic in one day a diagnosis of epilepsy, a headache management and a couple of Parkinson's problems, only (G2, A2, F, 29 years old, 11th p)

We see less, right? And then as you see less you know less too, right? (G2, A2, F, 29 years old, 11th p)

The lack of exposure to neurological complaints in training generates anxiety and the erroneous perception that these diseases are always complex and rare. In addition, because neurology outpatient clinics receive cases screened by generalists, this can distort students' views of the prevalence and severity of neurological conditions, reinforcing a perception bias.

DIFFICULTY ON THE PART OF TEACHERS IN TEACHING THE SUBJECT

Neuroscience professors who are not specialized in neurology reported discomfort when teaching classes in this area, considering the topic difficult due to the difficulty of keeping up to date with scientific news:

It's challenging to teach the neuro module, because it's not my area of study, of research, right? Here at the university, it's not just my specific research content for Master's doctoral training, right? So they are modules for me that I always study (G4, P1, F, 37 years old)

I did a master's degree in the field of pharmacology, but it is a very broad area, I focused my doctorate in the area of antimicrobials. ... I have and feel a lot of difficulty. ... We end up having to take the subjects that are not ours and we have to find a way to teach (teaching) (G4, P2, M, 40 years old)

The lack of familiarity with the content can convey a feeling of difficulty, generating insecurity and negatively impacting learning. Studies indicate that the teaching of neurology by non-specialists can harm students' perception of the discipline (GUPTA *et al.*, 2013; KAM *et al.*, 2013).

Among the professors, only one has a degree in neurosciences and perceives the students' resistance to the theme:

I, about resistance, I realized that this approach that I'm doing now a little more interactive is going better. They wear the shirt of what you propose in the classroom. So, whether you liked the subject or not, you say people we're going to do it. This is the attempt to put them on my team. You have to learn this, if you're passionate wonderful, you're not, come on, come with me and we'll be able to get through this phase, you know? (G5, P1, F, 48 YEARS OLD)

The *American Academy of Neurology* recommends including neuroscientists, as well as doctors and neurologists, in the faculty to ensure greater familiarity with the topics and convey more confidence to students. This approach aims to avoid the difficulties observed when teachers without specialization teach classes, contributing to a more positive perception of the content by students (SAFDIEH *et al.*, 2019).

NEUROLOGY AND NEUROSCIENCES: CONTENT WITH GREATER DIFFICULTY AND RESISTANCE

The professors note that, despite the interest, students show resistance in relation to the content of neurosciences and neurology, due to the stigma of great difficulty:

I think that sometimes neuro can be a bit nonspecific, I find this more difficult (G1, A2, M, 22 years old, 8th p)

I don't know if it's a feeling I had here, but it seems that what is more abstract is a little more difficult, what is not very palpable becomes more difficult (G1, A1, F, 23 years old, 8th p)

For me, neuro is a content that stands out for the various connections of neurons and the transmission of information, memory, and we have several diseases that to date we have not been able to discover a cure. And others too that managed to reverse some cases, right? But for me neuro is the most difficult (FG3, A1, M, 32 years old, 2nd p)

I feel that in the medical part it can be more complicated than other specialties (G1, A1, F, 23 years old, 8th p)

I think it's complicated even because of how it's given, we go so deep and even so it's more superficial. The other clinical specialties are much more applicable, more concrete, easier to visualize, so when we study diseases in patient care, everything else is easier for me (G1, A1, F, 23 years old, 8th p)

Neurology is perceived as the most difficult medical specialty, and neuroscience is equally challenging, mainly due to the abstract nature and complexity of the contents, compared to other specialties. This perception of complexity, in addition to being intrinsic to the theme, may be related to methodological problems in teaching (JOZEFOWICZ, 1994; PAZIN FILHO, 2007).

In addition to these aspects, the professors also observe that the theme still has many points to be studied and this generates discomfort when teaching the subject:

I think it starts from an issue in which the other systems have things very well defined and studied, proven. In neuro there are some things that are still controversial, that there are no (sufficient) studies that define it exactly as it is (pathophysiology, etiology, etc.). And then it gets complicated because there are many possibilities and different hypotheses and then it makes it difficult (G1, A1, F, 23 years old, 8th p)

In my opinion, it is Neurology, because it, among all the other systems, still has a large portion of it that are just theories. And then it's kind of difficult for us to understand. This makes the content more complicated, at least for us. Perhaps this will change throughout our undergraduate studies. At this moment it really is Neurology (FG3, A4, F, 22 years old, 2nd p)

The diversity of diagnoses and the lack of consensus also contribute to this perception (ABULABAN *et al.*, 2015; SANTOS-LOBATO *et al.*, 2018).

Resistance to the theme can also be caused by the fear of poor academic performance, especially when the content is taught in a condensed way, negatively affecting the learning process (SYLWESTER, 1994). Teachers suggest that non-traditional assessment methods and active teaching methodologies can increase students' interest and confidence in the topic (SHIELS *et al.*, 2017).

IMPLICATIONS OF NEUROPHOBIA IN STUDENT EDUCATION AND PROFESSIONAL PRACTICE

Neurophobia arises mainly from a lack of familiarity with these topics. Students and professionals can develop it, influenced by the perception that the nervous system is complex and difficult to understand (GUPTA *et al.*, 2013; MATTHIAS *et al.*, 2013; SANTOS-

LOBATO *et al.*, 2018). Although they are unaware of the term, students and teachers identify feelings of aversion to the subject during their academic lives:

I never heard it, but I managed to understand it (G1, A2, M, 22 years old, 8th p)

I also (never heard) the term itself or someone commenting on it no, but you can understand what it might mean (G1, A1, F, 23 years old, 8th p)

I think that while I was taking class, I was a little scared, I said 'What is this? What am I doing here?' I couldn't understand it, but then after I sat down to study, I saw that I could understand, you know, you can understand, it was more there in class, but otherwise not. (FG3, A2, M, 21 years old, 2nd p) Do you think there was fright or fear? (Researcher) Another fear. (FG3, A2, M, 21 years old, 2nd p) While you didn't understand? (Researcher) Yes, exactly (GF3, A2, M, 21 years old, 2nd p)

There are people I've seen who are averse to saying: 'God forbid. No, I never do it, I just want to pass this subject'. So, like this, you see some comments (G2, A3, F, 24 years old, 11th p)

Professors recognize that students have prejudices that generate resistance to neurology, due to the stigma of difficulty associated with the specialty. This idea can be reinforced by veterans of the course, professors and insecure preceptors, especially when they are not experts (RIDSDALE; MASSEY; CLARK, 2007).

As discussed, neurophobia is multifactorial and actions are needed to reduce it so as not to harm medical training, affecting the ability to deal with neurological diseases and the choice of the specialty.

PERSPECTIVES

The teaching of neurology in undergraduate medical courses is fundamental for the training of general practitioners. The understanding of neurosciences is crucial for the understanding of the neurological clinic, but there is a significant gap in the literature on the perception of professors and students about the teaching of this theme. This qualitative study investigated the perception of professors and students of a public medical course with a spiral modular curriculum. The results revealed challenges in the teaching of neurosciences, especially for teachers without specific training, and highlighted the lack of integration between medical and non-medical teachers, affecting the quality of the content taught.

The students reported insecurity when performing the neurological examination and in the management of neurological diseases, contributing to neurophobia. This insecurity can impact the choice of neurology as a specialty, aggravating the shortage of specialists, a problem that becomes more critical with the aging population. Limited exposure to neurological patients and the perception that these conditions are always complex intensify this insecurity.

To address these challenges, it is essential to better integrate neuroscience and clinical neurology into the curriculum. Educational strategies that promote this integration, such as the use of active methodologies and teaching based on neurological syndromes, can improve learning and increase students' confidence in the area. Innovative methodologies, such as simulated clinical cases, also increase the safety of students when dealing with neurological patients. To reduce neurophobia, the professors suggest greater integration between theory and practice, allowing a more applied understanding of the nervous system.

This study has some limitations, such as having been carried out in only one educational institution, not involving neurology physicians and physicians from other areas. The social isolation imposed by the pandemic may also have influenced the opinion of students, especially at the beginning of the course, in relation to the integration between theory and practice. On the other hand, as far as is known, it is the first national study and one of the few international studies that seeks to understand the factors associated with neurophobia, which guarantees it an unprecedented character.

The results indicate new perspectives to be explored in new studies, of an exploratory or interventional nature, in the search for the reduction of neurophobia and in the improvement of the teaching-learning process of neurosciences and clinical neurology. Among the proposals for improvement, the following stand out: greater integration between basic and clinical content, better training of non-specialist patients, greater exposure of students to clinical cases (real or simulated) and the use of active learning methods.

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