EDUCATION
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ORIGINAL ARTICLE

Facilitators and barriers to education for chiropractic students with visual impairment

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Objective: The purpose of this study was to document the academic experiences of students with visual impairment in a doctor of chiropractic program.
Methods: Ten participants were recruited, including 3 students who are "legally blind," 2 student notetakers, 3 faculty members who taught students with visual impairment, and 2 staff members from the Disability Services Office. For this qualitative study, the students were recruited through the Disability Services Office. The participants were audiotaped during approximately 1-hour interviews conducted in a semistructured manner within a private setting (a quiet office) on the campus during office hours. Thematic analysis was conducted using a deductive method for codes and an inductive method for themes.
Results: We identified facilitators and barriers to the education of students with visual impairment. Notable facilitators were planning for accessible educational materials, accessibility of workable space, and support systems, such as notetakers and close interaction with faculty. Notable barriers were attitudes of students with visual impairment toward their education, lack of personnel training, and lack of disability awareness in the campus community.
Conclusion: Meticulous planning of resources and communication are key to enriching academic experiences of students with visual impairment.

Key Indexing Terms: Chiropractic; Education of Visually Disabled; Educational Techniques; Teaching

J Chiropr Educ 2020;34(2):116–124 DOI 10.7899/JCE-18-14

INTRODUCTION

In 2012, the World Blind Union presented a resolution at the 8th General Assembly to "encourage employment" of individuals with visual impairment (VI). In 2013, a systematic review article appeared in the *British Medical Journal* stating that the economic burden of VI and blindness was "considerable." The highest costs disclosed by this extensive review were determined to be caused by loss of productivity.[1,2]

Training individuals with VI in the institutions of higher education presents some challenges. This leads to gross underrepresentation in many fields, including health care. Recent surveys in the United States (2017) reported that only 14.9% of individuals with VI have a bachelor's degree or higher education. Although currently in the United States 5.6 million people (20%) live with some type of disability, less than 3% of medical students have a disclosed disability. Not surprisingly, only 42% of individuals with VI are gainfully employed.[3–6]

In rare instances, students with VI have been admitted to medical schools. For example, a blind medical student completed his training and graduated into a successful practice in psychiatry at a university inpatient department. Published commentary further advocated including students with VI in medical schools.[7,8]

Neurological research has consistently demonstrated heightened tactile awareness in visually impaired individuals, particularly for textural mechanoreception. Enhanced tactile perception is particularly strong where the blindness has been congenital. Such research findings suggest that the individual with VI would be an asset in the areas of physical medicine.[9–16]

The scientific literature suggests that physiotherapy is an "excellent option" for people with disabilities and documents a long history of blind physiotherapists. Various physical therapy schools have successfully trained students with VI. A qualitative study was conducted to examine whether physiotherapy students with VI could be successful in their clinical placement. The study reported that, with individualized accommodations such as a reader to read screens, students with VI were able to complete their clinical training for bachelors of physiotherapy programs.[17,18]

Another study identified barriers and enablers to learning for students with VI in a physiotherapy program. This approach, along with the specific terminology used, derives in large part from work in France and Spain, proposing that disability is less a matter of personal impairment and can be humanistically addressed by removing cultural, societal, and economic constraints that constitute the barriers to the expression of their potential. Staff behaviors and resources were considered enablers, while the need for extra time and effort along with fear of disclosure of disability were identified as barriers to learning.[19,20]

A more recent qualitative study in India (2017) documented the experiences of students with VI in physical therapy pursuits. It included interviews of physical therapy students, clinicians, and teachers in an institution devoted specifically to the physical therapy training of blind and visually impaired individuals by faculty with and without VI. It is noteworthy that acceptance played a substantial role as a facilitator in the experiences of the blind students at this institution.[21] Our research team found no literature indicating that blind students are currently studying occupational therapy despite the likelihood that there will be an increased need for such individuals to assist an aging population with its predicted increased prevalence of VI.

On the other hand, chiropractic has long held the tradition of including individuals with VI in the profession. Dr C. R. Johnston, the first blind chiropractor, graduated on August 28, 1918, and practiced in Peekskill, New York, until 1943.[22,23] However, despite 100 years of inclusivity, no systematic attempt has been made to report the academic experiences involved with visually impaired students in a doctor of chiropractic program. To the best of our knowledge, this is the first such attempt. As such, it is an exploratory, qualitative study done with semistructured interviews. The purpose of this research is to document experiences in training students with VI in a doctor of chiropractic program in order to improve the delivery of chiropractic education to future students with VI.

METHODS

Setting and Participants

On approval from the institutional review board of Life Chiropractic College West, we recruited 10 participants, including 3 students with VI who were "legally blind," 2 student notetakers who assisted students with VI, 3 faculty members who taught students with VI, and 2 staff members from the Disability Services Office (DSO).

The principal investigator and coinvestigator met the DSO to begin recruitment. In order to maintain confidentiality regarding disability status of a student, all student participants were recruited through the DSO). The investigators prepared a recruitment flier that the DSO sent out to the students. The student notetakers recruited in the study had assisted in at least 3 or more classes. The volunteers for the study were screened by the Disability Services Officer for eligibility criteria. In the academic year 2016–2017, a total of 5 students with VI were enrolled in the doctor of chiropractic program, but only 3 met the study criteria (i.e., were "legally blind"). "Legally blind" is defined as "a medically diagnosed central visual acuity of 20/200 or less in the better eye with the best possible correction, and/or a visual field of 20 degrees or less."[3] The informed consent document was read to the students, and their verbal approval was recorded. The eligible 3 students were not enrolled in the same quarter.

The faculty members were recruited as volunteers directly from a list created by the investigators with representation from the spectrum of lecture and labs taken by the students over the course of the 3.5-year program, including their health center (HC) experience. All recruited faculty members had taught more than 1 student with VI over the previous 3 years, but only 1 per quarter of instruction. All faculty participants were full-time members and had completed the online disability awareness training. Additionally, faculty members who have students with disabilities registered for their classes undergo specific training by the DSO in advance. To avoid undue influence on student participants, the faculty who currently had students with VI in their class were excluded from the study. The staff from the DSO were recruited through direct contact as well. All staff participants had more than 5 years of work experience at the DSO. The participants were not paid any cash incentives or given any college credits.

Procedures

All interviews were conducted between January 2017 and August 2017. The participants were audiotaped during an approximately 1-hour interview conducted in a semi-structured manner either within a private setting (a quiet office) on the campus during office hours or by phone. All interviews were recorded, and transcripts were made of the call. If all questions from the interview guide were not covered within an hour, then a follow-up call was scheduled at a later date. To minimize effects of the interviewer's preconceptions, the interviewer used the institutional review board–approved interview guide and spoke minimally during the interview. The interviewer had extensive experience in interviewing participants in various qualitative studies. At the time of interview, the student participants had never been enrolled in the classes taught by the interviewer. Because 1 student had previously been in the interviewer's class, that student was interviewed by a member of the research department who is also an experienced interviewer. The staff and faculty participants were familiar with the interviewer as colleagues.

Our interview question guides were developed after conversations with a 4-person advisory board made up of experienced qualitative researchers and experts in disability policy and education. The questions in the guide were based on previous qualitative studies that collected data from people with different roles in a common phenomenon.[19,24–26] Given the small number of students with VI at our institute, the question guide was not pilot tested on them. However, prior to its use, the interview question guide was piloted on faculty and staff. The interview

question guide was provided to the participants for their review at least 24 hours prior to the interview.

The questions from the guide were posed to the participants (e.g., the participants were asked about the number of years spent at the college). They were asked about their learning or teaching experiences in the classroom, lab, and HC setting (as applicable). We probed and asked follow-up questions as new issues arose throughout the interview process. The students with VI were asked about accommodations, including instructional aids available (e.g., audio notes, Braille, and large print) and their effectiveness. They were asked about their experiences in using the tactile, visual, or audio modalities of learning and teaching. The students with VI were also asked about other student services, such as tutoring or access to the gym. Finally, they were encouraged to give open-ended comments and suggestions.

The staff, faculty, and notetakers were asked to describe their experiences in training students with VI (e.g., "please tell us about tactile model use in the labs"). Apart from the responses to interview questions, given the small sample size of the participants, no other sociodemographic data were collected. To maintain anonymity, neither the participants nor the interviewer referred to each other by name in their conversations. A complete set of interview guide questions is included in Appendix A, which is available as online content at http://www.journalchiroed.com.

Data Analysis

All interviews were audio recorded. Participants were offered the opportunity to review the transcripts or, in the case of students with VI, the recordings and asked to make further comments or corrections, but none accepted. Using a professional transcription service, the digital recordings were transcribed verbatim. Both authors heard the audio recordings and read the transcripts. Dedoose Version 7.0.23 (Web application for managing, analyzing, and presenting qualitative and mixed method research data; SocioCultural Research Consultants, LLC, Los Angeles, California, 2016, http://www.dedoose.com) was used to analyze the data. We conducted a thematic analysis of the transcripts to identify similarities and variations in the data and to enable us to recognize unexpected, important elements that might arise in the interviews.[27,28]

The data analysis was done by both the authors, and the data were analyzed using an iterative and inductive method for codes. The codes were assigned to relevant statements in the interviews by both the authors. Further, the 2 authors discussed the codes and revised them as necessary. To support the reliability of our findings, we used a reflexive process to discuss interpretations of data and minimize potential personal biases. An audit trail was made for the coding process. The themes were drawn by a deductive method. A multilevel coding scheme was used to identify themes (e.g., facilitators vs barriers; tactile, visual, or audio facilitators, and so on). The quotes that were chosen to be included in this article are representative of the interviews conducted and illustrate variations in the data.[29] While reporting the outcomes of the study, an effort was made to follow the guidelines for consolidated criteria for reporting qualitative research (COREQ).[30]

RESULTS

Analysis of data from the interview transcripts yielded 3 major themes: planning, technology and tools, and personnel. Within these themes, availability of resources and attitudes of participants emerged as barriers to or facilitators of student learning (Tables 1 and 2).

Theme 1: Planning

The study revealed that prior to enrolling the students with VI in various classes, planning of space and resources was done by the DSO, classroom faculty, and HC faculty. Within this theme, 3 facilitators and 3 barriers were noted.

Facilitators

The planning meetings played a crucial role in facilitating learning. At the beginning of each quarter, a planning meeting was organized. During this meeting, the faculty were made aware of the needs of students with VI. For example, the DSO staff explained the need to use very specific directional language. In contrast, "over here you can see such and such" provided no information for the student with VI. "We're encouraging them and even explicitly on the accommodation letter saying to use terminology like 'anterior, posterior, upper left quadrant' of this or that so that the students can follow and understand what is being discussed."

In addition to the planning meeting, an online training for faculty was provided to make them aware of the requirements under the Americans with Disabilities Act (ADA). The training enabled the faculty to adapt their teaching methods to meet the needs of the students with VI. It encouraged them to use verbal and tactile modalities while communicating with students. A student with VI reported, "The professors would work with me over breaks in their spare time to go over the specimens and actually . . . physically show me and allow me to feel the specimens . . . really descriptive . . . helping me through the lab process, both the core faculty and the adjunct faculty."

The DSO planned conversion of lecture materials into an accessible format. The students with VI used their audio readers that can read Word documents. Hence, all the instructional materials needed to be converted into Word format. The DSO accomplished this task at the beginning of the quarter.

The HC planned logistics to allow for regulatory requirements when the students with VI advanced to the HC. To maintain both Health Information Portability and Accountability Act and ADA compliance, administrative staff made 2 key changes. The service dogs accompanied students with VI in the main campus and HC areas. In the HC, the floor plan was changed to limit the impact of service dogs on an HC environment. Next, a special HC office space with technical devices was allocated for the students with VI to read patient notes. This ensured confidentiality and privacy of patient records while all HC

Table 1 - Facilitators to the Education of Students With Visual Impairment

Code	Quote	Speaker
Planning	"Every quarter [the DSO] asks the instructors that are going to be teaching blind and visually impaired students the following quarter to have a meeting with us so that we can discuss providing materials and what the special needs might be of each particular class."	Student
	"I assume they [the DSO] would spend the break just preparing the text file and then they would send it to me and the visually impaired students before the class started and then we were good to go for the whole quarter."	Notetaker
	"And so we came up with a system so that all needs were being met, the mentor knew the logistics of the floor with all of the other interns, the DS officer knew exactly what the ADA and what the actual VI needs for the VI student were going to be, and I knew Health Center policy and procedures and needed to make sure that that was in place."	Faculty
	"We had to designate a floor plan that was going to be conducive to the dog and make sure that it was a smaller footprint than other interns and that he knew the space. We had to designate an exam room that could also serve as a treatment room that was private, so it needed to have a table that could elevate and serve both as an exam table and an adjusting table."	
	"There's the paperwork that needed to be transferred and transitioned because, of course, it's not in Word documents. So all the paperwork needed to be available to them. Their actual reader, needed to be moved so it was in the Health Center so he could use it to read files."	
	"Providing instructional material before a quarter starts, give them time to review."	Administrative staff
Equipment	"I was able to get audio recordings of those books."	Student
	"The best screen reading software is actually on the mobile devices. Access Canvas on mobile phone."	
	"Paper that you scratch it and it puffs up so you have a tactile image. Very helpful."	
	"They have a program that they can use by scanning documents and it helps put it into text faster. So that's why they would do that. But if it was just a small document, then I could manage typing it up in an evening and that would be fine."	Notetaker
	"They [students with VI] have a special room and computer system that they can go into that can view x-rays and make prints bigger. That is something they use the entire program. We just moved it into the Health Center 'cause that's where you do most of your work at the end of your training or schooling. They had accommodative laptops and stuff like that, they had a ton of accommodations that the Health Center provided, but I think they also had some more stuff on the academic side as well."	Faculty
	"Some models I could attach Braille labels to it."	Administrative staff
	"Use the CCTV."	
	"So 3D printing is a whole 3-dimensional object. You can print a bone or a heart and you can, flip it around in your hand. It's got sides. But the tactile printouts, that's just basically a flat page with a texture, like Braille. And they have like—they print maps."	
Personnel	"The professors would work with me over breaks in their spare time to go over the specimens physically show me and allow me to feel the specimens."	Student
	"She [professor] reads me the test out loud and records my answers. It really helps to have the instructors read the exams."	
	None.	Notetaker
	"We basically chose a mentor and made the accommodation in the mentor's practice for each of the VI students as they came. So we tried to pick a mentor that was going to be a good fit with the personality of the intern but also not that 1 mentor was going to have all of the VI students."	Faculty
	"When the instructor needed to do a demonstration he would use them [student] as a model"	Administrative staff
	"cultivated some strong relationships amongst their classmates."	

Table 2 - Barriers to the Education of Students With Visual Impairment

Code	Quote	Speaker
Planning	"Note packets—I kind of gave up on it, pictures or charts there's just no way to get that information without having the written description."	Student
	"Patients that are transferred to me—there doesn't seem to have been any concrete plan or procedure so far."	
	"The clinical side the pre-planning part just did not seem to happen—lack of resources."	
	"I think more work needs to go into that sort of planning—visual exams."	
	"I never did work with any other notetakers. One of the struggles I had was with the front office asking me to do too much, honestly. Instead of letting us tailor it to what that particular student needed, they were asking you just basically to provide everything and that's not taking notes for somebody."	Notetaker
	"The DSO never had like a meeting of all of you?"	
	Notetaker: "No."	
	"The 1 confusing part was that I wasn't quite sure if we were supposed to be telling them if new assignments or stuff popped up on Canvas or not or if that was the responsibility of the academic office."	
	"And I think out of ignorance we're grouping it and they're visually impaired so they're going to need the same stuff and they're going to be the same way."	Faculty
	"I think they wouldn't even know what that actually looks like 'cause they're just getting their doctoring legs on. And you'd have to be really careful that the assistant didn't know more than they did, because if the assistant knew more than they did, then they wouldn't get the learning experience out of it. They're the ones that need to be in charge."	
	"The quarterly meetings to prepare for the following quarter, nobody shows up anymore. Faculty members, very few are responsive."	Administrative staff
Equipment	"It works better if the assignment doesn't have to be on Canvas—Canvas quiz."	Student
	"I know Lori or Nina has gone and put Braille labels on the cardio equipment [gym]. And then the next day or whatever, that won't be plugged in . . . have it [gym] accessible to everybody—more activities for everybody."	
	"You won't know that it's a funny picture of a boy wearing a blue shirt, you know, or what the caption says and everybody laughs. And VI student goes, 'Well what am I missing?,' you know?"	Notetaker
	"Adapting everything from paperwork to accommodating—spending time that's needed just because of the extra amount of time they need to have things read to them in some of our procedures, maybe."	Faculty
	"And most faculty members, it seems, they use PDFs and PowerPoints, which are not accessible."	Administrative staff
	"The screen reader. It would read APEX instead of A-P-E-X."	
Personnel	"I would say that the area of the education where the accommodations have been most lacking has been the clinic. The CAs that were chosen to work with you didn't get any extra training."	Student
	"The scribe hasn't been trained in—and my file's not in the proper order, which it should be. You know, I would think that would be something a scribe could do."	
	"The professor was really very poor at administering the tests—horrible experience."	
	"I tend to not have much time to do study groups—don't find that particularly useful."	
	"The training that we had was focused on deaf students so it was not really meeting the needs of the blind students—my experience is my training now."	Notetaker
	"The [students] expected their aide to be able to do more than just write."	Faculty
	"But filling aide positions is very difficult so my assistant and I have sat in on a lot of classes to assist."	Administrative staff
	"Trouble filling the notetaker positions."	
	"To be able to provide a CA, chiropractic assistant, for our students with visual impairment, for our interns. That's been a difficult process."	
	"Their notetakers just weren't doing what they needed to, so within 24 hours they need to provide the notes to the students. So, that wasn't happening."	
	"Very good but very, very trying, very taxing. It's not sustainable with the resources we have. Need more staffing."	
	"So, the students didn't get the attention that they needed anyway. pod doctors, which was more preferable I think to them anyway because the mentor docs, they are also overwhelmed."	

paperwork, such as intern notes, evaluation forms, and so on were converted into accessible formats.

Barriers

The planning meetings had limited success due to lack of attendance, particularly by part-time faculty. This impacted classroom instruction and impeded communication.

The conversion of materials to the proper format was challenging in several ways. Faculty did not always send instructional materials to the DSO in a timely manner, delaying their availability to the students. Access to course notes prior to the beginning of the quarter was preferred, as it helped the students with VI feel prepared. It was also difficult to convert instructional materials that had images and graphs into an accessible format. The staff at the DSO provided a verbal description of the image or graph. Additionally, it was difficult to convert the images of old journal articles into an accessible format. The DSO converted important pieces, such as an abstract of the article, into audio format.

The online training module provided information about ADA law requirements but was targeted toward notetaking training to assist deaf students. A notetaker reported, "We struggled at first . . . , 'cause the notetaking training was for deaf people; we struggled to find the right balance as far as what (the student with VI) wanted me to provide." Hence, it did not offer detailed insights on how best to train notetakers for students with VI.

Insufficient planning in 3 areas created barriers to education for the students with VI while working at the HC. Paperwork involved with patient transfer proved difficult and frustrating. Since the students with VI were not able to maintain the order of paperwork in the file, they anticipated adequate support to be provided. In some cases, fellow students had to help them out due to lack of other trained support. Visual exams were challenging. For example, in testing cranial nerve III or using an ophthalmoscope, the students with VI depended on their sighted assistants to describe the findings of the test for their interpretation. The sighted assistants were typically students without the necessary training for such a task.

Finally, HC experience varied with the students' expectations for assistance and the HC faculty members' beliefs about how best to assist. As 1 faculty member noted, "You'd have to be really careful that the assistant didn't know more than (the student with VI) did, because if the assistant knew more than they (the student with VI) did, then they wouldn't get the learning experience out of it. They're the ones that need to be in charge." A student who had a "go-getter" attitude was able to get support from various resources, such as audio books or their peers, to complete work on time, while a more passive student, who preferred more support from the DSO or hoped that an assistant would do more of the work for them, progressed at a slower pace.

Theme 2: Technology and Tools

Facilitators

The availability of technological resources and tools emerged as facilitators with the analysis of the data. For example, several science textbooks are available in audio formats. The DSO staff provided a large-print (enlarged-font) set of instructional materials to the students with VI. Screen readers were also used to facilitate large fonts. Furthermore, it provided a measure of welcome inclusivity that an additional white cane was available in the DSO in case students lost theirs. These various resources facilitated a welcoming learning environment for students with VI.

Braille labels, 3D printouts, and plastic models served as kinesthetic learning tools for students with VI. The faculty used craft supplies such as heat-sensitive paper or glue to make diagrams or charts for students with VI. A student with VI reported, "Dr. H brought in models for example, the blood supply of the brain. And that was extremely helpful to have tactile models . . . when we had biomechanics Dr. H would just take my hands and show me the motions of the different bones and . . . in the cadaver labs . . . they would physically allow me to touch the specimens. So, that was very helpful."

Barriers

Based on interview transcripts, technology barriers to learning for students with VI were identified. There is a lack of audio books for chiropractic techniques and philosophy. Screen readers are useful to read the documents in Microsoft Word format but not for PDFs or slide decks. Finally, the learning management system (Canvas) was not compatible with certain electronic devices used by the students with VI.

The college community lacked general awareness about Braille labels. For example, students inadvertently moved Braille-labeled gym equipment, which posed challenges for students with VI. A student with VI stated, "So I know that there's a problem with moving equipment and unplugging this machine and plugging that one in, just having it be pretty chaotic. I know Ms. L or N has gone and put Braille labels on the cardio equipment. And then the next day or whatever, that won't be plugged in. So that's been frustrating."

Theme 3: Personnel

Analysis of the audio transcripts revealed that the attitudes of the individuals toward their training, as well as the training itself, played a major role in facilitating or hindering learning.

Facilitators

Consistent with a service-oriented profession, faculty were generally inclined to be helpful to the students with VI. When properly informed, faculty adapted their teaching methods to become more descriptive and clear or used tactile modalities for training students. For example, students with VI were encouraged to touch lab specimens where feasible. In order to teach chiropractic adjustments, teachers demonstrated procedures on the students with VI so that they could feel the setup

"firsthand." Next, the instructor would hold the hands of students with VI in the proper position and guide them to adjust. Faculty also directly administered exams to the students with VI, in many cases reading the questions or describing structures. Efforts were made to match the students with VI and their HC mentors according to personality.

Participants reported that the most successful students with VI displayed a positive frame of mind and developed strong relationships with classmates. For example, classmates helped students with VI do the required HC paperwork when a chiropractic assistant was unavailable. The students with VI also benefited from informal group studies or peer tutor sessions available to them.

Barriers

As reported by participants, the learning environment became unsupportive to the students with VI when trained personnel were lacking and when student study groups contained less serious students. Finding staff such as aides, chiropractic assistants, and notetakers proved to be a challenge. Few individuals responded to the ads posted for aides or chiropractic assistant roles. Furthermore, a short window of time was available to train chiropractic assistants to efficiently help the student with VI. Consequently, the DSO was left to fill the gaps. A DSO staff member mentioned, "We just had so much difficulty getting aides throughout their didactic portion of the program. So, [DSO staff member] and I sat through a lot of classes, a lot of labs, and we learned a lot."

Studying for an exam with student groups including "sociable slackers" (unfocused or unmotivated students) was frustrating to students with VI, and when a professor was not available to administer tests requiring some technical guidance, such as descriptions of images, it proved stressful. When entering the HC, the lack of trained assistants became a barrier to filling out the proper paperwork. A student with VI noted that "we have to go to the CMRs [clinical management reviews] . . . that's when the care plans are approved by the doctors—and I'll go in and my file's not in the proper order, which it should be. You know, I would think that would be something a scribe could do, is to put the paperwork in the proper order. It's not something I can do. I mean, I can't tell you when it is in order."

DISCUSSION

This novel exploratory study provides further insight into the academic experiences of students with VI in a health care–related field, specifically the doctor of chiropractic program. No previous study related to the chiropractic profession has documented the academic experiences of chiropractic students with VI. This study demonstrates how these students can become successful in this endeavor and provides evidence for enrolling students with VI in a doctor of chiropractic program.

The findings of this study identified facilitators and barriers to learning for students with VI. Detailed and descriptive verbal instruction, as well as tactile methods, such as 3D models, facilitated learning. These methods of instruction are used by other institutes of higher education.[19,31] From anecdotal evidence and personal communications with faculty, it was noted that chiropractic colleges usually teach palpation and certain technique skills by temporarily blinding the sighted students; for example, "close your eyes and feel the area on the neck." This method is well suited for training students with VI. In addition, technique faculty soon learned that demonstrating procedures on the student with VI was particularly effective.

The attitudes of students, both sighted and visually impaired, as well as faculty, shaped their interactions to either facilitate or impede learning. It is critical to consider that students with VI are students first and individuals with disabilities second. Similar to their sighted peers, the students with VI have diverse beliefs and expectations, work ethics, and personality traits. Clearly, 1 solution does not fit all. Educators need to be aware of the value to society that can be generated by assisting in the training of students with VI in health-related occupations such as chiropractic. That acceptance, along with a willingness to provide diverse learning solutions, can create a rewarding experience for all.

Much scientific evidence cited previously exists to suggest that a person with VI may be particularly suited to providing health care services by tactile means. This research project, combined with that evidence, creates a foundation for ongoing discussions regarding the value of the visually impaired person within the chiropractic profession. It suggests the need for future studies that might support or deny efforts at wider inclusion of persons with VI in a chiropractic program. Based on similar educational research, further consideration to include students with VI in medical and physical therapy schools has begun.[7,17,19]

Finally, one of the findings of this study was that the resources, such as personnel and funds to train students with VI, were quite limited. Making reasonable accommodations for the students with VI becomes more and more reasonable with increased resources. Therefore, this study highlights the need for more funding to support people with disabilities, particularly VI, in tactile methods of health care, such as those taught in a doctor of chiropractic program. Specific to chiropractic education is the acute need for additional funding to create audio textbooks in technique and philosophy. The research conducted in physiotherapy programs has reached similar conclusions.[19]

Limitations

Ours was a convenience sample of current faculty, staff, and students with VI at our institution. While we were able to interview all of the students with VI and disability services staff, the small number of study participants placed limits on our ability to achieve thematic saturation. We were also unable to conduct participant checking. However, we explored consistencies and differences by triangulation involving interviewing people in multiple roles, probing and asking questions in several different

ways throughout each interview, and making iterative changes throughout the progress of the study.[29,30]

Further studies with a larger sample size should be conducted for generalizability of the study outcomes. Since the number of students with VI in chiropractic programs is still very small, a next step would likely be a collaborative project between multiple institutions. Also, our study did not interview other campus personnel, such as librarians who assisted students with VI to conduct research, student tutors who may have occasionally coached the students with VI, or part-time faculty who taught students with VI but did not volunteer for the study. Although it does not create any critical knowledge gaps in the current study outcomes, future studies should include all individuals contributing toward the education and successful experiences of students with VI.

CONCLUSION

It was determined that meticulous planning of limited resources and proactive communication are key to enriching academic experiences of students with VI. Having students with VI in a doctor of chiropractic program can be a rewarding experience for everyone despite some obvious challenges along the way. The students with VI learned chiropractic, while their presence made faculty and staff better communicators and better educators. Although the material resources available were lacking from the ideal, the collaborative and accepting spirit on campus helped make the learning experience of the students with VI successful. Finally, chiropractic programs likely will need to participate in developing teaching resources, such as technique textbooks for students with VI. Future studies need to focus on developing policy guidelines to promote inclusion of students with VI in chiropractic programs.

ACKNOWLEDGMENTS

We acknowledge Ms Mary Lou Breslin for consult on the interview guides, Dr Bonnie Glaser for her consult on the interview guides and assistance in data collection, Dr Monica Smith and Dr Donna Odierna for consults on research and interview guides, Ms Lori Pino for facilitating the recruitment, and Annette Osenga for bibliographical assistance.

FUNDING AND CONFLICT OF INTEREST

The study was funded internally. The authors have no conflicts of interest to declare relevant to this work.

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Concept development: SLR. Design: SLR, AJ. Supervision: SLR. Data collection/processing: SLR, AJ. Analysis/interpretation: SLR, AJ. Literature search: SLR, AJ. Writing: SLR, AJ. Critical review: SLR, AJ.

REFERENCES

1. Suttie A, Tabata M, Makarem M, Viera JM, Brinklow L. Resolutions Presented at the 8th General Assembly of the World Blind Union; November 12–16, 2012; Bangkok, Thailand. Toronto: World Blind Union; 2012. http://www.worldblindunion.org/English/general-assembly/Pages/GA-Resolutions.aspx.
2. Köberlein J, Beifus K, Schaffert C, Finger RP. The economic burden of visual impairment and blindness: a systematic review. *BMJ Open*. 2013;3(11).
3. National Federation of the Blind. Statistical facts about blindness in the United States 2017. Baltimore, MD: National Federation of the Blind; 2017. Available from: https://nfb.org/blindness-statistics. Updated January 2019.
4. Peacock G, Iezzoni LI, Harkin TR. Health care for Americans with disabilities—25 years after the ADA. *N Engl J Med*. 2015;373(10):892–893.
5. Meeks LM, Herzer KR. Prevalence of self-disclosed disability among medical students in us allopathic medical schools. *JAMA*. 2016;316(21):2271–2272.
6. Richardson JTE, Roy AWN, Richardson JTE, Roy AWN. The representation and attainment of students with a visual impairment in higher education. *Br J Vis. Impairment*. 2002;20(1):37–48.
7. Hartman DW, Hartman CW. Reflections on the outcome of admitting a blind student into medical school. *Am J Phys Med Rehabil*. 2008;87(9):776–778.
8. History of Dr. Jacob Bolotin. Atlanta, GA: National Federation of the Blind; 2007.
9. Wan CY, Wood AG, Reutens DC, Wilson SJ. Congenital blindness leads to enhanced vibrotactile perception. *Neuropsychologia*. 2010;48(2):631–635.
10. Alary F, Duquette M, Goldstein R, et al. Tactile acuity in the blind: a closer look reveals superiority over the sighted in some but not all cutaneous tasks. *Neuropsychologia*. 2009;47(10):2037–2043.
11. Collignon O, Charbonneau G, Lassonde M, Lepore F. Early visual deprivation alters multisensory processing

in peripersonal space. *Neuropsychologia*. 2009;47(14): 3236–3243.
12. Wong M, Gnanakumaran V, Goldreich D. Tactile spatial acuity enhancement in blindness: evidence for experience-dependent mechanisms. *J Neurosci*. 2011; 31(19):7028–7037.
13. Sathian K, Stilla R. Cross-modal plasticity of tactile perception in blindness. *Restor Neurol Neurosci*. 2010; 28(2):271–281.
14. Kupers R, Ptito M. Compensatory plasticity and cross-modal reorganization following early visual deprivation. *Neurosci Biobehav Rev*. 2014;41:36–52.
15. Striem-Amit E. *Neuroplasticity in the Blind and Sensory Substitution for Vision* [dissertation]. Jerusalem: Hebrew University of Jerusalem; 2014.
16. Heidary F, Gharebaghi R, Heidary R. Palpation by blind examiners: a novel approach for glaucoma screening. *Clin Ophthalmol*. 2010;4:671–672.
17. Johnston KN, Mackintosh S, Alcock M, Conlon-Leard A, Manson S. Reconsidering inherent requirements: a contribution to the debate from the clinical placement experience of a physiotherapy student with vision impairment. *BMC Med Educ*. 2016;16:74.
18. Atkinson K, Hutchinson JO. Transition from higher education to National Health Service for visually impaired physiotherapists: an interpretative phenomenological exploration. *Br J Vis. Impairment*. 2013; 31(1):32–46.
19. Helen F, Mike M, Graeme D. Investigating the learning experiences of student physiotherapists with visual impairments: an exploratory study. *Br J Vis. Impairment*. 2014;32(3):223–235.
20. French S, Swain J. *Understanding Disability: A Guide for Health Professionals*. Edinburgh: Elsevier/Churchill Livingston; 2008.
21. Da Silva CP, Bhatt A, Avant EB, Morar RT, Ebrahim S, Patel R. Experiences of students, teachers, and physical therapists from Blind People's Association in Ahmedabad, India: a qualitative study. *J Phys Ther Educ*. 2017;31(3):45–53.
22. Wittich W, Jarry J, Barstow E, Thomas A. Vision and hearing impairment and occupational therapy education: needs and current practice. *Br J Occup Ther*. 2017; 80(6):384–391.
23. Rehm WS. "The man who made Peekskill famous": Dr. C.R. Johnston—first blind chiropractor. *Chiropr Hist*. 1998;18(2):81–92.
24. Odierna DH, Bero LA. Retaining participants in outpatient and community-based health studies: researchers and participants in their own words. *Sage Open*. 2014;4(4):1–11.
25. Odierna DH, Katen MT, Feuz MA, et al. Symptom assessment solutions for in-home supportive services and diverse older adults: a roadmap for change. *J Palliat Med*. 2018;21(10):1486–1493.
26. Creswell JW. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. 3rd ed. Thousand Oaks, CA: Sage; 2012.
27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101.
28. Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: implications for conducting a qualitative descriptive study. *Nurs Health Sci*. 2013;15(3):398–405.
29. Creswell JW, Miller DL. Determining validity in qualitative inquiry. *Theory Into Practice*. 2000;39(3): 124–130.
30. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349–357.
31. Ishmael D. The use of verbal guidance and manual guidance techniques in the teaching and learning of learners with visual impairment. *IOSR J Humanit Soc Sci*. 2015;20(4):124–132.