

ORIGINAL ARTICLE

A Massive Open Online Course for teaching physiotherapy students and physiotherapists about spinal cord injuries

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Study design: A descriptive audit.

Objectives: To audit the participation and satisfaction in a Massive Open Online Course (MOOC) for teaching physiotherapy students and physiotherapists about spinal cord injuries.

Setting: Global and online.

Methods: A 5-week MOOC about the physiotherapy management of spinal cord injuries was hosted by Physiopedia and run in partnership with the International Spinal Cord Society. The MOOC was based on the physiotherapy-specific module of www.elearnSCI.org, and also involved extra readings, activities and online discussion through a closed Facebook group. Participation and satisfaction was quantified through a pre- and post-MOOC knowledge assessment and an online course evaluation. Participation was also gauged through Facebook activity and internet-based usage statistics.

Results: Three thousand five hundred and twenty-three people from 108 countries registered for the MOOC and 2527 joined the Facebook group. One thousand one hundred and twenty-one completed the pre- and post-MOOC knowledge assessments, with more completing one or the other. The median (interquartile range) results for those who completed the pre and post-MOOC knowledge assessments were 70% (60–80%) and 90% (80–95%), respectively. One thousand and twenty-nine completed the online course evaluation, with more than 80% agreeing or strongly agreeing with 12 of the 13 positive statements posed to them about the course.

Conclusion: Most participants who completed the MOOC performed well on the post-MOOC knowledge assessment and enjoyed the learning experience. However, these results may be biased if those who did not complete the MOOC were dissatisfied and/or did not sit the post-MOOC knowledge assessment.

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INTRODUCTION

A well-educated global workforce can potentially improve the lives of people with spinal cord injury (SCI).¹ Physiotherapists are part of this workforce. It is therefore important to find effective and inexpensive ways to educate physiotherapists about SCI. This has traditionally been carried out through face-to-face undergraduate and graduate physiotherapy educational programs at colleges and universities around the world. However, this method of education is problematic because SCI is highly specialised and it is difficult for educational institutes to find appropriately qualified academics to teach this part of the physiotherapy curriculum. This is particularly a problem for small academic institutes and for countries in which physiotherapy is a young profession. Physiotherapists also receive education in SCI through courses and workshops; however, these are often run on a commercial basis and consequently can be cost prohibitive. In some countries, there are few senior SCI physiotherapists with experience in education who can run courses and workshops. This adds another challenge.

The International Spinal Cord Society has attempted to address the need for education in SCI by developing www.elearnSCI.org, a free resource that contains seven online learning modules.² One of these seven modules is specifically for physiotherapy students and physiotherapists. It contains 14 lessons covering a range of physiotherapy

core topics. Each lesson contains a short didactic overview of the topic, interactive activities and a self-assessment quiz. Dispersed throughout the physiotherapy module are over 150 videos of people with SCI, and interviews with both physiotherapists and patients from a diverse range of countries. The interactive activities are where most of the learning content is presented.

The physiotherapy module of www.elearnSCI.org aims to provide a consistent learning experience in SCI for physiotherapy students and physiotherapists. However, users need to work through the lessons on their own. This requires self-discipline and motivation. It was hypothesised that a Massive Open Online Course (MOOC) based around the physiotherapy-specific modules might help users maintain interest and motivation to complete the lessons and in this way learn about SCI. The MOOC would also provide the opportunity to include additional activities, which could extend more capable users and help reinforce some key points for others.

MOOCs have existed for approximately 10 years, although the term 'MOOC' was only coined in 2008.^{3–6} MOOCs are 'massive' because they sometimes have 1000s of students, they are 'open' because they are free, they are 'online' because the course is delivered by the web and they are 'courses' because they have a curriculum and learning objectives.⁷ MOOCs have various formats but most involve listening to lectures online, completing tasks, reading articles and completing

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self-assessments. Importantly, most have online forums that provide participants with the opportunity to engage with fellow students and teachers from around the world. These latter aspects of MOOCs are considered particularly important because they develop an online virtual classroom often fostering a sense of collectiveness that helps maintain motivation to learn.^{3,8} MOOCs are increasingly popular because they are inexpensive to run and provide students from all countries access to the same level of education.^{3,5–11} Therefore, Physiopedia in collaboration with the International Spinal Cord Society partnered to run a MOOC for physiotherapy students and physiotherapists. This paper describes the outcome of this MOOC. In particular, it focuses on user participation and satisfaction, and changes in knowledge.

METHODS

Design

This is a descriptive audit of a 5-week MOOC that was run for physiotherapy students and physiotherapists between 28 April and 30 May 2014. The MOOC was managed by Physiopedia and run in collaboration with the International Spinal Cord Society. The MOOC was accredited by the World Confederation for Physical Therapy, and those who successfully completed it were provided with a certificate of completion and 15 International Physical Therapy Continuing Education Units.

Details about the MOOC

Details about the MOOC can be found at http://www.physio-pedia.com/Physiotherapy_Management_of_Spinal_Cord_Injuries. The MOOC primarily targeted physiotherapy students and junior physiotherapists with little prior experience in SCI but with a general understanding of the principles of physiotherapy. It was advertised widely through newsletters associated with the World Confederation for Physical Therapy, the International Network of Spinal Cord Injury Physiotherapists (www.scipt.org), Physiopedia and ISCoS, and through social media associated with the International Network of Spinal Cord Injury Physiotherapists and physiopedia. The aim of the MOOC was to equip participants with sufficient knowledge to manage a person with SCI. This included assessing impairments, activity limitations and participation restrictions, setting appropriate goals of treatment, formulating an evidence-based treatment plan, implementing treatment and evaluating its success. The MOOC was free and required participants to register and then devote 3 h per week for 5 weeks (total of 15 h). There were two designated teachers of the MOOC. Both had clinical and academic experience in the physiotherapy management of SCI.

Participants were given three tasks each week, namely:

1. Complete 2 to 3 of the physiotherapy-specific lessons that are part of www.elearnSCI.org.
2. Look at additional readings, videos and resources. This included selected readings from the course text book,¹² which was made freely available for participants to read online for the duration of the course.
3. Contribute to an online discussion run through a closed Facebook group.

Participants were sent an email at the beginning of each week. This directed them to an appropriate URL to find the details of what they were expected to do for that week. The weekly emails also provided an opportunity to communicate any issues that had arisen in the previous week. In addition, one of the course coordinators was videoed each week in an informal way to introduce the content of each week. This was posted on YouTube.

The Facebook group was an important aspect of the MOOC and participants were encouraged to join and contribute to the discussions. Two to four discussion topics were posted each week to facilitate discussion (see Table 1 for examples of discussion topics). Some of the discussion topics were intentionally designed to be slightly controversial and to encourage participants to think, read more about the evidence or to seek information from other sources. Some discussion topics invited participants to reflect on what they had learnt during the week or to reflect on aspects of the learning experience they had enjoyed. Only participants of the course were invited to join the Facebook group and post messages, although this was difficult to monitor, and at least some who joined the Facebook group were not registered on the course.

Participants of the MOOC were given many opportunities at different stages to assess their knowledge and understanding through multiple self-assessments and different interactive activities, which formed part of the physiotherapy lessons accessed through www.elearnSCI.org. For example, there were 10 multiple choice questions at the end of each lesson in www.elearnSCI.org.

Assessment of participation and satisfaction

Participation and satisfaction with the MOOC were gauged through the pre- and post-MOOC knowledge assessment, an online course evaluation, Facebook activity and internet-based usage statistics.

Pre-MOOC and post-MOOC knowledge assessments. Participants' knowledge was assessed at the beginning and end of the MOOC through 20 multiple choice questions. The questions in the two knowledge assessments were slightly different and designed specifically for the MOOC. Initially, 20 pairs of questions were composed, which were similar in content and complexity. One question of each pair was randomly allocated to the pre-MOOC knowledge assessment and the other to the post-MOOC knowledge assessment.

Course evaluation by participants. This was administered online at the completion of the course. It consisted of 13 positive statements designed to determine satisfaction with the learning experience (see Figure 1 for the

Table 1 Four examples of discussion topics that were posted to the Facebook group with the number of posts to each

<i>Week 1:</i> Tell us how physiotherapists can help eradicate pressure ulcers. So think about this problem across the world. It is probably the leading cause of misery and mortality, especially in low and middle income countries. Why is it such a problem? What can we as a professional group do to help eradicate the problem? What will you do differently in clinical practice now you know a bit more about the issue? Is it our responsibility? What if patients, hospitals and countries do not have access to expensive cushions? Are there any cheap alternatives? (920 posts)
<i>Week 3:</i> What do you think about the routine administration of passive movements? What does the evidence say about passive movements? To whom and when would you routinely administer passive movements? Which joints do you think physiotherapists should focus on? What is the rationale for passive movements? Should we question the effectiveness of passive movements? If so, why? Are there any other ways to prevent joint stiffness and contracture? What do you think about the administration of stretch for the treatment and prevention of contracture? What does the evidence say about stretch? What do you think is the most effective way to prevent and treat contracture in people with SCI? (390 posts)
<i>Week 3:</i> Think about transfers for people with C6 motor complete lesions. Why is this transfer difficult for these people? Can you find some videos or photos that show different ways they transfer or tricks or aids they may use? How long do you think it takes a person with a C6 motor complete lesion to learn to transfer? Are you able to provide sufficient rehabilitation in your country to enable these patients to gain independence with these transfers? Sometimes, you and your patient might decide that learning to transfer independently is not an appropriate goal. Why? What are the implications on daily life if a person with C6 motor complete lesion cannot transfer? (502 posts)
<i>Week 5:</i> What advice would you give a wheelchair-dependent person with C6 tetraplegia who is about to go home that will help ensure that he/she does not develop shoulder problems in the future? Do you think that we should be encouraging them to rely on others for transfers to avoid shoulder problems? What are the pros and cons of this sort of sacrifice in independence for a person? What is the quality of the evidence upon which the guidelines about preservation of the shoulders are based? (341 posts)

Abbreviation: SCI, spinal cord injury.

statements). Participants were required to respond to each statement on a 5-point scale. In addition, there were two open-ended questions, which required participants to identify aspects of the MOOC that worked well and aspects of the MOOC that did not work well.

Facebook activity. The number of people who joined the Facebook group and the number of posts to each discussion topic were recorded to indicate course engagement and participation.

Online website tracking systems. Google analytics and an inbuilt tracking system were used to determine how many participants completed the multiple-choice questions at the end of each lesson in www.elearnSCI.org, how many participants opened their emails each week (these contained directions to the URL providing detailed instructions for the week) and how many participants accessed the URL with the instructions for each week.

RESULTS

The number of registrants for the course was 3523. Registrants were from 108 countries (see Table 2) and had a mix of experience (see Table 3). The most represented countries were United States of America (718), Australia (482), UK (383), India (185), Canada (172), Thailand (137) and Pakistan (118).

Knowledge assessments

The pre- and post-MOOC knowledge assessments were attempted by 2187 and 1506 participants, respectively (see Figure 2a for results). However, some participants completed just the pre- or post-MOOC knowledge assessments. One thousand one hundred and twenty-one students did both assessments (see Figure 2b for results). The median (interquartile range) result of those who did both assessments were 70% (60–80%) and 90% (80–95%), respectively.

Course evaluation by participants

The course evaluation was completed by 1029 participants. More than 80% of respondents agreed or strongly agreed with 12 of the 13 positive statements about the learning experience posed to them as part of the course evaluation (see Figure 1). The exception was one statement about the usefulness of the Facebook discussion in which 65% 'agreed' or 'strongly agreed', and 23% were 'neutral' (the remaining 8% either 'disagreed' or 'strongly disagreed'). The two open-ended questions were answered extensively in over 39 500 words. The responses were counted by general themes (see Tables 4 and 5). The two most commonly cited positive aspects of the MOOC were: (1) the opportunity to engage with other physiotherapy students and physiotherapists around the world, and (2) the number of images and interactive screens on the www.elearnSCI.org lessons. The two most commonly cited negative aspects of the MOOC were: (1) the time it

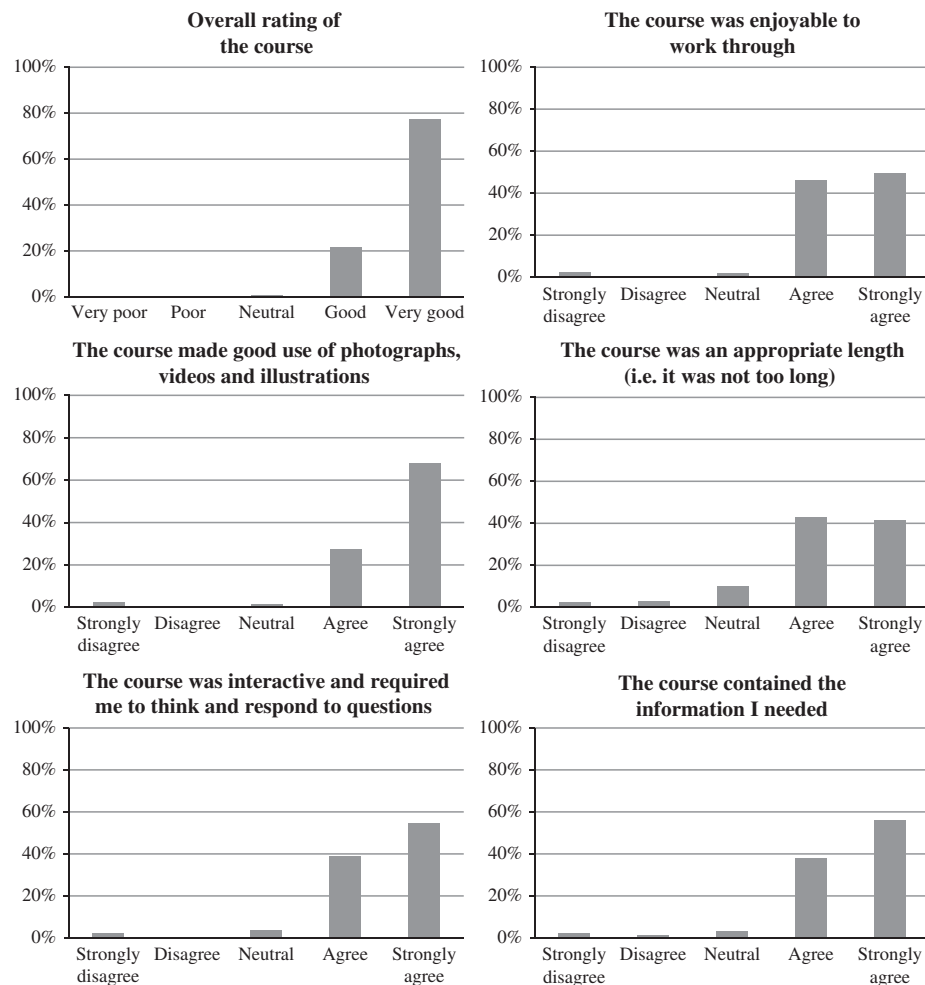


Figure 1 Responses to the 13 statements comprising the course evaluation. The responses are expressed as percentage. The total number of respondents was 1029.

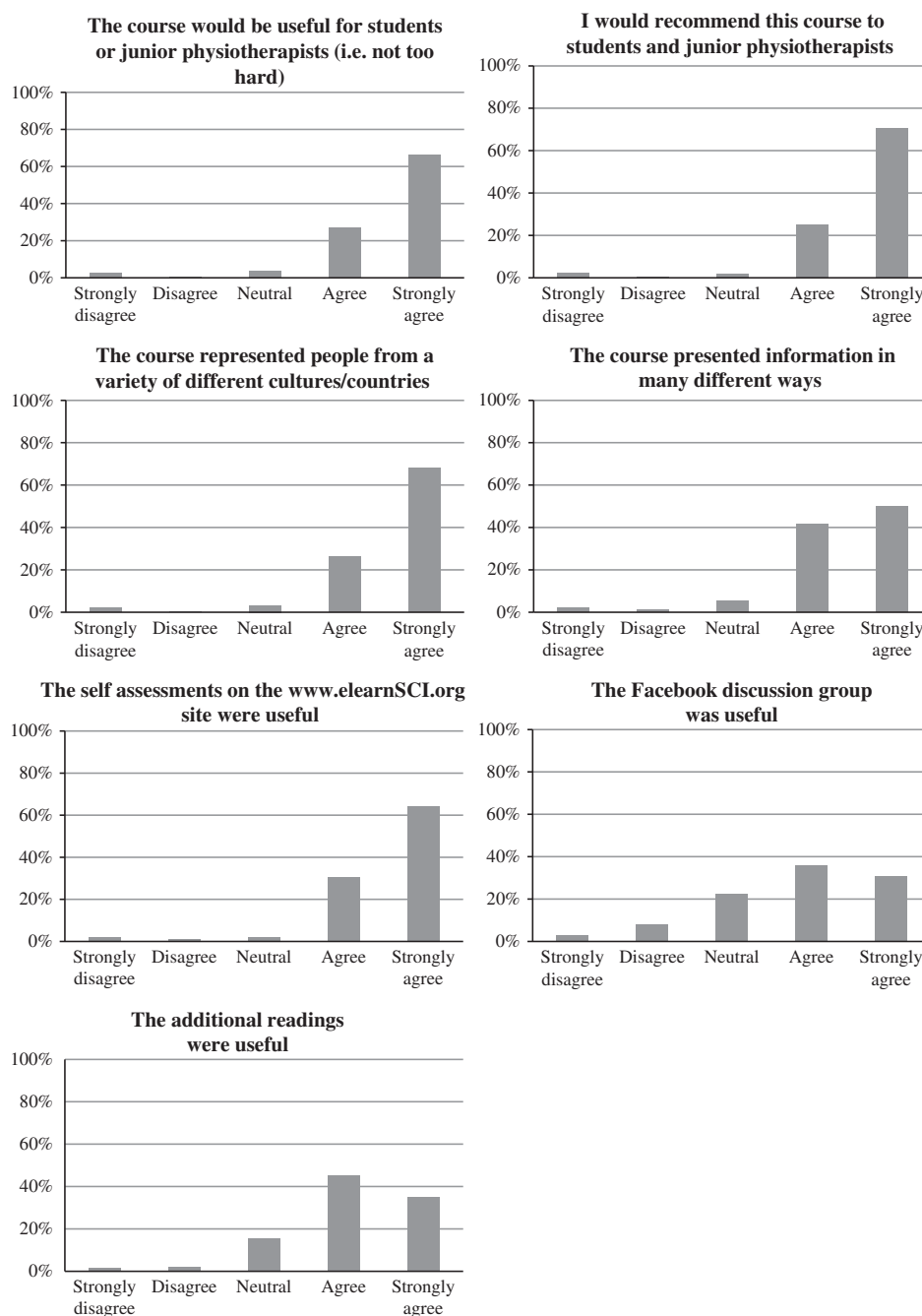


Figure 1 Continued.

took each week to complete all the tasks (it took some participants longer than the allocated 3 h), and (2) the excessive number of posts on the Facebook discussion threads.

Facebook activity

Engagement with the Facebook discussion was good with 2529 people joining the Facebook group and together contributing to over 10 000 posts over the 5-week period. Each discussion topic attracted between 393 posts (week 5—discussion topic no. 2—staying fit and healthy) to 829 posts (week 1—discussion topic no. 2—classification of SCI) with an obvious fall off in engagement over the duration of the course. One discussion topic during week 4 required students to use

www.physiotherapyexercises.com to design an appropriate exercise program for a patient and then post the URL of the exercise program to the Facebook group. This was quite a complex task but attracted 506 posts.

Online website tracking systems

The multiple-choice questions at the end of each lesson in the physiotherapy-specific module of www.elearnSCI.org were completed by between 1000 and 1500 people (the number varied for each lesson). Initially, 80% of students opened their emails which contained directions to the URL providing detailed instructions for the week. This dropped to 54% by week 5 (this does not include the 451

Table 2 The number of course participants from different countries (missing data on two participants)

Afghanistan	1	Nepal	1
Algeria	1	Netherlands	13
Argentina	14	New Caledonia	1
Australia	482	New Zealand	53
Austria	2	Nigeria	50
Bahamas	2	Norway	31
Bangladesh	41	Oman	1
Barbados	7	Pakistan	118
Belgium	6	Palestine	2
Bermuda	1	Panama	2
Bolivia	1	Peru	6
Brazil	24	Philippines	13
British Virgin Islands	1	Poland	44
Bulgaria	2	Portugal	8
Burma	3	Qatar	7
Cameroon	3	Romania	4
Canada	172	Russia	1
Chile	13	Rwanda	47
China	16	Saudi Arabia	32
Colombia	9	Senegal	1
Costa Rica	9	Serbia	3
Croatia	5	Sierra Leone	1
Cyprus	1	Singapore	7
Dominican Republic	11	Slovenia	4
Ecuador	2	South Africa	74
Egypt	19	South Korea	2
Estonia	5	Spain	49
Ethiopia	10	Sri Lanka	46
Finland	12	Sudan	1
France	31	Suriname	1
Germany	8	Swaziland	4
Ghana	5	Sweden	23
Greece	30	Switzerland	9
Guyana	4	Syria	1
Haiti	4	Taiwan	1
Hong Kong	3	Tanzania	2
Hungary	19	Thailand	137
Iceland	5	Togo	2
India	185	Trinidad	1
Indonesia	3	Uganda	1
Iran	2	United Arab Emirates	14
Iraq	1	United Kingdom	383
Ireland	27	USA	718
Israel	15	Vietnam	8
Italy	26	Yemen	1
Jamaica	91	Zambia	20
Japan	4	Zimbabwe	6
Jordan	39		
Kenya	2		
Kuwait	11		
Latvia	1		
Lebanon	3		
Macau	5		
Madagascar	18		
Malaysia	47		
Maldives	1		
Malta	45		
Mauritius	4		
Mexico	41		
Mongolia	1		
Namibia	11		

Table 3 The number of participants who were students, physiotherapists with no experience in SCI, physiotherapists with < 1 year experience in SCI, physiotherapists with 2–5 years experience in SCI and physiotherapists with > 5 years experience in SCI (missing data on one participant)

Experience	n
Student	1349
No experience	190
< 1 year	844
2–5 years	671
> 5 years	468

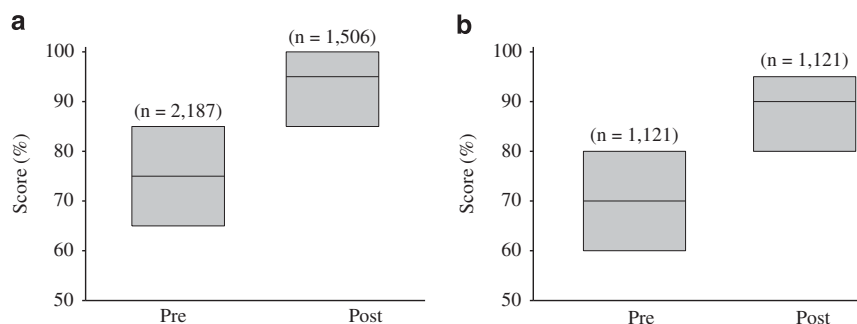


Figure 2 Scores for the pre- and post-MOOC knowledge assessments (median, interquartile range). (a) Includes all participants who completed the assessments and reflects the results of participants' best attempt (some participants made repeated attempts). (b) Includes only the participants who completed both the pre- and post-MOOC assessments and reflects the results of participants' first attempt.

Table 4 The 10 most common responses to the open-ended questions on the course evaluation, which asked participants to nominate the aspects of the MOOC that worked well

Theme (examples of comments)	Number
Breadth of content (for example, the additional resources, videos, text book)	332
Course organization/administration (for example, well organised and structured, good communication from the administrators)	271
Style of learning (for example, the interactive nature of the www.elearnSCI.org lessons, the different types of learning and the breakdown of topics into lessons)	261
Course content (for example, the theory, relevance to real life, the case studies)	241
Sense of community (for example, the interaction with others, Facebook discussions, international aspect of course)	233
The self-assessments and quizzes (for example, the regular opportunities to monitor progress)	215
Online nature of course (for example, the self-paced nature of course, the flexibility it provided, accessing the course online)	208
Pitch of the content (for example, easy to understand content, appropriately targeted content, course easy to use)	106

Abbreviations: MOOC, Massive Open Online Course.
All responses were collated by general themes.

Table 5 The 10 most common responses to the open-ended questions on the course evaluation, which asked participants to nominate the aspects of the MOOC that did not work well

Theme (examples of comments)	Number
Structure of Facebook (for example, Facebook discussion format)	365
Time (for example, took longer than 3 h per week, would like more time)	238
Nothing did not work well (for example, no issues)	190
Course organisation/administration (for example, admin emails not received, structure not clear, hard to follow, not enough contact with administrators, not enough detail on how the course worked)	114
IT problems (for example, problems with internet, playing videos, accessing online resources)	97
Miscellaneous comments (for example, no practical experience, needed more evidence, diverse experience and knowledge of participants)	52
Technical aspects of Facebook (for example, no access to Facebook, did not like Facebook)	38
Self-assessments (for example, did not like self assessments or had problems with the self assessment)	22
Content too easy (for example, content was too basic, not enough detail for advanced participants, concepts repeated in different lessons)	41
Language (for example, problems with language for those in whom English was a second language)	19

Abbreviation: MOOC, Massive Open Online Course.
All responses were collated by general themes.

participants who did not provide a valid email address). Results from Google analytics indicate that at week 1, there were 9170 unique views of the URL, which provided the detailed instructions for the week. This dropped by week 5 to 3539 unique views.

DISCUSSION

The results of this audit indicate that physiotherapy students and physiotherapists are interested and willing to participate in MOOCs on SCI. This is important to know because physiotherapy students' and physiotherapists' acceptance of this form of learning is probably

indicative of other health-care professionals' acceptance of the same style of learning. MOOCs may therefore provide a way of educating all types of health-care professionals about SCI. The model used for the physiotherapists could be rolled out to other health-care professionals in SCI because the content of MOOCs could be based on the modules already developed by the International Spinal Cord Society and freely available at www.elearnSCI.org.

The results of this audit do not indicate the effectiveness of MOOCs for learning. They only indicate students' and physiotherapists' willingness to participate in this style of learning and their satisfaction

with the learning experience. A randomised controlled trial carried out as part of this MOOC involving a small subset of physiotherapy students from Bangladesh ($n=48$) showed that these students did not gain more knowledge (mean between group difference and 95% confidence interval (CI), 1 point (-1 to 3) on a 0–20 point scale).¹³ Nor did they feel more confident to treat a person with SCI or have better satisfaction with the learning experience compared with students who were asked to progress through the physiotherapy-specific module on www.elearnSCI.org at their own pace. These students however may not be representative of all students because English was their second language and most were trying to access the Facebook discussion from their mobile phones with limited internet connectivity. These two factors may have restricted their participation. In addition, there were high levels of satisfaction and confidence in both groups at the end of the trial period, indicating ceiling effects with these two outcomes, which may have masked between-group differences. Nonetheless, MOOCs will never fully replace a skilled teacher providing face-to-face education in a classroom situation. Nor will MOOCs provide students with practical experience. However, they may provide a consistent learning experience to very large numbers of physiotherapy students and physiotherapists from many countries around the world where educational opportunities about SCI may be limited.

The completion rate of our MOOC was 41% (1506 students completed the final assessment from a total of 3523 students who enrolled). This is notably higher than the 10% retention rate typically reported in the literature for MOOCs. Poor retention in MOOCs is widely commented upon.^{3,5–11} Some argue that poor retention is problematic and reflective of the inadequacies of MOOCs compared with traditional face-to-face teaching, whereas others argue that poor retention merely reflects a lack of true commitment to the course from students when they sign up. MOOCs are largely free and therefore people with a passing curiosity may be tempted to register for a MOOC. Our MOOC may have attracted a lot of people who were just curious and interested in seeing how the educational content was delivered with no real intention of completing it. MOOCs are new to physiotherapists, thus there may have been a high level of curiosity. However, regardless, our retention rate was fairly good. This may partly be because participants earned Continuing Education Credits from the World Confederation for Physical Therapists and received a completion certificate. Alternatively, may be participants simply enjoyed the learning experience or highly valued the opportunity to increase their knowledge and skills in this area. No doubt participation and completion rates could be further increased if academic institutes incorporated the MOOC into their curriculums and results were used as part of students' formal assessments.

Feedback from the evaluations indicated that those who completed the MOOC enjoyed it (see Figure 1). However, one aspect of the MOOC that was not enjoyed by all participants was the Facebook discussion. This was very popular with some and very unpopular with others (see Tables 4 and 5). Those who enjoyed the discussions on Facebook typically commented on valuing the opportunity this provided to connect with other course participants from other countries. They typically stated that this broadened their perspective and heightened their understanding of issues around the world. One of the challenges with the Facebook group was the large number of posts. Some discussion topics attracted close to a 1000 posts within a week. In some weeks, up to four discussion topics were set as part of the course and participants were free to add their own discussion topics. Thus, this equated to several thousand posts per week. This was too much for participants to read and the format was not conducive to

a meaningful discussion between participants. In addition, it was difficult for the teachers to answer participants' specific questions because questions and answers were often lost in the long discussion threads. However, regardless, the set discussion topics probably at least drew participants' attention to specific issues. For example, one of the discussion topics for week 1 was about pressure ulcers (see Table 1). The mere act of seeing hundreds of posts on this topic must have at least made participants aware of the gravity of the problem.

An important limitation of this audit is that no data are available on those who registered but did not complete the course. This is a source of bias because those who did not complete the course are probably not representative of those that did. The other important limitation of this audit was our inability to monitor accurately how much of the learning material participants were moving through. We could indirectly estimate this by looking at the number of people who attempted the multiple choice questions at the end of each lesson in www.elearnSCI.org. However, participants may have moved through lessons and not done the multiple choice questions, or they may have done the multiple choice questions without moving through the lessons. Arguably, it does not matter how much of the content participants moved through provided they did well in the final post-MOOC knowledge assessments, which was the case for those who completed them.

In all, this audit does not provide answers about the effectiveness of MOOCs; however, it does open the discussion about possible strategies that could be used to educate the SCI workforce around the globe. It is probably not correct to assume that health-care professionals receive sufficient training in SCI as part of their undergraduate or graduate programs. Spinal cord injuries is often considered a highly specialised area and therefore not given high priority in course curriculums. In addition, educational institutes often struggle to provide appropriately qualified academics and teachers with expertise in SCI. The modules developed at part of www.elearnSCI.org are clearly an important step in this direction. However, now the challenge is getting these modules embedded within formal undergraduate and graduate training programs and encouraging and supporting people to complete them. MOOCs may provide a partial solution with the added benefit of providing students the opportunity to make connections with colleagues from other countries through social media.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The course was not funded and no one received any financial benefit from being involved. The two course coordinators did however receive some local funding from their workplace to contribute to salary support for a small portion of the time they devoted to the course. Physiopedia received no financial assistance to manage the course. They do however receive sponsorship from Elsevier, which in turn receives publicity through Physiopedia. Elsevier did also inadvertently receive publicity through the Facebook postings. Elsevier and LA Harvey may also have indirectly benefited through any sales of the course text book generated by the MOOC (even though all course delegates were provided with free online access to the text book for the duration of the MOOC).

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health through universal access to physiotherapy knowledge. Physiopedia did not receive any financial support or payment for running the MOOC. We gratefully acknowledge the support of Physiopedia. The MOOC was based on the physiotherapy-specific module of www.elearnSCI.org. This website was the initiative of the International Spinal Cord Society. The physiotherapy-specific module was compiled by over 40 physiotherapists in different countries. The contributions of all that made the website possible and specifically contributed to the physiotherapy-specific module is acknowledged. The contributions of Dr HS Chhabra and Mr S Muldoon to the coordination of the entire website are also acknowledged. The MOOC was also based on www.physiotherapyexercises.com. This was an initiative of Sydney-based physiotherapists. The contributions of all those who contributed to this website are gratefully acknowledged, especially Peter Messenger and Paul Pattie.

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