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Original Research

The Effect of a 2-Week Pre-clerkship Residency Exploration Program on Specialty Interest and Understanding of Physical Medicine and Rehabilitation

Emily Sheppard, MScPT [a], Michael Smyth, MSc [a], Todd Dow, BSc [a], Thomas Sebastian Haupt, BA [a], Sonja McVeigh, MD, FRCPC, Dip. Sport Med [a,b]

[a] *Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia, Canada*
[b] *Department of Physical Medicine & Rehabilitation, Dalhousie University, Halifax, Nova Scotia, Canada*

KEYWORDS
Career choice;
Education;
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Abstract *Objective:* To assess the effect the Pre-clerkship Residency Exploration Program (PREP) had on student career interest and improving understanding of physical medicine and rehabilitation (PMR).
Design: During a 2-week program, students were exposed to a PMR elective, workshop, career presentation, and panel discussion with PMR residents. Interest and understanding were assessed using pre- and postprogram questionnaires.
Setting: PREP was held at a Canadian medical school during the summer between the second and third years of undergraduate medical training.
Participants: Second-year medical student participants (N=40) (26 women and 14 men, aged 20 to >30 y) were randomly selected from 74 applicants at a Canadian medical school.
Interventions: Of the 40 program participants, 20 participated in a PMR elective and specialty-specific workshop. The full cohort of 40 participants participated in the PMR career presentation and PMR resident panel discussion.
Main Outcome Measure: Primary outcome measure was an increase in understanding of the PMR specialty.
Results: Understanding of the roles and responsibilities of physiatrists increased significantly, with larger trends in those with greater exposure time. After PREP, comfort level in common PMR procedures also significantly increased. Higher exposure time was correlated with an increased top 3 career selection. Student interest in PMR did not significantly change after the program.

List of abbreviations: MSK, musculoskeletal; PMR, physical medicine and rehabilitation; PREP, Pre-clerkship Residency Exploration Program.
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Conclusion: Although no statistically significant effects were found from the 2-week PREP in this population in terms of career choice, benefits were found in the participants comfort with PMR procedures and understanding the roles and responsibilities of physiatrists. A brief exposure as part of a 2-week summer elective is beneficial for career decision planning and may be feasible to implement in medical curricula.

The choice of residency is one of the most important aspects of medical student education, because it directs each student's future career in medicine. With >40 direct entry specialties, and >20 more in the medicine subspecialty match to choose from, adequate medical student exposure to each specialty is not feasible in the curriculum at most medical schools.[1] Physical medicine and rehabilitation (PMR) is one of the medical specialties continuing to compete for more exposure in the standard undergraduate medical school curriculum, because generally the awareness of PMR as a specialty is limited by medical students.[2-5]

At present, most of the Canadian and American medical schools do not include compulsory PMR blocks during clerkship rotations. Further, many Canadian and American medical schools do not have an academic PMR department.[2] In those that do, common practice is to offer a PMR rotation as an optional *selective* that can be chosen by a medical student during core internal medicine rotations. Therefore, for a student to have any formal exposure to PMR prior to participating in the residency matching services, programs that match medical students to residency programs in Canada and the United States, a student must choose PMR of their own accord as part of their internal medicine clerkship rotation or during limited preclerkship elective time.

In addition, those few students who desire exposure to a PMR block in their clerkship rotation may not have the opportunity to do so. At Dalhousie University in Halifax, Nova Scotia, for example, students rank specialty rotations that are outside of their compulsory rotations (*selectives*) that they would like to gain exposure to. These selectives are then entered into a lottery system, resulting in a student not being guaranteed their first choice.

Another option for exposure to PMR during a student's undergraduate medical education is to seek out electives during preclerkship years, which is for only limited periods of time at many medical schools. A medical student can also arrange a PMR elective during their elective tour toward the end of their medical degree; however, this is unlikely to be of interest if he or she has not already had exposure to PMR during medical school. In addition, a PMR elective during that time may result in the student not obtaining PMR experience in time to support a residency application to such.

Exposure to medical specialties has been shown to be strongly correlated to career choices postmedical school. Therefore, experiencing as many areas of medicine as possible during the early years of medical school will facilitate more informed decisions regarding choice of clerkship selectives, arranging elective tours, and ultimately as a student chooses a career path.[6] A medical student who makes an informed choice regarding their medical residency may lead to improved contentment regarding their career choice and an increased likelihood of remaining in that career.

In addition to career choice, exposure to different areas of medicine in medical school is also associated with a greater understanding of the roles and responsibilities of the various specialties. This, in turn, could generate more informed multidisciplinary interactions and more appropriate referrals in the future. As such, exposure to PMR can be beneficial for all medical students, not only those with a specific interest in rehabilitation medicine.[7]

The Pre-clerkship Residency Exploration Program (PREP) was first introduced in 2018 with the intention of providing medical students with brief exposures to numerous medical subspecialties not otherwise provided in the core clerkship rotations. During this 2-week preclerkship elective program, selected students were exposed to a half-day PMR elective, a half-day PMR workshop, a career presentation with a staff physiatrist (PMR specialist physician), and a panel discussion with residents throughout the course of the program. These components of the program provided participants with general information on PMR, tours of the local PMR facilities, PMR-specific skills training, patient interactions, and the opportunity for participants to ask questions. The goal of the PREP was to increase medical student exposure to PMR to provide an improved understanding of the specialty and to ultimately assist students in making more informed career choices.

The objective of the current study is to assess PREP and the program's ability to meet these goals.

Methods

Preprogram

All second-year medical students at Dalhousie University were provided with a program manual outlining general information regarding PREP. This included a sample schedule, skills workshop themes, lunchtime discussion topics, and general information on the 14 specialties involved in the program (anesthesia, cardiology, endocrinology, general internal medicine, hematology, neonatology, nephrology, neurology, ophthalmology, pathology, pediatric cardiology, pediatric hematology, PMR, radiation oncology). PMR-specific information included general

information about the specialty, common practices and skills performed, residency program information (including Canadian Residency Matching Service data), and insight to a career in PMR.

Selection process

In total, PREP consisted of 40 students: 37 participants and 3 student program directors. All 110 second-year medical students were eligible to apply, with the sole exclusion criteria being students who could not attend all sessions during the 2-week period. In total, 74 students applied for 37 available spots. To submit an application, students completed an online survey, which numerically coded their identity to eliminate potential selection bias. The participant list was randomized, and the first 37 selected numbers were offered a spot in the PREP program and waitlist numbers were provided for the remaining applicants. Participation was voluntary and written informed consent was received after institutional ethics approval. Students were required to pay a $150 fee to help offset the cost of lunchtime meals and workshop supplies. An additional $100 fee was required by the university to cover student insurance because they participated in hospital electives.

The participants were randomly divided into 2 subgroups, A and B. Because of departmental staff limitations and time, electives and workshops in each of the 14 specialties could not be offered to all 40 students. Each student completed 10 half-day elective blocks and 4 half-day workshops, which were assigned randomly.

PMR in PREP

During the 2-week program, PMR exposure was provided through various methods: (1) *Electives:* in total, 16 students participated in a half-day elective shadowing a staff physiatrist at the rehabilitation center. Students attended clinic hours observing patient interactions and PMR-specific skills. (2) *Workshop*: 23 students participated in a half-day (4h) workshop at the rehabilitation center, led by physiatry staff and residents. Students were divided into 3 groups and rotated through 3 stations including a general tour of the facility, patient interactions observing a history and physical examination, observation of botulinum toxin injections using electromyography guidance, and observation of intrathecal baclofen pump refill and programming for spasticity. (3) *Lunchtime talk:* all 37 students attended a 1-hour lunchtime discussion held by a staff physiatrist, which covered general physiatry information including residency training, subspecialties, and specific skill sets. Time was also allotted for open group discussion and questions. (4) *Skills:* all 37 students were introduced to joint injection techniques of the shoulder and knee. A physiatry resident demonstrated skills during one of the general skills workshops. Students were then observed while they practiced giving injections on mannequins. A questionnaire of student comfort level completing this skill in upcoming clerkship placements was completed immediately after the session.

Data collection

Application questionnaire

Opinio software[a] was used to create a web-based questionnaire. Demographics including age, sex, highest level of education, and career interests were collected. A 5-point Likert scale was used to assess overall interest in PMR.

Program entrance and exit questionnaires

Surveys were distributed online through Opinio for participants to complete on the first and last days of the program. A 5-point Likert scale was used to assess interest in PMR (1—none, 5—highly interested), understanding of the daily roles and responsibilities of a physiatrist (1—strongly disagree, 5—strongly agree), and students' current top 3 career choices.

Skills session evaluations

Evaluation forms were distributed as hard copies for students to complete at the joint injection workshop station. Students were asked to rate their level of comfort in performing the skills in upcoming clerkship rotations on a 5-point Likert scale (1—very low, 5—very high).

Statistical analysis

Statistics were performed using the Wilcoxon signed-rank test to compare nonparametrical paired data for differences in program entrance and exit questionnaires. A P value of $<.05$ was used to indicate significance. Statistical analyses were performed using IBM SPSS statistical software (version 24.0).[b]

Results

In total, 40 students participated in the 2-week elective program with a 93% survey response rate (n = 37). Student demographics are listed in table 1. Sixty-five percent of participants were women, with most between the ages of 20 and 26.

At the start of the program, 70% of PREP participants had a very high interest in nonsurgical specialties. Overall interest in PMR did not significantly change between the 3 time point collections, with a slight downward trend in those highly interested (fig 1). In contrast, understanding of the roles and responsibilities of physiatrists increased significantly ($P<.05$) among participants, with positive trends in those with greater exposure time (workshop and/or elective time) (fig 2). Trends were also seen with higher exposure time being correlated with an increased top 3 career selection by participants (fig 3); however, no significant differences were found. Last, a significant increase ($P<.05$) in comfort level performing knee and shoulder joint injections during upcoming clerkship rotations was found (fig 4).

Discussion

PMR is one of many specialties medical students have the choice of pursuing as a residency; however, there is limited

Table 1 Student demographics in the Pre-clerkship Residency Exploration Program

Variable	N (%)
Sex	
Men	13 (35)
Women	24 (65)
Age	
20-24	9 (24)
25-26	16 (43)
27-28	7 (19)
29-30	4 (11)
>30	1 (3)
Education	
Bachelors	23 (62)
Masters	12 (32)
PhD	1 (3)
Other	1 (3)
Interest in surgical specialties	
Very low	10 (28)
Low	13 (36)
Neutral	3 (8)
High	4 (11)
Very high	6 (17)
Interest in nonsurgical specialties	
Very low	1 (3)
Low	0
Neutral	10 (27)
High	0
Very high	26 (70)

exposure to PMR in many medical school curriculums. Increased exposure could lead to improved informed career decisions by medical students, more appropriate referrals by other medical practitioners, improved knowledge of musculoskeletal and neurologic conditions, improved neuromusculoskeletal clinical skills, and improved understanding of the common issues of patients with disabilities. In addition, increased medical student interest in PMR may lead to more medical students choosing PMR as a career, which is essentially given the anticipated significant future need for rehabilitation services due to the boom in the aging population.[8] Presently, in Canada, there are an average of 30 residency spots per year for PMR across 13 schools, with an applicant to match rate of close to 1:1. This suggests the number of applicants and spots for training is closely matched, providing a good outlook for those students interested.[9]

Prior to PREP, only 17% of participants stated they understood the daily roles and responsibilities of a physiatrist. This is similar to the findings of several studies in the literature, which suggest medical students have limited knowledge of PMR patient populations, diagnostic or clinical procedures, and appropriate referrals.[10] Abramson and Stein[11] found the senior medical student referral rate for a variety of musculoskeletal (MSK) disorders such as low back pain, carpal tunnel syndrome, and sports injuries was strongly influenced by their knowledge of PMR and that increasing awareness may be the most effective means to promote knowledgeable referrals in the future.

Bloch et al.[7] further suggest all medical students could benefit from exposure to the concepts of impairment and disability and would gain a better understanding of the importance of functional goals in patient management. Furthermore, they concluded students would benefit from increased exposure and practice of neuromusculoskeletal examination skills regardless of career path.[12]

Increased exposure to specialties like PMR can provide additional opportunities to practice neuromusculoskeletal history and physical examination skills. In Canada, MSK complaints are the second most common reason patients visit a physician.[13] On average, this accounts for 20% of total health costs in Western countries. MSK-related diagnoses are the primary cause of long-term pain, physical disability, and health-related problems leading to inability to work.[14] Despite these factors, MSK teaching in medical school curricula continues to be minimal. Freedman and

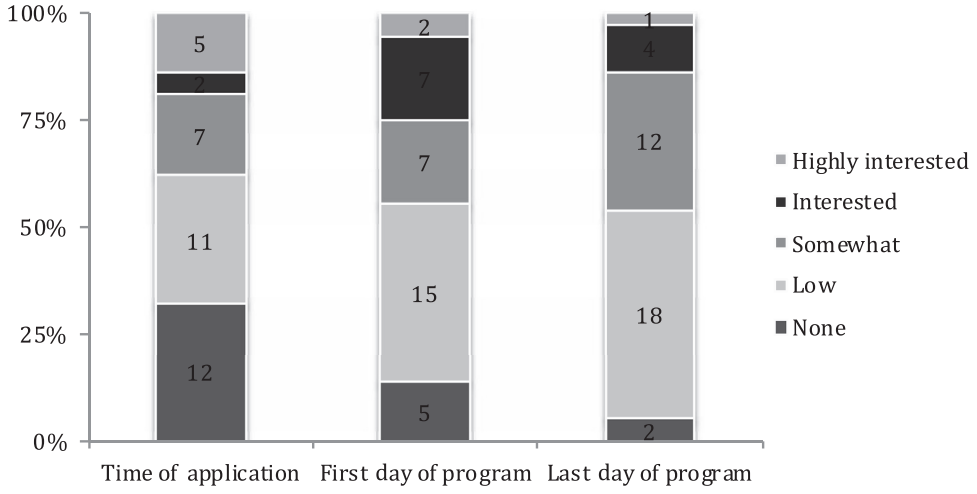

Fig 1 Student interest in PMR during PREP. Students (n = 37) completed 3 online surveys using 5-point Likert scales (1—none, 5—highly interested) to assess overall interest in PMR at 3 time points. No significant differences using Wilcoxon signed-rank tests were found with $P<.05$.

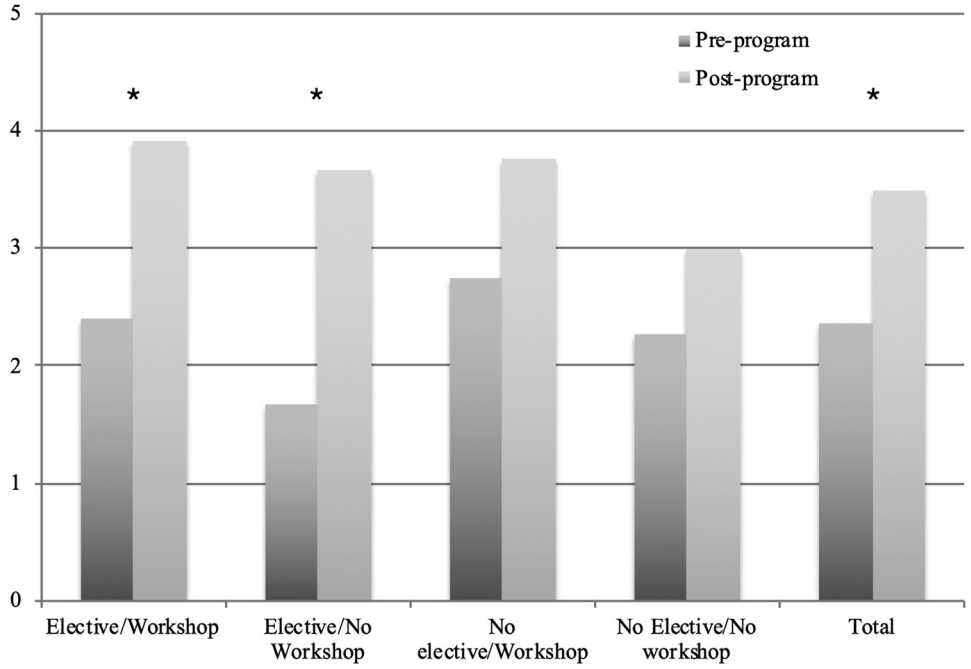

Fig 2 Student understanding of the daily roles and responsibilities of PMR physicians (mean ± 1 SD). Students (n = 37) completed an online survey on the first and last days using a 5-point Likert scale (1—strongly disagree, 5—strongly agree). Four groups based on exposure time were recorded: elective and workshop (n = 11), elective and no workshop (n = 3), no elective and workshop (n = 8), and no elective and no workshop (n = 15). Wilcoxon signed-rank tests were performed, with a *P* value of <.05 determined as significant and denoted by an asterisk.

Bernstein[15,16] who developed an examination to evaluate students' knowledge of MSK medicine found that 82% of all medical trainees entering postgraduate residency programs failed to demonstrate basic MSK proficiency using a standardized questionnaire. This was further reinforced by additional studies, which reported that less than half of fourth-year medical students demonstrated competency in MSK-related skills and diagnoses, which continues to be a knowledge gap.[17,18] Pinney et al[19] reported on average, 2.2% of curriculum time in Canadian medical schools is spent on MSK education. Despite this, there are widely accepted core curriculum recommendations agreed on by a group of physicians and surgeons in Canada regarding what undergraduate medical school MSK education should encompass, including joint and soft tissue injuries and conditions, tumor and bone disorders, red flags. and

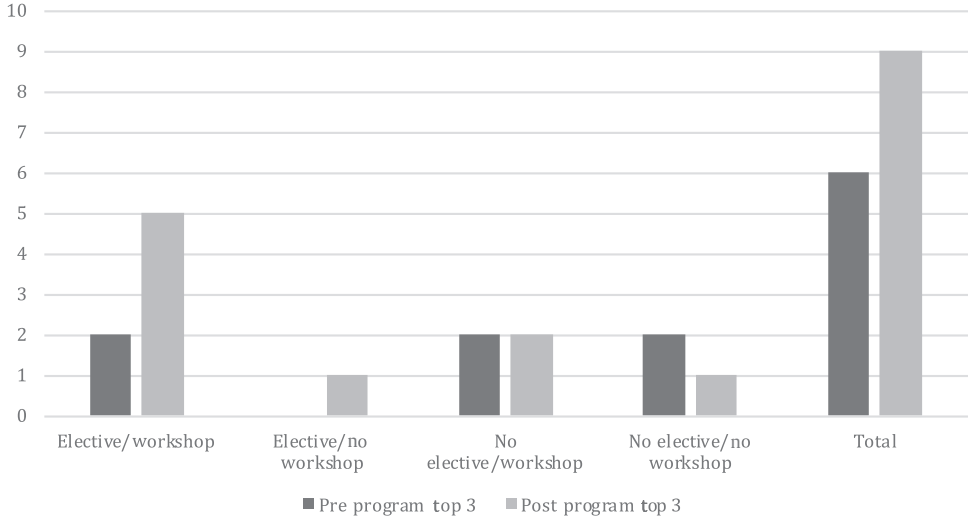

Fig 3 Top 3 choice for a chosen medical career specialty. Students (n = 37) completed an online survey on the first and last days ranking their top 3 choices for a career specialty. Four groups based on exposure time were recorded: elective and workshop (n = 11), elective and no workshop (n = 3), no elective and workshop (n = 8), and no elective and no workshop (n = 15). Wilcoxon signed-rank tests were performed, with a *P* value of <.05 determined as significant and denoted by an asterisk.

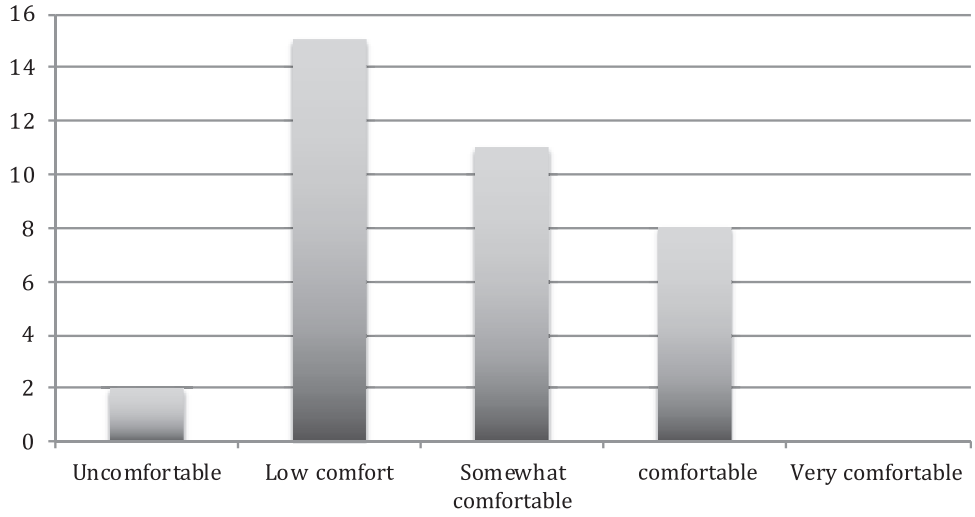

Fig 4 Student comfort with giving knee and shoulder joint injections during upcoming clerkship rotations. Students (n = 37) completed incoming web surveys on the first day of PREP and paper evaluation forms directly after completing the joint injection workshop station. Comfort in performing the skills in upcoming clerkship rotations was recorded on a 5-point Likert scale (1—uncomfortable, 5—very comfortable).

emergencies.[20] Since this time, numerous attempts have been made to increase MSK exposure in medical schools with various improvements in overall time and clinical exposure.[18] Therefore, although part of a much larger concern, increased exposure to specialists in musculoskeletal disciplines, such as PMR, could also improve overall MSK education and skills for medical students.

As such, there have been numerous attempts to implement electives in PMR into medical curricula across medical schools in the United States, which have all been successful at increasing student understanding of the field.[10,21-24] Unlike the studies that have examined these programs in the United States, many of which varied between 1 and 2 weeks in length, the present study determined that even after limited exposure through a program like PREP, medical students had a significant increase in their understanding of PMR. This suggests curriculum demands may not need to be large to have an effect and given the current demand from multiple specialties for increased time in the formal curriculum, a program such as PREP may be more feasible to implement without radically changing current medical school curricula.

The present study found that student interest in pursuing a career in PMR changed twofold during the course of PREP. We found an increase in the number of students who placed PMR in their top 3 career choices post-PREP compared to pre-PREP, and despite small sample sizes, this increase appeared to correlate with students who received more PMR exposure. This was contrary to the overall interest in the specialty, which saw a downward trend postprogram. One can hypothesize that students were able to refine their interests through involvement in PREP, and although this may not lead them all to a career in PMR, the exposure is still invaluable. This information also supports the idea of focusing future studies on programs similar to PREP to further evaluate attrition rates in PMR, as well as other specialties, to determine if this trend is repeated.

This study also determined that exposure to joint injections completed by physiatry residents proved beneficial in preparation for clerkship. Over half the participants reported to be somewhat comfortable or comfortable in performing these techniques moving forward, which was a significant difference from the entrance survey results. This suggests PREP may provide additional benefits in preparing students for their clinical rotations by providing them with a more informal environment to try new clinical techniques with immediate feedback.

Study limitations

There are important limitations to this study. Because of departmental constraints, PMR exposure could not be provided to all program participants, leading to a small sample size and variable numbers in each group. Participants may also be subject to selection biases, because those who completed a 2-week summer medical elective may be previously interested in the specialties included in the program. For this reason, the data may not extrapolate to larger medical student populations such as those where a similar program has been made mandatory.

In contrast, a major strength of the program was the large voluntary response rate to participate in the program. In total, 74 of the 110 students in second-year medical students applied for participation in the program. By randomly selecting applicants, selection bias toward students with a preformed interest toward PMR was avoided to the highest standard possible.

Conclusions

Through assessment of the program, it was demonstrated that PREP effectively refined student interest in PMR, while also significantly improving participant understanding of the specialty. Therefore, brief PMR exposure as part of a

larger 2-week summer elective proved to be a valuable experience for second-year medical students. As students prepare for their early clerkship years, knowledge of the large variety of specialties is beneficial not only for career decision planning, but also to become informed members of multidisciplinary teams. Because exposure to the sheer number of specialties in the medical curriculum is not feasible, installment of elective programs such as PREP may provide an additional opportunity for medical students to gain exposure to specialties, they may not otherwise have exposure to during medical school.

Suppliers

a. Opinio software; ObjectPlanet, Inc.
b. SPSS statistical software; IBM.

Corresponding author

Emily Sheppard, MScPT, Faculty of Medicine, Dalhousie University, Tupper Medical Building, 5850 College St, Halifax, NS B3H 4H7, Canada. *E-mail address:* em867056@dal.ca.

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