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Medical education of attention: A qualitative study of learning to listen to sound

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ABSTRACT

Introduction: There has been little qualitative research examining how physical examination skills are learned, particularly the sensory and subjective aspects of learning. The authors set out to study how medical students are taught and learn the skills of listening to sound.

Methods: As part of an ethnographic study in Melbourne, 15 semi-structured in-depth interviews were conducted with students and teachers as a way to reflect explicitly on their learning and teaching.

Results: From these interviews, we found that learning the skills of listening to lung sounds was frequently difficult for students, with many experiencing awkwardness, uncertainty, pressure, and intimidation. However not everyone found this process difficult. Often those who had studied music reported finding it easier to be attentive to the frequency and rhythm of body sounds and find ways to describe them.

Conclusions: By incorporating, distinctively in medical education, theoretical insights into “attentiveness” from anthropology and science and technology studies, the article suggests that musical education provides medical students with skills in sensory awareness. Training the senses is a critical aspect of diagnosis that needs to be better addressed in medical education. Practical approaches for improving students’ education of attention are proposed.

Background

The teaching and learning of physical examination skills in medicine has become contentious. Some clinicians question the usefulness of subjective, sensory examination techniques in an era of rapid technological advances in diagnosis (Russi 2005). Others argue that the performance of examinations remains an important aspect of medical care and requires training even though other modalities can provide the same diagnoses (Verghese 2009). Despite the controversy, little is known about how physical examination skills are, and have been, learned (Duvivier 2012), particularly the sensory and subjective aspects of learning such skills.

This gap led the authors to design a project to discover the ways in which one set of physical examination skills – the skills of listening during a respiratory and cardiovascular examination – were taught and learned. What the authors *did not* set out to do, is to enter the debate on the relevancy of physical examination skills learning or the accuracy of the physical examination compared to other diagnostic tests, as this is thoroughly dealt with elsewhere (e.g. JAMA’s The Rational Clinical Examination collection).

This study was part of a larger international project about the use of sonic skills across professions (see the Sonic Skills website [<http://fasos-research.nl/sonic-skills/>] for further details). The specific objectives of the medical school research were: to consider how knowledge of sounds was shared between expert and novice, by observing and describing the learning and teaching of lung sounds in university and hospital contexts; to build theoretical insights by analyzing these findings in light of relevant social science theories; and to contribute evidence that will enable investigation, consideration, and potential improvement of current

Practice points

- Attention is an important dimension in developing physical examination skills.
- Musical training fosters skills in attentiveness.
- Attentiveness could be better articulated into the curriculum, through practical exercises.
- Theories from anthropology and science and technology studies on attention offer new perspectives to medical education research.
- Ethnographic interviewing is a useful method for giving insights into *practices*.

teaching practices of sensory observation. This paper deals with the material from the interviews with teachers and students that were conducted as part of this ethnographic study. The interviews focused on how individuals learned to listen to sounds.

Theoretical framework

Contributing to a shift in medical education that attempts to broaden the repertoire of theories used (Wartman 1994; Eva 2008), the authors draw uniquely (for medical education) upon theoretical insights into “attentiveness” from science and technology studies (STS) and anthropology. By relating these theoretical frameworks to the findings of the interviews, the authors argue that learning the traditional skills of physical examination has an important

role in modern clinical medicine through its focus on sensory awareness. In particular it is imperative to address how medical students are taught to pay *attention* while performing physical examinations, as well as consider how medical educators can use attentiveness when teaching skills to students; skills which are increasingly perceived to be highly “subjective,” with signs which are difficult to articulate, elicited through techniques which are heavily dependent on the abilities of the practitioner.

Methods

The project was undertaken in both the preclinical and clinical sites of a medical school involving students and their clinical skills teachers. Students in their first and second years of a graduate entry course and sixth (final year of a previous school leaver entry course) year were available to participate in the study, as they were present in the medical school and hospital, and learning or practicing the skills of physical examination. The second year students were in their first clinical (hospital based) year of the course.

The study involved an initial broad ethnography which was undertaken through hundreds of hours of observation of fieldwork in Melbourne by the first author (AH) immersing herself in clinical skills teaching sessions at both university and hospital sites to observe the ways in which medical students are taught and learn the skill of listening to sounds, particularly lung and heart sounds, through practices such as auscultation and percussion (as well as listening to other sounds such as cough or wheeze). The later part of the study included detailed interviews with students and teachers who had been involved in the ethnographic study.

AH, a medical graduate and anthropologist, conducted the participant observation in Melbourne from July to October 2013. She was not known to the participants of this research prior to the study and did not undertake any teaching activities. The second author (EF), a doctor, educator, and researcher, facilitated entrance into these settings and collaborated during the fieldwork. She was not involved in recruitment, nor did she teach any of these students.

During the fieldwork, AH established good rapport with participants and 15 semi-structured interviews were conducted with eight students and eight teachers (note: one interview was with a student and teacher together; note: identifying numbers in results section are labeled from the Melbourne ethnographic study, where S is for student and CE is for clinical educator – therefore numbers extend beyond 8).

One student interviewed was from first year, one from final year, and the rest from second year. The interviews explored in more detail the observations made during the fieldwork as the participants were asked to articulate their current listening practices, as well as reflect on their learning and teaching in the past. Questions asked during the interviews were iterative, with the information from early interviews and fieldwork modifying the questions in later interviews, although all interviews included questions about techniques and strategies of learning and teaching sounds, and what was challenging and what was helpful.

AH conducted all interviews at the medical school campuses either at the university, hospital, or clinic. Interviews were audio-recorded and lasted on average one hour. She

also made handwritten notes for each interview. A sensory interviewing technique was utilized which involved the use of prompts in order to understand more about listening practices (for example, asking questions related to sensory experience or using sounds to elicit memories) (Harris 2015).

The interviews were transcribed and anonymized by a student assistant. AH undertook the first stage of analysis after fieldwork had finished, immersing herself in the material by hand-coding the transcripts for emerging themes. Interpretive notes were also made on the transcripts. This thematic analytical process was repeated, working back and forth across the data and relevant theoretical and empirical literature. A selection of the material was then shared with EF and both authors engaged in further thematic analysis selecting and verifying the important themes. All decision-making was carefully documented. The findings have been written up in accordance with the 21 items in the Standards for Reporting Qualitative Research (SRQR) guidelines (O’Brien et al. 2014). The project had ethics approval from both University and Hospital Research Ethics Committees.

Results

From the thematic analysis of the interview material with teachers and students, the authors found three key findings which are described in more detail below. (1) Learning the skills of listening to lung sounds was frequently difficult for students, with many experiencing awkwardness, uncertainty, pressure, and intimidation. (2) Learning to hear these sounds meant learning to pay attention. (3) Not everyone found learning to listen to sounds difficult. Often those who had studied music reported finding it easier to be attentive to the frequency and rhythm of body sounds and find ways to describe them.

These findings have been analyzed in the context of the broader comparative ethnographic project which involved fieldwork in both Melbourne and the Netherlands. The Dutch findings are reported elsewhere (Harris and Rethans, in progress) and focus on the creativity and improvisation of teachers sharing sounds with students.

Difficulties in learning to listen

Many clinical educators (CE) and students (S) expressed the difficulties they found in hearing sounds for the first time and in the early stages of learning. One student encapsulated the sentiments of many: “at the start you can’t really hear anything ... I didn’t know what I was hearing, or supposed to be listening for” (S2). Several CEs remembered feeling awkward as students learning to listen, having difficulty not only in finding patients on the ward who were not too exhausted by medical students listening to their “auditory sign,” but also learning to use techniques such as percussion and auscultation. They described difficulties such as:

Getting access to the patient, getting exposure – gender issues, female patients – you know – how to you place your stethoscope (CE4)

Clinical educators also remembered “not hearing” the sounds they were meant to hear once they did have a

chance to listen. Added to these difficulties were the noisy environments they found themselves practicing listening in, the hospital wards very different from quieter tutorial rooms, as well as the harried and often intimidating nature of some of their ward round teaching sessions:

It was so frustrating when there was a particular sound that you just couldn't hear. So we'd give our interpretation and the consultant would say "oh no, this is what this patient has. They have this and this" and I would think – why couldn't I hear that? (CE4)

One CE felt so much pressure as a student to hear the sounds, from his professor, he and his cohort were "petrified" and pretended they had heard them. Several students also described pretending to hear through peer-pressure:

It's a bit of a game, because sometimes you make the call when you weren't convinced of it yourself – the best example of that is in a tute [tutorial] with a doctor who will tell you what is there. And then of course you have to hear it. You can't not hear it! (S11)

Many desired the "aha" moment, when they would suddenly hear the sounds. For two CE, there was no "watershed moment" or "anything spectacular" as a student, while another CE remembered the frustrations of not hearing and then "all of a sudden I think a kind of clarity of having been told of something to hear and understanding what it was and hearing what it was."

The difficulties students and their teachers reported relate to pressures to hear something that they could not hear, as well as those related to approaching patients.

Being taught to pay attention

While many of the CE remembered frustrations as students trying to hear sounds, they also remembered how they gradually learned to attend to sounds, which happened with practice, as one teacher put it "the more you hear, the more you hear, the more you hear" (CE10). Several described what could be identified as a form of pattern recognition: "once you've heard them a couple of times, you never, you don't forget them" (CE9).

What was important was the guidance from teachers, in being made aware of these sounds:

The other memorable experience was being told that look this patient has an early diastolic murmur, its here – "listen with the stethoscope, if you can't [find it], I'll find it. Put this in your ears, use my stethoscope. I'll hold it on the spot. Ask the patient to exhale, lean the patient forwards... right you should be able to hear it now." And it was those kind of things that meant that I first heard – I first heard what I was supposed to be hearing (CE9)

The doctors were being taught to pay attention. This process was perhaps best captured in a section of field-notes detailing a learning moment on the wards, between a first year medical student and an emergency room consultant:

My mobile phone buzzes and I read a message from Chris (pseudonym), the student I am shadowing that day: "Hi [Anna], I just listened to a lung if you want to come down to Resus 6." I find Chris at the nursing station, standing next to an Emergency Room consultant typing rapidly away on a ward computer. We wait patiently for a few moments, and

then the following conversation ensues, as pieces of paper spit out of the nearby printer:

Consultant: What did you hear?

Chris: Early respiratory rough crackles. There were a few crackles on inspiration.

Consultant: Are you sure that's what you heard? You can hear the crackles throughout. That's a pleural rub. That's quite rare. I can't remember the last time I saw one. Its not crunchy like a pneumothorax, sounds more creaky. So that's a plural rub. Very rare. At least for me, I can't remember the last time I heard one.

Chris: I wish you had told me what to look for.

Consultant: That was the point, not to know so you can listen for yourself. That's why I told you to pay attention, to pay attention to what you hear. Listen again, wait for the analgesia to kick in then listen again.

Returning to the interview material, an important part of paying attention is also learning to describe the sounds, and correlating this to what was heard:

How I was taught was "listen to this" – "what do you hear?" ... "Funny noises". "What sort of noises – describe the noises. Ok, yes, what you're hearing is rhales fine and crackling noises. Make sure you're hearing what I'm describing" (CE10)

Here the difficulties were those of learning to become attentive to the sounds, and then to be able to describe them appropriately.

The benefits of musical training

When it came to describing sounds, many of the medical students who had some form of musical training found it easier:

I think a lot of it is also kind of learning the words you should use to describe sound. Because as you learn music you learn also about the difference – different words like frequency or pitch or intonation or... tone and timbre and all these kinds of things. And having these words, forms that kind of mental framework as to how you could describe sounds as opposed to just saying "oh that was loud or that was soft or this was... like high pitch or low pitch" (S12)

Not all students had these skills of sonic description:

So, I still don't feel good about my heart sounds, and I think – I don't know why but I feel like a lot of people got it ... it might also be the fact that I'm not a very musical person and I think that might be a huge thing (S1)

The quote is from a student who explicitly described herself as a nonmusical person, who found listening difficult. Many of the teachers also reported this observation amongst their students:

Students who are a bit musical or play an instrument – they are a bit better at – you know – focusing in on the actual frequency of the sound (CE3)

The teachers also encouraged a musical kind of listening:

I tell them that listening to murmurs is different to any other listening you've done, unless you're a musician. It is not like putting the stethoscope in your ears and letting the sounds washing over you. You need to concentrate. You need to focus on frequency, on intensity. The sounds might be quieter than you think. You need to listen actively. Like when you listen to classical music and listen for the era, the

composer, whether it is a symphony or concerto, what key, what instruments. They are trumpets, there is the viola. This is active listening I tell them (CE16)

Students who had had musical training also thought that they had an advantage when it came to learning lung sounds:

Well it's just like if you learn any kind of music you learn how to listen... If you play music you listen to a lot of music and you become really particular about... you hear the phrasing. You can hear the rests, you can hear the pauses. You become more skilled in listening to the nuances of the sound (S7)

Here the students describe not only honing their skills of listening but also of paying attention to the details of this sensory experience. For some of the students this was a very implicit aspect of their practices, something which was particularly revealed through the process of participating in the ethnographic interviews:

I took a lot of practical music classes but I also took a lot of music theory classes as well. And so... you've got a score of a piece of music and you're actually listening to the piece of music and then you are watching it visually unfold. So you can see how... that language is transcribed into the sound. And so... this is really particular... it's a really particular training ... I guess it's an advantage in a way. I would perceive it as such – although until I've had this conversation with you I never really thought about like that... And so I do find that when I listen [to patients] I tend to close my eyes and get quite still ... but then that's how I used to listen to music. That repetition of phrasing or – like things popping out like all the way through a piece of music ... (S7)

The benefits of a musical education were evident in the students' ability to have a framework to enable them to hear the sounds and to describe them.

Discussion

This study, based on interviews with teachers and students conducted as part of an ethnographic study on how doctors learn to listen to sound, showed the importance of skills of attentiveness in learning the subjective skills of physical examination.

There have been many ethnographic studies of medical education which have shown the richness of this approach for helping to understand how teaching and learning plays out in everyday contexts (see Atkinson and Pugsley 2005; Pope 2005; Reeves et al. 2013 for overviews), as well as in the assessment of competencies (Whitehead et al. 2015). To date, ethnographies of medical education have tended to focus on the professional identity formation of medical students, building upon foundational work such as Becker et al.'s (1961) study of United States medical schools. The study presented in this article, along with others, offers an alternative perspective, moving attention away from professional *identity* toward medical *practices*; that is, what people *do*, rather than how they *think* about their actions (Schatzki et al. 2005).

The anthropological approach adopted in this study was used in order to understand the practices entailed in learning to listen to sounds. In doing so, multiple, subjective realities are assumed rather than a single objective truth. The broader ethnographic project was guided by the

enskillment theories of anthropologist Ingold (2000) who argues that skills are not cognitive and technical attributes acquired through transmission of information but rather embodied practices learned gradually while becoming attuned to one's sociomaterial environment.

In his excellent study of how London students learn to listen to heart sounds, the anthropologist Rice (2013) also draws from Ingold's work and uses the practice-orientated approach adopted in this study. His ethnographic study showed that students found listening practices such as auscultation extremely difficult. Rice recounts students' frustrations concerning first attempts to detect murmurs. His study does not focus on the challenges of developing listening skills, simply reporting on most students gradually "acquiring" proficiency at auscultation. The authors wished to fill the gaps in Rice's study by exploring the difficulties that students encounter in learning to listen, and whether all students are able to learn the skill eventually. The study also addresses a current gap in the skills literature in medical education, by attending to the *sensory details* of learning.

Rice is skeptical about whether auscultation will remain a relevant practice in the future, amidst technologies such as hand-held ultrasound machines. While the concern is recognized, the authors suggest that the benefits of learning to listen to sounds are also tied into *learning to pay attention*, a quality that is important for all sensory skills, not only those of auscultation and percussion. Students are engaged in what the ecological psychologist Gibson calls an "education of attention" (Ingold 1996), a term further developed by STS philosopher Latour (2004) who writes of "training to be affected." For Latour this means learning to attend to differences of smaller and smaller magnitudes. Similarly Bleakley et al. (2003) discuss, drawing on the philosopher Polanyi, the notion of a sensory connoisseurship in medical education, as an esthetic and imaginative approach toward distinguishing differences.

Our analysis of the interview material showed that not only was teaching and learning sounds challenging, and required paying attention, but also that those who had studied music found it easier to be attentive to the frequency and rhythm of body sounds and find ways to describe them. This connection between musical training and physical examination skills is not new. Historians of medicine have long pointed out the musical abilities of the physicians who developed the skills of auscultation and percussion, Leopold Auenbrugger and Rene Laennec (Vouhé 2011; Bosanquet et al. 2014; Pesic 2016). Some famous teachers, such as the cardiologist W. Proctor Harvey have also used classical music as a way to introduce students to the principles and techniques of aural identification and sound classification (Harris and van Drie 2015). Interestingly, there has been more focus on the links with classical music, and indeed all of the medical students and teachers who mentioned music were referring to classical music. Recently researchers such as Brown et al. (2012) have attempted to move away from the predominant focus on classical music in therapeutic environments to consider other forms of sound and music, a direction which would also be useful to consider in medical education.

What is most important in respect to this finding in our material, however, is not so much whether we can conclude that music is beneficial to learning auscultation

(see others such as Pellico et al. 2012 who are researching this systematically), but rather that music training enhances the students' skills in attentiveness. An important and beneficial aspect of musical training was a training of the senses, a general education in sensory awareness that is also important in learning the sounds of the body. The attentiveness developed in musical training could also be of benefit in providing an ability to attend carefully to the sounds from the stethoscope in spite of being in a noisy ward (Parbery-Clark et al. 2009). Learning to pay attention was integral to learning to listen to murmurs and pathological breathing, a process which required guidance by teachers. The clinical teachers needed to direct the students' attention toward what sounds to listen to, how to focus their attention. These skills in sensory awareness are vital to good medical practice, yet difficult to teach in medical school. As Bleakley et al. (2003) write, "how one may educate a perceptual attention, or close noticing, is a long-standing problem in medicine."

Attention is not only one of the bedrock goals of clinical teaching (Charon et al. 2016) but also fundamental in all our daily interactions with the world around us. Ingold (1996, 2000) argues that it is through situated and attentive engagement that one becomes a skilled practitioner in daily life. The role of any "tutor" in this process, he suggests, is to set up situations in which the novice is instructed to attend to the particularities of what can be seen, touched, heard and to get a feel for it themselves. He draws from Gibson's notion of "education of attention" to make this argument, whereby a novice is trained to "pick up" aspects of their environment that they might otherwise fail to notice.

For professionals such as doctors there is much at stake in training the senses through attentiveness, just as there are for other sensory experts. Latour (2004, p. 213) describes how a novice perfumer can become "a nose" through training their sense of smell with odor kits, which help them distinguish from very obvious to very small differences: "the more you learn, the more differences exist." Part of this process is learning to become more articulate, which the medical students in this study noted, particularly those trained in music. The more training they had to listen to musical sounds, the better their skills in articulating body sounds were perceived to be.

Pellico et al. (2012) write that "clinical competence begins by developing and sharpening skills that use the senses: observing, palpating, hearing, and smelling" and that "given that the skill of physical examination is multi-sensory, curricula that enhance the skills of observing, touching, and hearing logically have potential for improved competency. Development of these skills is critical since they are the basis for initial assessment, physical examination, diagnosis of a patient's needs and evaluation of treatment impact." A series of practical activities focusing on sensory awareness, which would assist students to gain these skills, is discussed below.

In summary, the authors do not advocate for or against the teaching and learning of physical examination skills; instead they report on current and past practices of teachers and students elicited from ethnographic interviews in a medical school. The study is limited in that it focuses mainly on second year students and teachers. While some may also consider the findings limited and subject to recall bias in that they rely predominantly on sensory memories,

this is a common approach in ethnographic and oral history interviewing and we believe that there is much richness in these auditory memories. The memories offer insight into the everyday practices of learning to listen to sounds, which are triggered by active involvement in the teaching program (see Harris 2015 for more detailed approach to sensory memory methods).

Practical implications

There has already been important work on the sensory training of medical students, often within the remit of medical humanities and particularly art classes for medical students, since Braverman's (2011) introduction of this approach in Yale. In Melbourne, Heather Gaunt and Eleanor Flynn have introduced such a program in a collaboration between the Ian Potter Museum of Art and the Medical School. There are also courses on improving students' perceptive attention through the teaching of skills of close reading of literature and through creative writing (Wellbery & McAteer 2015; Charon et al. 2016). Finally, some have attended to musical training as well, such as Pellico et al.'s (2012) study of aural training.

Reports evaluating and reviewing art classes for medical students describe evidence of improved observational skills, which facilitate seeing in ways that improve diagnostic ability (Perry et al. 2011; Gaunt et al. 2014; Wellbery & McAteer 2015). Many of these studies find the importance of training observation skills to be based on better pattern recognition, viewed as a critical step in clinical reasoning. They draw from cognitive learning models in order to understand these findings. There is also a focus on how these courses train skills in empathy. While this article's approach differs in regards to its focus on bodily, sensory learning, using anthropological models of skills training, it draws from descriptions of these arts-based courses and the findings of the ethnographic interviews to suggest that diagnostic skills can be better developed through specific sensory training exercises.

A series of practical workshops for medical students that focus their skills in attention and sensory awareness through a curriculum of hands-on activities could be developed and articulated into the existing curriculum. These could be drawn from classical music training and the art and writing sessions already mentioned in this article, but also incorporate other forms of sensory training, such as cooking classes, tea/coffee tasting lessons, mindfulness training, nature walks, or contemporary dance classes. The aim of such sessions, led by a sensory expert in the respective field, would be to train the students to attend to differences (in sounds, sight, taste, smell, texture, movement, etc.), to guide them to notice aspects of their body, materials, their environment, they might otherwise not notice, to find ways to articulate these experiences and to reflect on the skills of observation and attentiveness to those observations that are required for their work as doctors. Such sessions would have to be embedded in the clinical skills practical classes so the students could "see" the connections. The encouragement of reflection before, during, and after the sessions, through guided discussions with the sensory expert and a medical educator and the documentation of the observations and reflections would be a necessary part of such sessions.

These practical suggestions serve to reinforce the importance of attending to attentiveness when teaching medical students physical examination skills, a quality which is important, and indeed crucial, to their abilities as diagnosticians.

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Glossary

Enskilment: the process of learning a skill.

Ingold T. 2000. *The perception of the environment: essays on livelihood, dwelling and skill*. London: Routledge.

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