

## **Understanding the Genesis of Neurophobia: A Mixed-Methods Study of Trainees' Perceptions of Neurology Education**

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## ABSTRACT

**Background/Problem:** Neurology remains an area of the medical curriculum that students and residents alike continue to avoid. This *neurophobia* has been ascribed by trainees to be due to poor teaching, little interaction with patients with neurological conditions, and the complexity of neuroanatomy. Many studies have examined neurophobia in the U.S., Asia, Europe, and Caribbean. However, to date, no studies have explored the concept of neurophobia in Canadian medical schools. The primary goal of this pilot study is to examine the extent to which neurophobia exists among selected undergraduate medical students and determine if students' perceptions of neurology differ significantly by year of study. As a secondary goal, the study aims to explore why neurophobia develops, including the factors that contribute to its genesis.

**Methodology:** This study will employ a two-phase, sequential, mixed methods explanatory design. Phase 1 will involve the collection and analysis of quantitative survey data. Building on Phase 1, Phase 2 will involve the collection and analysis of qualitative focus group data.

**Implications:** This pilot study will inform the design of a Canada-wide mixed methods study on neurophobia among medical students. Furthermore, the findings from this study may provide a rationale for the creation of a neurology-based educational intervention for medical students at the University of Ottawa. In future, this research may stimulate other Canadian medical schools to evaluate the status of their neurology curricula and implement their own changes to improve neurological education for trainees at both the undergraduate and postgraduate levels.

## **BACKGROUND**

The burden of neurological disease in Canada, much as elsewhere in the world, is intensifying. A report from the Canadian Institute for Health Information (2007) found that neurological conditions represent 9% of acute care hospitalizations and that 19% of patient days in acute care facilities, between 2004 and 2005, were for patients with neurological illnesses or injuries. Moreover, 20% of patients receiving inpatient rehabilitation, in 2005-2006, had one of the six common neurological injuries (i.e., head injury, multiple sclerosis, Parkinson's disease, spinal injury, stroke), and 50% of complex continuing care stays in Ontario alone were for patients with Alzheimer's disease, amyotrophic lateral sclerosis, cerebral palsy, epilepsy, head injury, multiple sclerosis, Parkinson's disease, or stroke. (Canadian Institute for Health Information, 2007). Not only are neurological conditions often insidious in their presentation, they are seldom curable and often amount to a high level of disability. Given the impact and high presence of neurological conditions, more demand is being placed on the Canadian healthcare system to deliver high quality neurological care and as such, physicians cannot afford to be ill prepared in their approaches to this area of medicine. However, researchers have shown that most practitioners and trainees share a common dislike for the neurological sciences and some develop *neurophobia* (Jozefowicz, 1994). Developed by Jozefowicz (1994) neurophobia is a "fear of the neural sciences and clinical neurology that is due to the students' inability to apply their knowledge of basic sciences to clinical situations" (p. 328).

## **PROBLEM STATEMENT**

Since the burden of neurological conditions is expected to rise continually and evidence suggests that governments are ill prepared to cope with the demands of this increase, it is important to understand the extent to which neurophobia exists as well as the reasons for it. With a better understanding of neurophobia, especially within the Canadian context, we can implement educational interventions to help both undergraduate and postgraduate trainees overcome the phobia, as well as ensure that they have a solid foundation in the neurological sciences and are confident in their abilities to provide neurological care. Although neurophobia has been reported in several countries, researchers have not examined the extent to which neurophobia exists among Canadian medical students or the factors that contribute to its genesis. Although neurophobia commonly begins in medical school, it has implications for trainees at the postgraduate level. Therefore, the primary goal of this sequential explanatory mixed methods study is to examine the extent to which neurophobia exists among selected undergraduate medical students and determine if students' perceptions of neurology differ significantly by year of study. As a secondary goal, the study aims to explore why neurophobia develops including the factors that contribute to its genesis. It is important to note, that this is a pilot study that will focus on first, second, and third year medical students at the University of Ottawa. The results from this study will be used to inform the design of a Canada-wide mixed methods study on neurophobia among medical students and residents and may provide us with a rationale for the creation of an educational intervention for undergraduate and postgraduate trainees to improve their neurological knowledge and reduce their neurophobia.

## **LITERATURE REVIEW**

The phenomenon of neurophobia has been studied previously in the literature and has often been linked to students' and physicians' perceived difficulty with or limited knowledge of

neurology. For example, Schon et al. (2002) conducted a survey aimed at medical students and General Practitioners in the United States (U.S.) and found that neurology was ranked as the most difficult of the subspecialties by their participants. Commonly identified reasons for the perceived difficulty were poor quality neurology teaching and difficulty with clinical neurology examinations (Schon, et al., 2002). Similar findings were also found in a survey conducted by Flanagan and colleagues (2007) in Ireland. Aimed at students and junior physicians from various medical institutions across the country, they found that neurology was the most difficult subject among all other medical subspecialties and that moderate to poor teaching in neurology and limited exposure to neurological patients were possible explanations for these findings (Flanagan, et al., 2007). More recently, similar conclusions were found by researchers in both the Caribbean and U.S. who surveyed senior medical students and junior residents to determine their perceived knowledge of and difficulty with the topic of neurology, thus providing potential evidence of neurophobia (Youssef, 2009; Zinchuk, Flanagan, Tubridy, Miller, & McCullough, 2010). Through their studies they found that participants had minimal knowledge of neurology, difficulty with the subject area, and therefore presented signs of neurophobia.

These reviewed studies have three main limitations. First, they focused primarily on students' and physicians' perceived knowledge levels and difficulties with the neurology rather than the participants' perceived fears or phobias of the subspecialty. Second, their sole use of quantitative methods provided some insights into to the perceived difficulties and potential existence of neurophobia, but they did not allow for a detailed, multifaceted exploration of the issues and problems from the perspectives and vocabularies of the students or physicians themselves. Lastly, these studies did not examine if students' or physicians' perceptions of neurology differed significantly, for example, by year of study, level of study, or years of practice. Given these gaps and limitations, the following research questions will guide this two-phase mixed methods study:

- 1) (Quantitative) To what extent does neurophobia exist among selected undergraduate medical students?
  - a) Do students' perceptions of neurology differ significantly by year of study?
  - b) What are the interrelations between attitudes and perceptions towards neurology?
- 2) (Qualitative) Why do students develop neurophobia?
  - a) What factors contribute to its genesis?

## **METHODOLOGY**

Ethical approval will be sought from the local ethics board (i.e., Children's Hospital of Eastern Ontario Research Ethics Board) prior to study commencement.

### ***Research Design***

To gain a comprehensive understanding of the research problem, this study will employ a two-phase, sequential, mixed methods explanatory design. Phase 1 will involve the collection and analysis of quantitative data. Building on the results from Phase 1, Phase 2 will involve the collection and analysis of qualitative data (Creswell, 2009). Weight will be given to the quantitative data, as the results from Phase 1 will inform the focus, participant selection, and participant-level questions for Phase 2. Each phase will be analyzed separately but the two sets of findings will be integrated in the discussion section (Creswell & Plano-Clark, 2007).

## **Phase 1**

The purpose of this phase is to examine the extent to which neurophobia exists among selected undergraduate medical students and determine if students' perceptions of neurology differ significantly by year of study. The interrelations between students' attitudes and perceptions towards neurology will also be examined.

**Sample.** Using a convenient sampling approach, we will invite all French and English medical students in first, second, and third year at the University of Ottawa to participate in this pilot study. By surveying those in first, second, and third year, we will gain insight into students' perceptions before and after they complete the Neurology Block in second year.

**Instrument Development.** After conducting an extensive review of the literature, we developed the content areas for the **online** questionnaire. We determined that the questionnaire should focus on: (a) students' general perceptions of neurology and neuroscience as well as their neurological education; (b) students' perceived level of knowledge in neurology and neuroscience; (c) students' perceived difficulty with neurology and neuroscience; (d) students' exposure to neurological patients; and (e) students' perceived level of fear of neurology and neuroscience. Using these content areas and published questionnaires on this topic, we then developed a pool of items and developed a preliminary questionnaire (see Appendix A). The questionnaire asks students to indicate the degree to which they agree or disagree with various statements on a 4-point scale with 1 being defined as *Strongly Disagree* and 4 as *Strongly Agree*. There is also a *Don't Know* category in an attempt to minimize the number of missing responses. The questionnaire will be made available in French and English.

Two individuals who have knowledge of neurology and the teaching of it will review the questionnaire for content validity (CD & HM). This review will ensure that the contents of the survey are appropriate and relevant to the topic area and that the survey is not missing any pertinent items or content areas (Litwin, 2003). The survey will also be piloted with 10 to 12 medical residents. As part of this pilot, we will ask each resident to complete a debriefing questionnaire that focuses on the appropriateness, comprehensibility, and feasibility of the preliminary questionnaire (see Appendix B). We will then make any necessary revisions to it.

**Procedure.** Since the University of Ottawa cannot release the medical students' email addresses to us, we will provide the electronic information letter and survey link to the undergraduate coordinators at the University of Ottawa. The undergraduate coordinators, assigned to a given class, will circulate the information to the students. Using a modified version of Dillman's (2000) Tailored Design Method, they will also send two reminder emails to the students in an attempt to maximize the response rate. We will keep all questionnaire responses confidential. The individual responses of students will not be released to the University of Ottawa or the students' supervisors or colleagues. However, to recruit potential participants (i.e., based on their responses) for the Phase 2 focus groups, we will ask survey respondents to provide their email addresses if they are interested in obtaining additional information and potentially participating, if eligible, in a focus group for Phase 2.

**Analysis.** We will perform analyses of the survey data using SPSS version 19. Descriptive statistics (frequencies and percentages) will be used to examine the extent to which neurophobia exists among the participating medical students. The interrelationships between item responses will be investigated using cross-tabulations and Fisher's exact test. One-way ANOVA will be used to test for differences in perceptions of students in different years of study.

Two-sided p-values less than 0.05 will be considered statistically significant, and corresponding 95% confidence intervals will be calculated.

### **Phase 2**

The purpose of this phase is to explore why neurophobia develops including the factors that contribute to its genesis.

**Sample.** The goal of sampling will be to obtain information-rich data (Patton, 2002). As such, we will use a purposeful sampling approach. To ensure that Phase 2 participants have information and insights on neurophobia, the study sample will be drawn from those who have shown potential evidence of neurophobia in Phase 1 and expressed interest in participating (i.e., by providing their email addresses in Phase 1). Since the findings from Phase 1 will inform the recruitment for these focus groups, an exact sample size cannot be predetermined. Given our timelines and resources, we are aiming to conduct a maximum of three focus groups with 6 to 8 participants in each (Krueger, 1994). If more than 24 students are eligible and interested in taking part, we will randomly select students to participate. Conversely, if less than six students are eligible and interested we will use one-on-one interviews instead. Although resources will only allow us to conduct the focus groups in English, we will welcome participation from students in the French program recognizing that the majority are bilingual.

**Instrument development.** We will use the findings from Phase 1 to inform the development of the focus group question guide and thus, we have yet to develop a draft. The guide will consist of an introductory script and various open-ended questions that explore why students develop neurophobia and the factors that contribute to its genesis. Participants will be encouraged to provide examples of how their education and clinical experiences have contributed to their neurophobia or perceptions of neurology. The research team will develop the guide and an independent qualitative research consultant from the Clinical Research Unit (CRU) at the Children's Hospital of Eastern Ontario Research Institute (CHEO RI) will review the guide for face validity. An expert in neurophobia (NT) will also review the guide for content validity and ensure that the questions are appropriate, complete, and relevant to the topic area (Colton & Covert, 2007).

**Procedure.** The Research Assistant (RA) will distribute information letters to eligible participants. The information letter will ask these participants to contact the RA if they are interested in participating in a focus group. A trained qualitative research assistant will moderate each focus group session, while a note taker observes and records the key points and non-verbal gestures of the participants. All sessions will last approximately 1-hour. Each focus group session will be audio-recorded and transcribed verbatim. All participants will sign an informed consent form prior to the focus group.

**Analysis.** We will use a conventional qualitative content analysis (Hsieh & Shannon, 2005) because minimal information and research literature exists on this topic area. This approach will ensure that the coding scheme is derived inductively and flows directly from the data. Initially, two trained qualitative consultants, versed in the topic area, will independently read the focus group transcripts multiple times to obtain a sense of the whole (Tesch, 1990). They will then read through the data word by word to derive an initial coding scheme. Next, they will sort these codes into overarching categories based on how the codes relate to one another. The consultants will then meet to compare and discuss their categorical systems and develop definitions for each category. They will then reanalyze the transcripts using their agreed list of categories and codes and identify exemplars of each for reporting purposes. These exemplars

combined with the use of multiple coders will ensure the rigor and trustworthiness of the analysis. They will also triangulate the findings from the various focus groups (Creswell, 2009). Furthermore, the consultants will keep an audit trail of coding decisions and data analysis procedures as well as copies of evolving coding schemes (Rogers & Cowles, 1993). Focus group participants will also be invited to review and provide feedback on the accuracy of the findings (Creswell, 2009; Lincoln & Guba, 1985).

### **TIMELINE**

<b>Study Milestone</b>	<b>Completion Date</b>
Submit study proposal and completed tools to CHEO REB	October 2011
<b>Phase 1</b>	
Finalize questionnaire	November 2012
Submit revised questionnaire to CHEO REB (if revisions are made)	December 2012
Distribute survey to all students at the end of Neuro Block for second year students.	March 2012
Analyze survey data	April 2012
<b>Phase 2</b>	
Finalize focus group guide	April 2012
Submit focus group guide to CHEO REB for expedited review by REB Chair	April 2012
Recruit focus group participants	April 2012
Conduct focus groups	May 2012
Analyze focus group data	June-July 2012
Integrate Phase 1 & Phase 2 findings	August 2012
<b>Dissemination of Findings</b>	
Submit abstract for CCME conference	October 2012
Prepare manuscript	September-November 2012
Submit manuscript for publication	December 2012
Submit a 2-page final report on the project to AIME	December 2012
Present final results at CCME conference	April 2013
Present preliminary findings at AIME Annual Medical Education Day & CHEO RI	April 2013

### **IMPLICATIONS: HOW THIS PROJECT WILL INFORM FUTURE WORK**

This pilot study will inform the design of our Canada-wide mixed methods study on neurophobia among medical students and residents. Furthermore, the findings from this study may provide us with a rationale for the creation of an educational intervention(s) for medical students at the University of Ottawa that aims to improve their neurological knowledge and reduce their neurophobia. With the expansion of this pilot study and development of such educational interventions, we hope to stimulate other Canadian medical schools to evaluate the status of their neurology curricula and implement their own changes to improve neurological education for trainees at both the undergraduate and post graduate level. Overall, these changes will ensure a qualified and competent physician workforce in the neurological sciences, in the years to come.

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## Budget

Item & Justification	Cost Estimate(s)	Total
<b>Phase 1 (Online Questionnaire)</b>		
Fluid© online survey software : Fluid will be provided in-kind by the Clinical Research Unit (CRU) at the Children’s Hospital of Eastern Ontario Research Institute (CHEO RI)	In-kind	\$0.00
Data Specialist (DS): The DS from the CRU will set up the online questionnaire in Fluid, monitor the data collection process, download the survey from Fluid into SPSS, and perform data cleaning.	10 hours @ \$30.75/hour (including benefits)	\$307.50
Statistical Consultant: N. Barrowman, co-investigator, will provide <b>in-kind</b> statistical advice to the study team.	In-kind	\$0.00
Statistical Support: A research statistician from the CRU will provide statistical support for the study including access to SPSS.	15 hours @ \$75.00/hour (including benefits)	\$1125.00
<b>Phase 2 (3 Focus Groups)</b>		
Snacks/refreshments for 6-8 participants in each of the three focus groups will be provided by CHEO catering	\$60 per focus group	\$180.00
Audio recording equipment: The CRU will provide audio-recorders for the focus groups <b>in-kind</b>	In-kind	\$0.00
Qualitative Research Consultants: Two qualitative research consultants from the CRU will lead the analysis of the focus group data. One of the consultants is a co-investigator (K.Moreau) and will provide her time <b>in-kind</b> . Given the complexities of analyzing focus group data, we anticipate that the other consultant will require a maximum of 40 hours for each focus group.	120 hours @ \$43.75/hour (including benefits)	\$5250.00
Research Assistant (RA): An RA trained in qualitative research methods from the CRU will recruit participants for the focus groups (~15.5 hours) and set up and conduct the 3 focus groups (~4.5 hours). We anticipate that this will take 20 hours over an 8 week period.	20 hours @ \$30.75/hour (including benefits)	\$615.00
Note taker: An administrative assistant from the CRU will observe and record the key points and non-verbal gestures of the participants at each focus group.	3 hours @ \$30.75/hour (including benefits)	\$92.25
Transcription: A professional transcriptionist will transcribe the 3 focus group audio-recordings. Given the challenges of transcribing focus groups (e.g. overlapping voices) she anticipates 8 hours of transcription per focus group.	24 hours @ \$25/hour	\$600.00
<b>Dissemination</b>		
Travel, accommodation, meals and conference registration to disseminate the study findings.		\$1500
<b>Total</b>		<b>\$9669.75</b>

\* This budget has been developed in collaboration with the Clinical Research Unit at the Children’s Hospital of Eastern Ontario.

## Appendix A

### Draft Questionnaire (Phase 1)

#### **Understanding the genesis of neurophobia: A mixed-methods study of trainees' perceptions of neurology education (Phase 1)**

We would like to invite you to complete this survey so that we can better understand your perceptions of neuroscience and neurology. We are interested in your honest opinions, whether they are positive or negative.

Please select your answer choices.

#### **1. What is your current year of study?**

<b>First Year</b>	<b>Second Year</b>	<b>Third Year</b>	<b>Other (specify)</b>
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<b>2. Please indicate the extent to which you agree or disagree with the following statements. NOTE: <i>These questions refer to your medical school training to date and not to previous undergraduate training.</i></b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>Don't Know</b>
I think neurology is important to the study of medicine in general.					
I think neuroscience is important to the study of medicine in general.					
I think neurology is important for general practitioners (i.e., family physicians, general internists, general pediatricians).					
I am happy with the amount of education I have received in neurology.					
I am happy with the amount of education I have received in neuroscience.					
I am happy with the type of education I have received in neurology.					
I am happy with the type of education I have received in neuroscience.					
I am comfortable with the subject of neurology.					
I am comfortable with neuroscience.					
I have adequate knowledge of neurology.					
I have adequate knowledge of neuroscience.					
I think neuroanatomy is difficult.					

Appendix A

Draft Questionnaire (Phase 1)

2. Please indicate the extent to which you agree or disagree with the following statements. NOTE: <i>These questions refer to your medical school training to date and not to previous undergraduate training.</i>	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
I think neurology is difficult.					
I think neurology is one of the most difficult disciplines in medicine.					
I have had limited exposure to neurological patients.					
I would like to have more exposure to neurological patients.					
I am afraid of neurology.					
I am afraid of neuroscience.					

**3. If eligible, would you be interested in participating in a follow up FOCUS GROUP for this study (Note: all focus groups will be conducted in English)?**

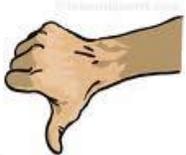
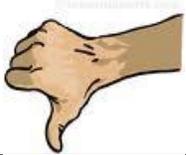
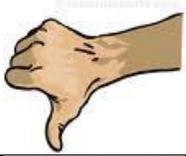
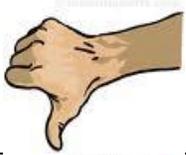
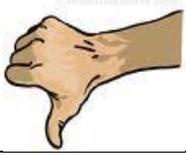
Yes, please email additional information to me at: (please insert your email address)	Maybe, please email additional information to me at: (please insert your email address)	No, not at this time.
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Appendix B

Debriefing Questionnaire for Piloting Draft Questionnaire with Medical Residents

How was your experience taking this survey?

Here is your chance to tell us what you thought about this survey. Please be honest! Your feedback will help us improve the survey-taking experience for our future participants. Please consider the following statements and give each a 'thumbs up' if you agree or a 'thumbs down' if you disagree. Thank you for your help!

1. This survey provided answer choices that reflected my true thoughts, opinions, or experiences.		
2. I found this survey interesting.		
3. I felt the survey was an acceptable length.		
4. The survey questions were clear.		
5. I would recommend this survey to my colleagues.		

Additional Comments:
