Analysis and retraining of upper limb function after stroke

StrokeEd Massive Open Online Course

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Executive Summary

Overview: *Analysis and retraining of upper limb function after stroke* is a massive open online course (MOOC) which was offered in June 2024 by the StrokeEd Collaboration, an Australian organisation. This was the first MOOC run by StrokeEd. The course was targeted at occupational therapists and physiotherapists. The content aimed to improve participants' understanding and application of evidence-based rehabilitation of the upper limb after stroke.

Demographics: A total of 1,728 participants from 46 countries registered for the MOOC. The course had the capacity to accommodate up to 3,000 learners. Most registrants were occupational therapists or physiotherapists from Australia, Brazil, Malaysia, South Africa, United Kingdom and Egypt. Most participants worked in metropolitan areas (71%) and in an inpatient setting (46%).

Engagement: Approximately half (47%) of the 1728 registrants completed the MOOC. Two thirds of participants, (66%, n=1,142) accessed the learning platform; of those participants who accessed the learning platform, 70% (n=803) completed all content and quizzes. The Facebook group had 917 participants, of which 102 participants posted an introductory message, and shared 468 interactions (comments / reactions). A total of 177 emails were received by StrokeEd before and during the MOOC.

Effectiveness: Participants completed a knowledge assessment pre and post MOOC. Scores of 80% or above (for the first quiz attempt) improved from baseline pre-MOOC (22%) to the final quiz (81%). Comments in the post-MOOC evaluation and on the Facebook page referred frequently to learning (n=168) and confidence (n=95).

Reactions: Participants provided positive feedback on the ease of MOOC registration (71% strongly agreed) and access to MOOC content (62% strongly agreed), that teaching of the MOOC was of a high quality (78% strongly agreed) and learning content of the MOOC was high quality (79% strongly agreed). Most participants (n=571, 66%) were from high income countries and paid $50 AUD for the MOOC; 52% of that group

(n=300) reported that they were willing to pay $50 USD for the MOOC in future. Of the participants from middle to low-income countries (n=291, 34%), 19% (n=55) of that cohort were not willing to pay a fee for the MOOC and 19% (n=54) were willing to pay $50 USD. Participants' comments in the post-MOOC evaluation and Facebook page used the words "learnt"/" learnt a lot" 168 times and described the course as "amazing", "brilliant", "fantastic", "great" or "wonderful" 56 times.

Practice change: In the post-MOOC evaluation, 803 participants reported on their intention to: increase /count repetitions of practice (n=346, 14%), change their communication and practice set-up through the use of external cues and refined verbal instructions (n=339, 14%), implement semi-supervised and independent practice (n=241, 10%), implement task-specific training (n=228, 9%), perform movement analysis and/or use their new understanding of biomechanics to inform therapy decisions (n=198, 8%).

Conclusions:

The MOOC had a high proportion of registrants (47%) who completed the online content including the post MOOC quiz, compared to other MOOCs, with typical completion rates of 10% to 20%. Feedback received from participants indicated that the MOOC had high quality content and employed high quality teaching methods. The MOOC appeared to be effective at helping participants to plan evidence-based practice change.

Future plans:

Considering the excellent feedback and success of the inaugural MOOC, StrokeEd will run the course annually in June, advertising early in the year with registrations opening in May. The MOOC will use the same online format with an online discussion group on Facebook. The MOOC will continue to be run with a fee for residents of high-income countries, enabling StrokeEd to fund the costs of content development and IT support.

Changes to the MOOC in 2025 are expected to include: providing translation of recorded lectures and videos into several languages, using site analytics to understand participants' learning patterns, increasing the cost for residents of high income

countries, and increasing course duration to 5 weeks to allow the content of week 3 to be spread across 2 weeks.

1. Introduction

Analysis and retraining of upper limb function after stroke was a massive open online course (MOOC) run by the StrokeEd Collaboration. This was the first MOOC to be run by StrokeEd. The course was targeted at occupational therapists and physiotherapists and the content aimed to improve participants' understanding and application of evidence-based rehabilitation of the upper limb after stroke. The completion rate (defined as the percentage of enrolled participants that completed the course content and final quiz) was 47%. Completion rates for other MOOCs are reported to vary from 0.7% to 52.1%, with a median value of 12.6% (Jordan, 2015). Therefore, a completion rate of 47% represents very good engagement.

2. Background

The MOOC ran for 4 weeks, between 3rd June and 30th June 2024. The course material was delivered in English, with opportunities for translation of text-based content within the learning platform. No fee was charged to registrants from middle to low-income countries (ie the course was free); a fee of $50 AUD was charged to registrants from high-income countries.

The target audience was occupational therapists and physiotherapists working in neurological rehabilitation and anyone interested in post-stroke rehabilitation. Participants were expected to devote 3-4 hours per week over 4 weeks to the online lessons and discussion forum, as well as engage with additional resources. They could complete these activities at any time during the week. Two live discussion forums were included in weeks 2 and 4, which participants could join live or watch later as a recording. Pre-reading was made available via an online link in advance.

The MOOC aimed to:

- Provide a high quality evidence-based curriculum

- Provide an opportunity for health professionals from low and middle income countries as well as high income countries to participate
- Develop teaching methods which enable participants to practise analysis skills
- Present current evidence-based interventions
- Present intervention strategies that are relevant for stroke survivors who are very weak as well as those who have more advanced hand function skills. Importantly for therapists in low income countries, the intervention strategies did not involve expensive equipment

LearnDash software was used for delivery of all course-related materials and quizzes. A translation function was used within Learndash that enabled translation of all text-based content, but there was no translation of recorded lectures and videos.

A closed Facebook group was used for interactive discussion, moderated by a StrokeEd administrator. StrokeEd posts and interactions were in English, with the option for participants to use Facebook's text translation feature.

A certificate of completion was provided if participants completed the final MOOC knowledge quiz with a minimum score of 80%. Participants could repeat the final quiz multiple times to achieve 80% and obtain their certificate.

3. Results

Understanding the learner's experience and impact of the MOOC are effective ways to improve future courses. To summarise results and evaluate the success of training, we used four questions based on the RE-AIM and Kirkpatrick frameworks (Ayub, Wei & Yue, 2017; Aleman de la Garza, Sancho Vinuesa & Gomez Zermeno, 2015; Meinert et al., 2018; Ross, Penkunas, Maher, Certain & Lanois 2022). Our key questions were:

1. **REACH**: Who were the participants and were they engaged?
2. **EFFECTIVENESS**: Was there an immediate or short-term change in knowledge and/or confidence?
3. **REACTION**: How did participants react to the MOOC?

4. **BEHAVIOUR**: Will participants change their clinical practice or teach others differently in response to the MOOC?

Qualitative and quantitative data were collected from the registration list, course quizzes, end of MOOC evaluation, Facebook discussion and email correspondence.

REACH: Who were the participants and were they engaged?

A total of 1,747 people registered for the MOOC from 46 countries (Figure 1) with most registrants based in Australia, Brazil, Malaysia, South Africa, United Kingdom and Egypt (Table 1). There was a mix of professions (Figure 2) and years of experience in neuro rehabilitation (Figure 3). Most registrants worked in metropolitan areas (71%) and in an inpatient setting (46%), and most registrants (72%) had not attended a StrokeEd workshop prior to registering for the MOOC. About half of the registrants (n=845) were from high income countries and paid $50 AUD to access the MOOC.

Figure 1: – REACH: Country of origin of registrants (n= 1728)

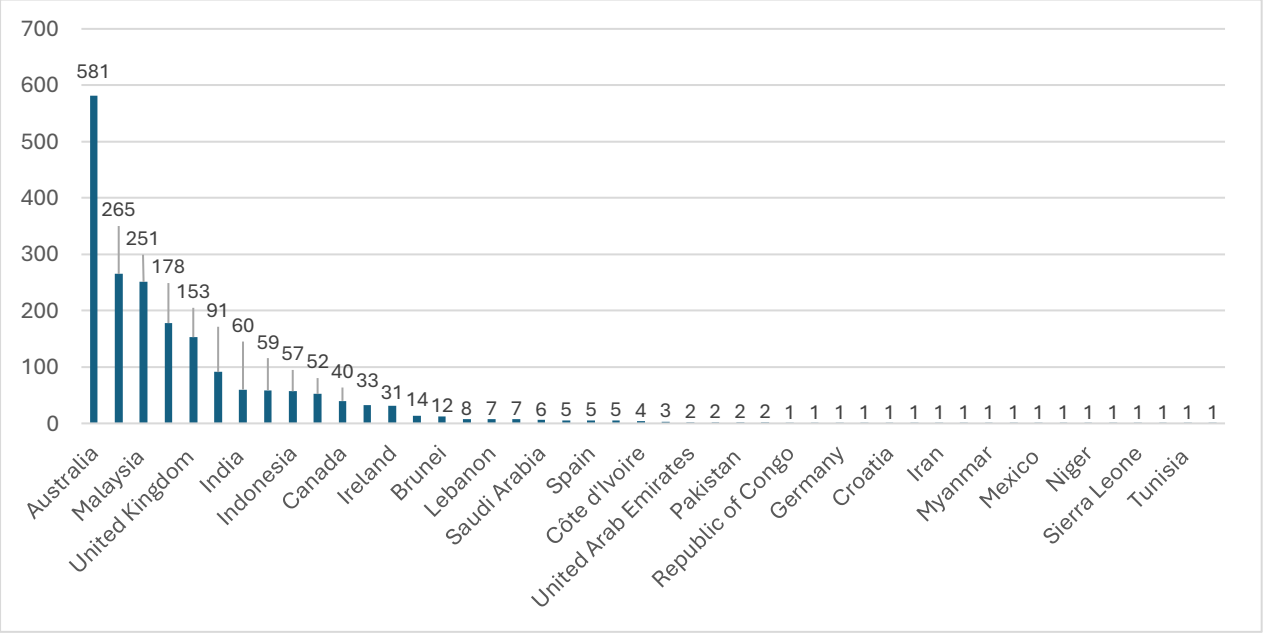


Table 1: REACH: Number of registrants from 10 top countries (n= 1747)

Australia	581 (30%)
Brazil	265 (14%)
Malaysia	251 (13%)
South Africa	178 (9%)
United Kingdom	153 (8%)
Egypt	91 (5%)
India	60 (3%)
New Zealand	59 (3%)
Indonesia	57 (3%)
Singapore	52 (3%)

Figure 2: REACH: Professions represented (n= 1747)

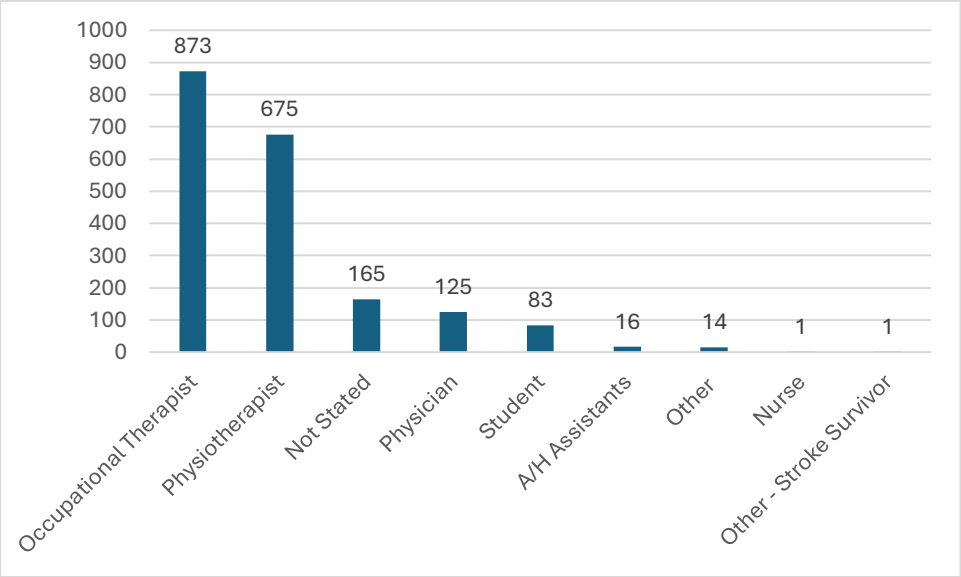
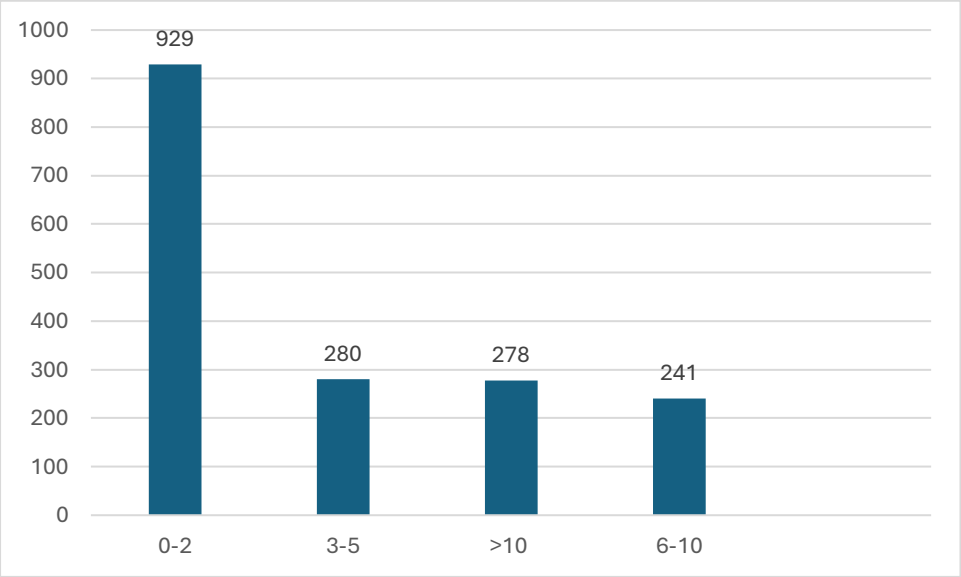


Figure 3: REACH: Participants' Years of experience in neuro rehabilitation (n= 1747)

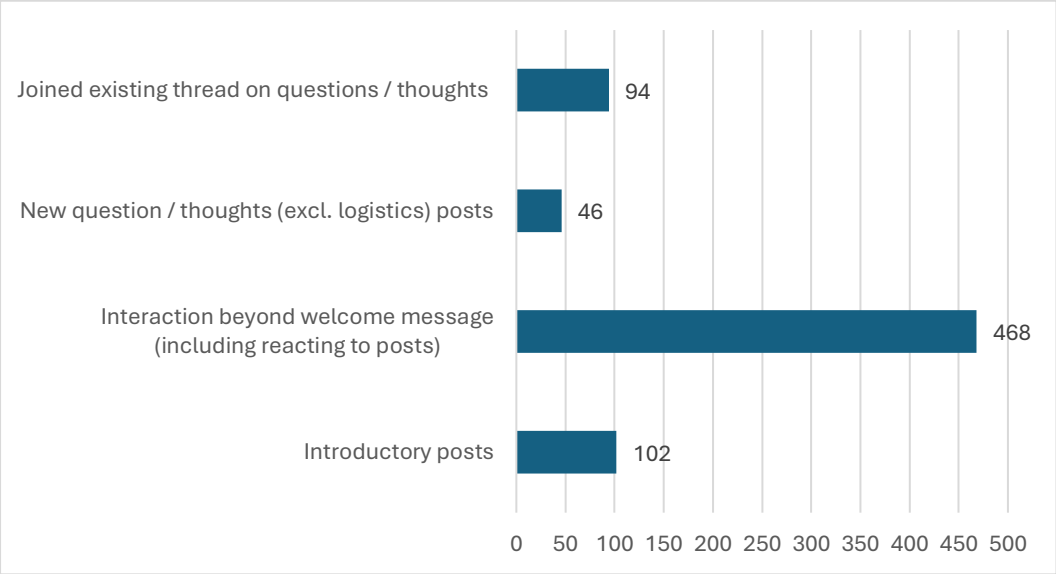


Engagement: 1142 (66%) of the registrants started the MOOC and 803 (47%) participants completed the MOOC.

Facebook group: 917 participants joined the group. There were 102 introductory messages posted by participants and 468 interactions (comments / reactions) beyond the welcome message, 46 questions and comments posted by participants, and 94 interactions (comments / reactions) posted by other participants. See Figure 4. Some participants were not Facebook users or preferred not to use Facebook for the MOOC. Approximately 200 of the 'active' registrants did not join the Facebook group (i.e. those who accessed the learning platform).

Emails: 177 emails were received at mooc@strokeed.com before and during the 4 weeks of the MOOC. Most emails (n=60) enquired about access to the learning content due to difficulty logging in or accessing content and quizzes. Others needed help to register and pay (n=22), wanted to register after the cut-off date (n=20), requested an extension of time (n=12) after the MOOC completion date, enquired about a certificate of completion (n=8) or about the live Q&A session (n=4).

Figure 4: REACH: Participant engagement via Facebook group (n=710)



Attrition rate: Of the 1,747 registrants, 1,142 participants (66%) accessed the learning platform. One third (34%) of registrants did not access the learning platform.
Of those participants who accessed the learning platform, 70% completed all content including the final MOOC quiz. Excluding those who did not access the learning platform, most dropouts occurred before or during week 1 (see Figure 5).

Completers and non-completers: The demographics of completer and non-completer populations were assessed to identify trends. Australia, United Kingdom, New Zealand, Singapore, Canada and Ireland had more completers (52% average) than non-completers (28% average) (see Figure 6a).

Occupational therapists were the only profession with more completers (54%) than non-completers (46%). Physicians had the highest proportion of non-completers v completers (80% v 20%) (see Figure 6b).

Most participants had ≤ 2 years experience in neuro rehabilitation; these more recent graduates had more non-completers than completers (60% v 40%) (Figure 6c).
Most participants worked in an inpatient clinical setting (n=896, 46%). Participants who worked in the community had a greater proportion of completers than non-completers

(59% v 41%) (see Figure 6d). Other demographic data showing completers v non-completers are available as supplementary material or upon request.

Figure 5: REACH: Participant drop-out points (excluding registrants who did not access the learning platform).

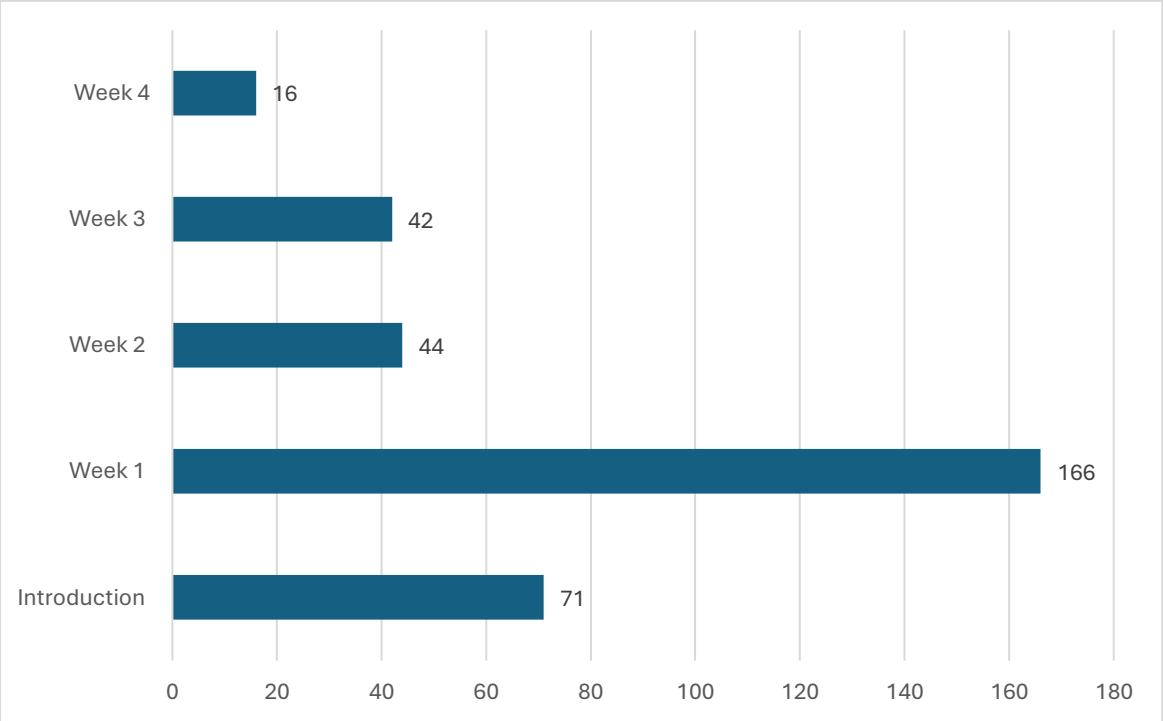
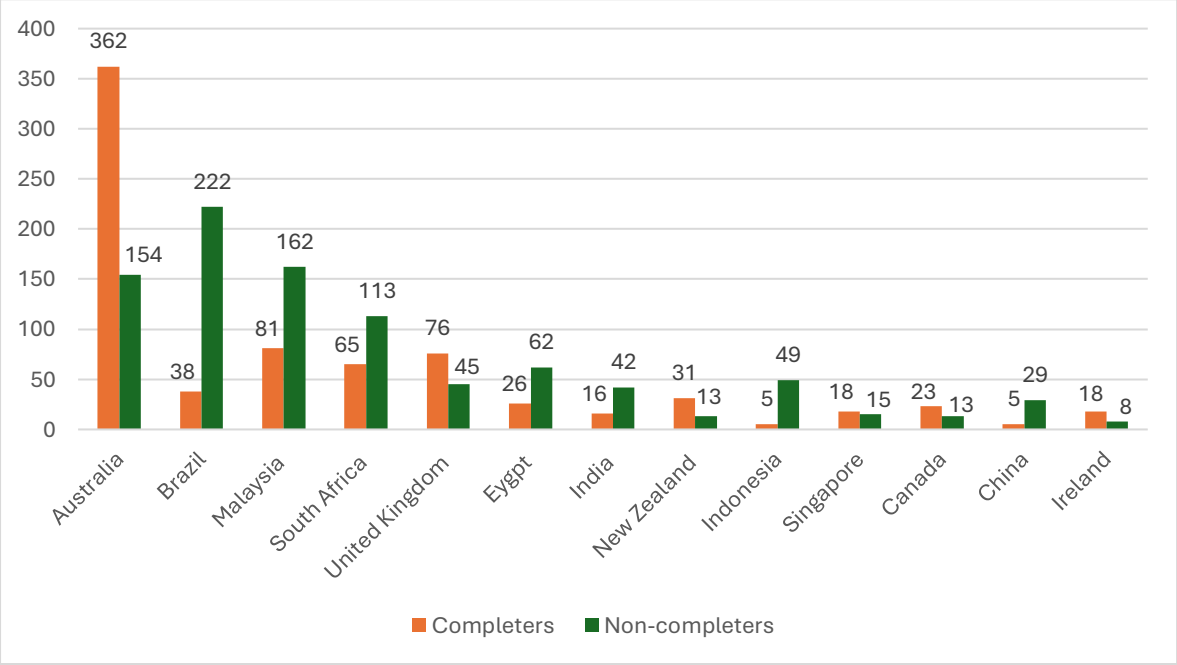


Figure 6a: REACH: Completers v non-completers by country of origin. Countries with >30 participants were included (13 in total). For all countries, see supplementary material.



There were a high number of dropouts from Brazil. We were informed that Brazilian participants may have dropped out due to a misunderstanding that the content would be available in Portuguese. The recorded content was in English.

Figure 6b: REACH: Completers v non-completers by profession (n=1632)

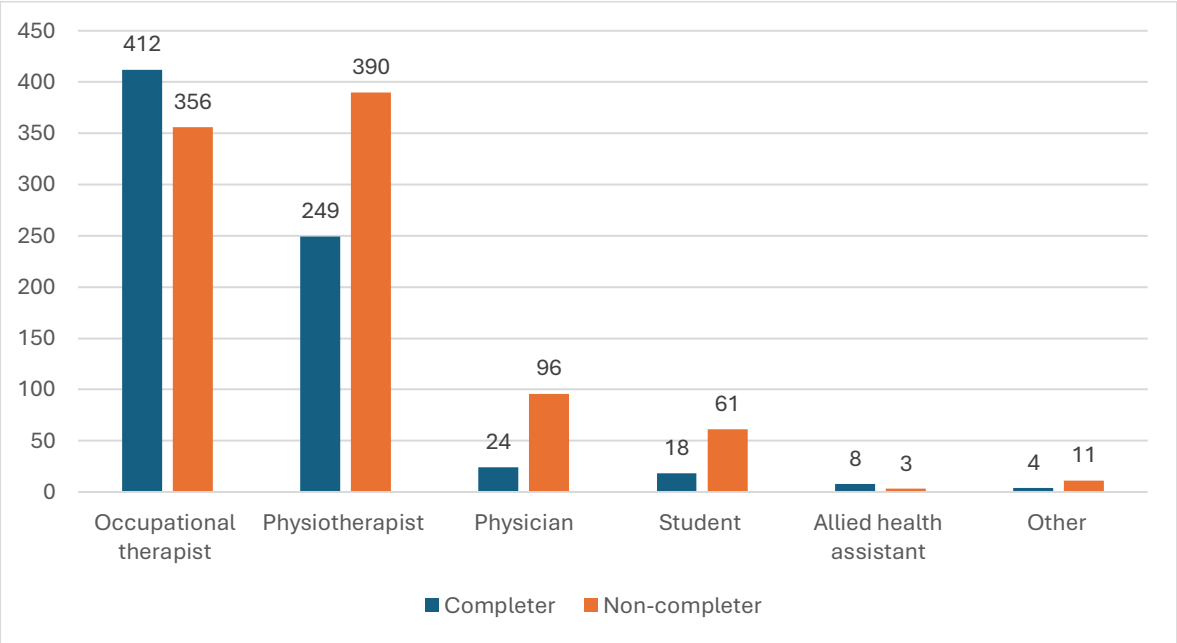


Figure 6c: REACH: Completers v non-completers by years of neuro-rehabilitation experience (n=1566)

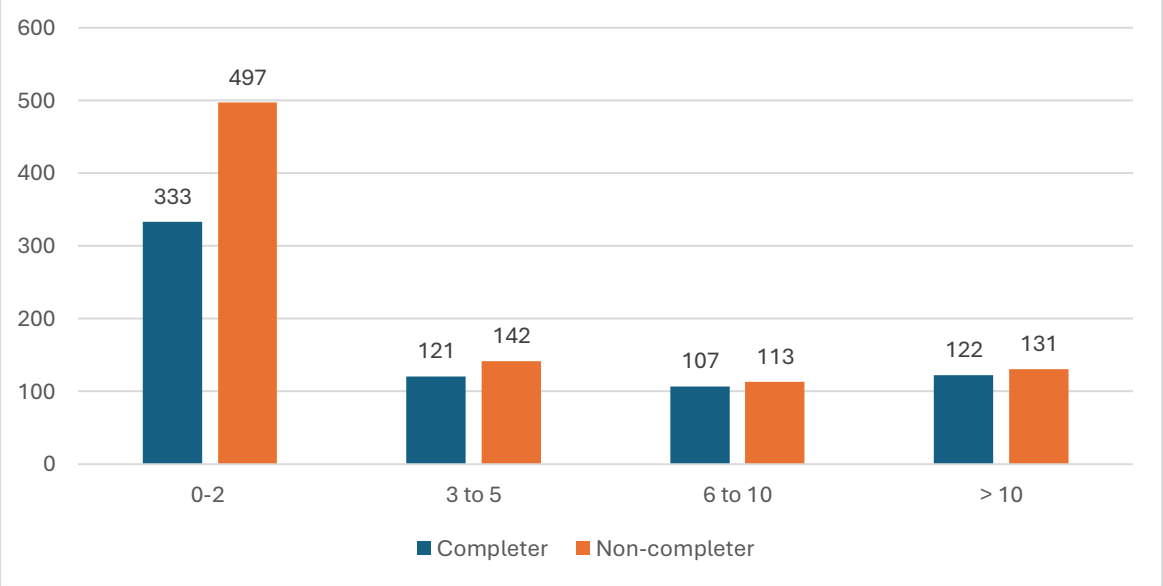
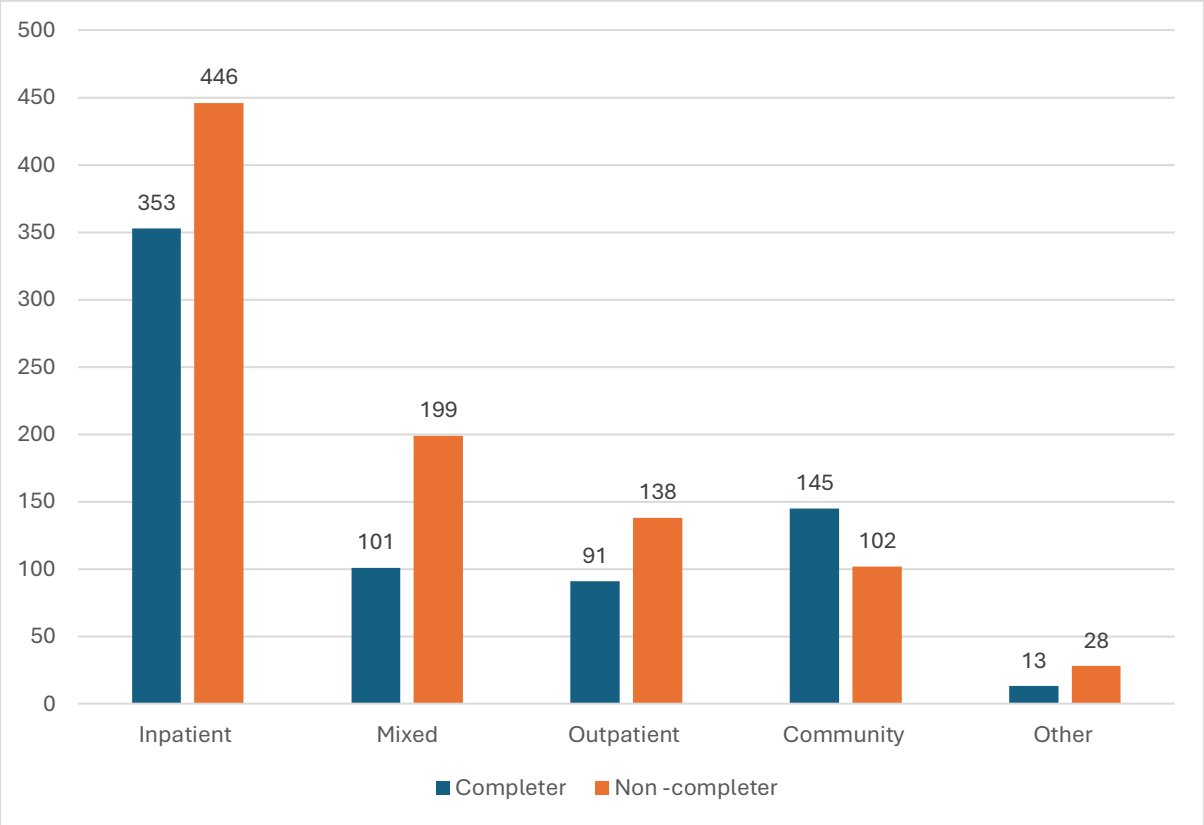
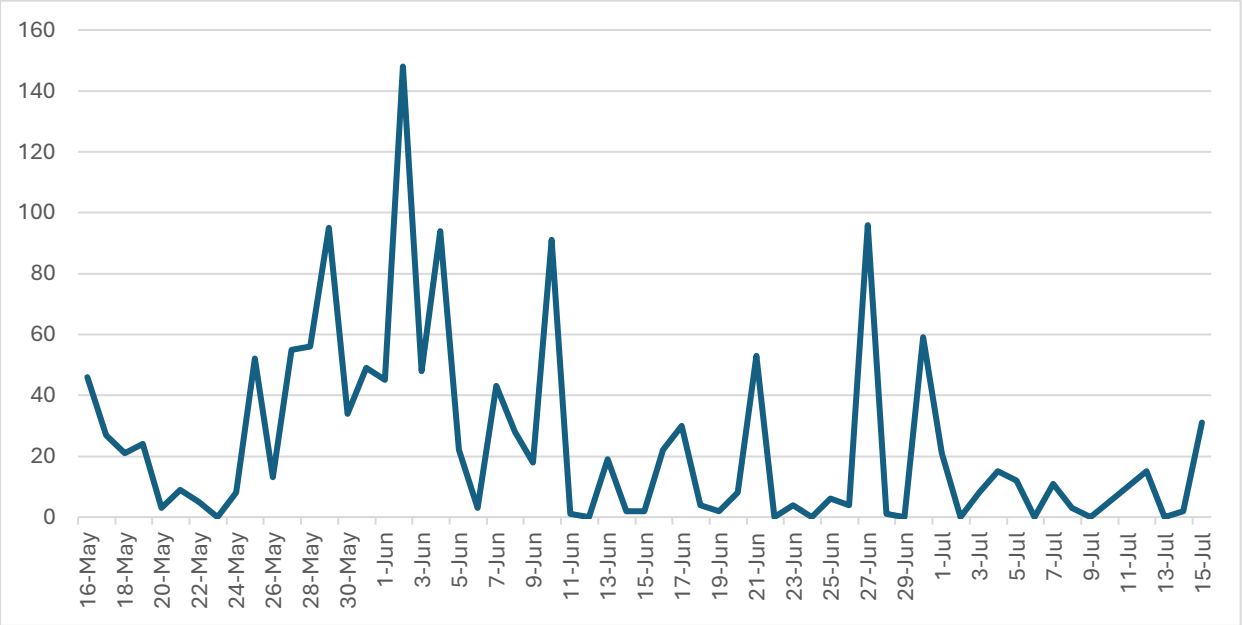


Figure 6d: REACH: Completers v non-completers by clinical setting (n=1616)



Interaction via the Facebook group was highest at the start of the MOOC and spiked in accordance with reflection tasks that encouraged discussion and reflection. See Figure 7.

Figure 7: REACH: Number of Facebook interactions (including posts, likes and comments) between 16th May and 15th July 2024 (n=710)



Of the participants who accessed the learning platform, the greatest number of dropouts occurred during the introduction and/ or week 1 content. Of the participants who completed the baseline knowledge quiz, 78% went on to complete the MOOC content and final quiz. The early dropout numbers may be because participants learnt more about the course structure and content in the introduction and week 1 and decided not to continue.

There were some technological errors that may have impacted participants' flow through the course. For example, there was a spike in dropouts in week 2 and week 4 where there was an additional "mark as complete" button added for participants to click to mark the lesson as complete. As the course content was sequential, some participants may not have been able to progress through the course if they missed this "mark as complete" button.

EFFECTIVENESS: Was there an immediate or short-term change in knowledge and/or confidence?

Knowledge assessments: 1,009 participants completed the baseline pre-MOOC quiz and 803 participants completed the final post-MOOC quiz. Access to the course was sequential, therefore all participants who completed the post-MOOC quiz had completed the pre-MOOC quiz.

For the baseline quiz, 22% of participants achieved a score of 80% or above for their first attempt. For the final quiz, 81% of participants achieved a score of 80% or above for their first attempt.

See Figure 8 for a comparison of pre- and post-MOOC quiz results.

Figure 8: EFFECTIVENESS: Pre- and post-MOOC quiz scores (first attempt only)

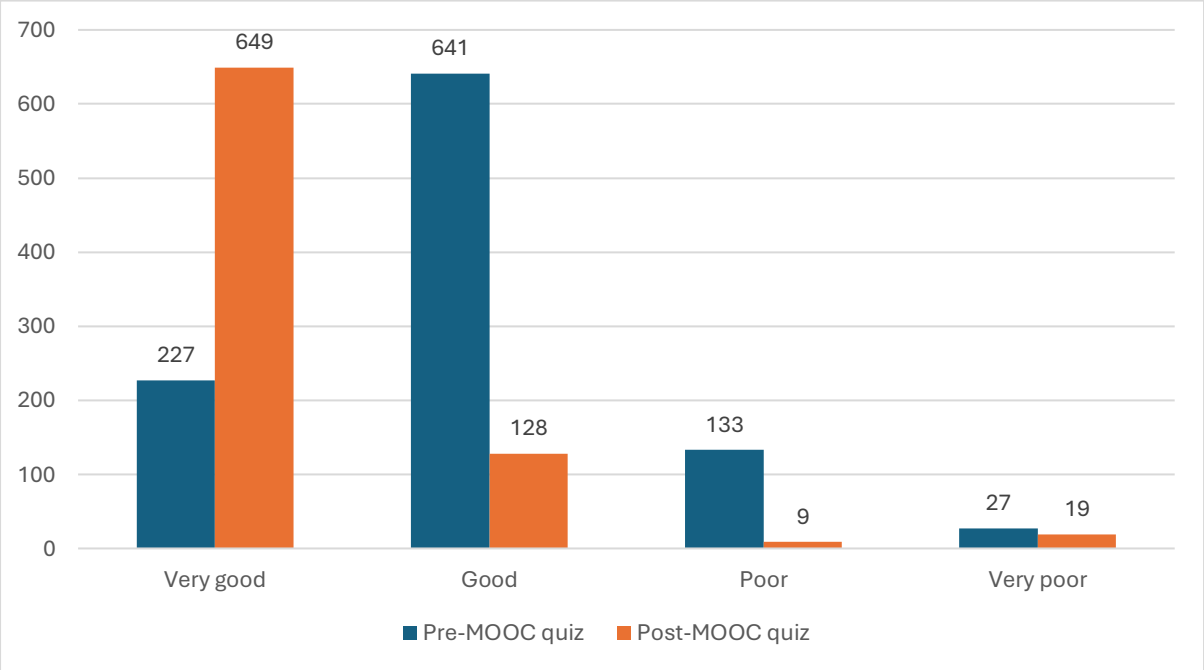


Figure 8: Very good = score 100% - 80%; Good = score 50% - 79%; Poor = score 20% - 49%; Very poor = score 0% - 19%

Text analysis: Comments made by participants in the post-MOOC evaluation and on the Facebook page were categorised for analysis. There were 168 comments that mentioned the words “learnt”, “learnt a lot/so much”, “learned”, “learn”, “didn’t know”

and “understand”. There were 95 comments that mentioned the words “confidence” or “confident”. See Table 2 for examples of comments.

Table 2: EFFECTIVENESS: Examples of comments in the post-MOOC evaluation related to a change in knowledge and/or confidence

Comment
This information has broadened my knowledge, and now I feel far more *confident* when setting up rehab programmes with patients, as well as how i am able to describe compensatory movements and barriers to function in my note writing.
I feel much more *confident* in analysing, prescribing exercises and addressing compensations, as well as being comfortable with modalities such as mirror therapy, e-stim and mental practice
I am more *confident* of the evidence-based approaches and looking forward to better service provision and a structured UL programme
I also feel more *confident* educating other HPs (Rehab Physicians etc) about what evidence has low value (such as splinting).
Further understand components of fine motor tasks eg handwriting and cutlery use and feel *confident* to assess and part practice these with clients
I now feel more *confident* about implementing some upper limb rehab as part of my treatment.
More advanced knowledge of evidence-based UL rehabilitation and feeling more *confident* with implementation
I am more *confident* to refuse to routinely splint patients post stroke.
Am new to stroke rehab so have *learnt so much* about how to assess the upper limb and interventions to try
I *learnt a lot* about UL assessment and treatment post stroke
Learnt a lot about UL stroke rehab from basics till evidence-based rehab and how to improve the therapy sessions
I've *learnt a lot* about treatment strategies and ways to change the environment to create a semi-supervised program for upper limb class.

REACTION: How did participants react to the MOOC?

Post-MOOC evaluation: 803 participants completed the post-MOOC evaluation. Most participants agreed that it was easy to register for the MOOC (71% strongly agreed), and

easy to access MOOC content (62% strongly agreed) including the MOOC videos, that teaching of the MOOC was high quality (78% strongly agreed) and learning content of the MOOC was high quality (79% strongly agreed).

Participants were asked what fees they would be prepared to pay in future for the MOOC. Of the 571 (66%) participants from high income countries, 52% (n=300) were willing to pay $50 USD for the MOOC and 30% (n=169) were willing to pay $100 USD.

Of the 291 (34%) participants from middle to low-income countries, 19% (n=55) of that cohort were not willing to pay a fee for the MOOC, 19% (n=54) were prepared to pay $50 USD, 15% (n=43) were prepared to pay $10 USD or less, and 13% (n=39) were prepared to pay between $21-$30 USD.

Text analysis: Comments made by participants in the post-MOOC evaluation and the Facebook page were categorised for analysis. Participants stated that they "learnt" or "learnt a lot/learnt so much" 168 times. They used the words "amazing", "brilliant", "fantastic", "great" or "wonderful" to describe the MOOC 56 times. See Table 3 for participants' overall impressions of the MOOC.

Table 3 – REACTION: Participants' overall impressions of the MOOC

Learnt a lot/learnt	168
Confident/confidence	95
Amazing/brilliant/great/fantastic/wonderful	56
Informative/useful/beneficial/helpful	35
Thanks/thank you	68
Interesting	2
Easy/simple	25
Enjoyed	13
Interact[ive]	2
Appreciate/grateful	9
Love[d]	9
Comprehensive/thorough/detailed	23
Great/good opportunity	5

BEHAVIOUR: Will participants change their clinical practice or teach others differently in response to the MOOC?

Text analysis: In the post-MOOC evaluation, 803 participants reported on practice changes in response to the MOOC. These changes were grouped into 19 categories. The five most reported categories were an intention to: increase /count repetitions of practice (n=346, 14%), change their communication and practice set-up through the use of external cues and refined verbal instructions (n=339, 14%), implement semi-supervised and independent practice (n=241, 10%), implement task-specific training (n=228, 9%) and perform movement analysis and use their new understanding of biomechanics to inform therapy decisions (n=198, 8%). See Table 4 for the full list of participants intended practice changes in response to the MOOC.

Table 4: BEHAVIOUR: Participants' intended practice changes in response to the MOOC

Increase/count repetitions of practice	346 (14%)
Improve communication skills - use external cues; refine verbal instructions	339 (14%)
Implement semi-supervised and independent practice	241 (10%)
Understand and implement task specific training	228 (9%)
Improve knowledge of movement analysis and biomechanics	198 (8%)
Use new ideas and resources - UL tool kit, tally counter, reps sheet	149 (6%)
De-implement outdated techniques	149 (6%)
Prescribe more targeted exercises	120 (5%)
Incorporate research and EBP	111 (5%)
Reduce use of manual facilitation	106 (4%)
Improve coaching with clear, goal-oriented feedback	105 (4%)
Use mental practice	88 (4%)
Improved upper limb assessment procedures	85 (3%)
Use mirror therapy	69 (3%)
Use low-tech, everyday items for analysis and training	57 (2%)
Use electrical stimulation	52 (2%)
Use video analysis	21 (1%)
Increase collaboration, professional development and share insights with colleagues	17 (1%)
Encourage patient independence	4 (0%)

Participant feedback

Participants were given the opportunity to provide feedback on the course. Key conclusions from the participants' feedback include:

- *Course duration and time commitment:* Seven participants provided feedback on the time taken to complete the course. Two participants suggested a future 6-week MOOC; three participants said the MOOC content took longer than suggested to complete; and one participant reported that the course could be completed in the expected time (3-4 hours per week, total of 12 hours over four weeks).
- *Learning format*: Three participants requested a downloadable workbook to assist their learning and information retention.
- *Future directions:* Four participants expressed interest in a lower limb version of the MOOC. Four participants asked if the same MOOC will be run again next year.

Recommendations for the 2025 MOOC

StrokeEd plans to run the MOOC again in June 2025 with the following changes:

1. Provide translation options for recorded content – lectures, videos, live session.
2. Provide a step-by-step guide to accessing the LearnDash learning platform.
3. Limit or eliminate the '*mark as complete'* button.
4. Use site analytics to obtain data on participants' learning patterns – i.e. time of day and duration of session.
5. Increase the cost by a small amount (e.g. $100 for high income countries, $20-30 for high-middle income countries) to cover the cost of video production, administration and website support.
6. Increase the duration of the MOOC from 4 weeks to 5 weeks, allowing more time for Week 3 content to be completed over two or more weeks.

4. Summary and Conclusions

The inaugural StrokeEd MOOC can be considered a success as the number of registrants who completed the content was close to 50%, considerably higher than average completion of MOOCs which have a median completion rate of 13% (Jordan, 2015).

Participants' evaluation of the MOOC indicated that most had a good learning experience, and were planning to change their clinical practice as a result of completing the MOOC. The participants' feedback indicated that the content and the teaching methods of the MOOC were high quality. The MOOC appeared to help participants plan evidence-based practice changes in their delivery of upper limb rehabilitation after stroke.

References

1. Jordan K. Massive open online course completion rates revisited: Assessment, length and attrition. *Int Rev Res Open Distrib Learn*. 2015;16(3). doi:10.19173/irrodl.v16i3.2112

2. Ayub E, Wei GW, Yue WS. Exploring factors affecting learners' acceptance of MOOCs based on Kirkpatrick's model. In: *Proceedings of the 8th International Conference on E-Education, E-Business, E-Management and E-Learning*. ACM; 2017.

3. Aleman de la Garza L, Sancho Vinuesa T, Gomez Zermeño MG. Indicators of pedagogical quality for the design of a Massive Open Online Course for teacher training. *RUSC Univ Knowl Soc J*. 2015;12(1):104. doi:10.7238/rusc.v12i1.2260

4. Meinert E, Alturkistani A, Brindley D, Carter A, Wells G, Car J. Protocol for a mixed-methods evaluation of a massive open online course on real world evidence. *BMJ Open*. 2018;8(8):e025188. doi:10.1136/bmjopen-2018-025188

5. Ross B, Penkunas MJ, Maher D, Certain E, Launois P. Evaluating results of the implementation research MOOC using Kirkpatrick's four-level model: a cross-sectional mixed-methods study. *BMJ Open*. 2022;12(5):e054719. doi:10.1136/bmjopen-2021-054719