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# Allied health students' experience of a rapid transition to telerehabilitation clinical placements as a result of COVID-19

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**Abstract**

*Introduction:* This study explores allied health students' experience with and perceptions of telerehabilitation prior to and following the rapid transition of university clinical placements to telerehabilitation due to COVID-19.

*Methods:* Semi-structured interviews were conducted with allied health students who had completed a clinical placement (between March and September 2020) at the University of Queensland that was rapidly transitioned to telerehabilitation due to COVID-19. Students were asked to report on their pre-conceptions, lived experience and post placement reflections of delivering consultations via telerehabilitation rather than in-person. Qualitative data were analysed using thematic content analysis.

*Results:* 18 students (72% female, 20 to 31 years of age) from speech pathology (39%), physiotherapy (39%), occupational therapy (11%) and audiology (11%) conducted telerehabilitation consultations. Reflections on preconceptions of telerehabilitation nested under four themes: *clinical effectiveness, interacting/communicating via telerehabilitation, technology* and *anticipation about a telerehabilitation placement.* Experiences during placement clustered under similar topics of *clinical effectiveness, interacting/communicating, practical aspects* and *technology.* Reflections upon completion of placements related to *experience in a global pandemic, benefits of combining technology and telerehabilitation, convenience, future use* and *knowledge, skills, and confidence with telerehabilitation.*

*Conclusion:* Despite initial concerns, students were able to rapidly transition to telerehabilitation and effectively deliver quality care, modify techniques, and achieve positive client outcomes. Student skills, knowledge and confidence improved with rapid exposure through learning "on the go", and many indicated willingness to continue to use telerehabilitation in the future.

# I INTRODUCTION

Telehealth is the delivery of health services remotely using electronic communication (Dario et al., 2017), involving either real-time (i.e., telephone or videoconferencing) and/or asynchronous (e.g., email) exchange of health information between patient and health care practitioner (Russell, 2009). The delivery of rehabilitation services via telehealth (i.e., often by allied health professionals) is referred to as telerehabilitation (Brennan et al., 2010). This service model enables greater access to rehabilitation by negating the barriers of travel, distance and limited availability of local allied health providers (Theodoros & Russell, 2008). Benefits of telerehabilitation include greater and/or more frequent access to care, greater emphasis on self-management and improved time and cost effectiveness (Kairy et al., 2009). While telerehabilitation has proven to be a valid, effective, and acceptable mode of delivery (Dias et al., 2021; Iacono et al., 2016; Russell et al., 2011), widespread adoption and use has historically remained limited (Wade et al., 2016).

Clinician acceptance has been acknowledged as a key determinant of success and adoption of telerehabilitation (Wade et al., 2014). Research has shown that many clinicians are reticent about the use of telerehabilitation, with reported concerns including poor technology self-efficacy, (Scott Kruse et al., 2018) reluctance to change clinical practice (Brewster et al., 2014), perceived de-personalisation (Green et al., 2016), and patient safety concerns (Mair et al., 2008). Addressing these perceived barriers, either through direct training or repeated exposure, can effectively improve clinician acceptance and confidence in telerehabilitation (Cottrell et al., 2018). However, this may take time and is reliant on clinicians' willingness to participate in professional development or upskilling while concurrently working in their clinical roles.

Providing training to students that addresses perceived barriers and provides practical experience in telerehabilitation delivery, may be an alternative method of equipping the workforce with clinicians who are competent with the technology and adaptations to clinical practice that are required to confidently and effectively deliver telerehabilitation services. Reports of the extent to which telerehabilitation content is currently incorporated into allied health curricula (Hui et al., 2021) and original studies exploring the student experience of telerehabilitation are lacking. Understanding allied health students' perspectives of telerehabilitation may provide key insights to specific training and upskilling that is required in coursework and placements to produce graduates that are confident in the delivery of telerehabilitation services. The rapid transition to telerehabilitation in response to COVID-19 restrictions provided a platform for this to be explored.

The COVID-19 pandemic resulted in considerable, previously unforeseen changes to the delivery of health services (Allied Health Professions Australia, 2020). At the commencement of "lockdown" periods across Australia, it was recommended across government levels that wherever possible, health services were delivered via telehealth. This represented a significant policy shift in Australian healthcare, with changes made to Medicare scheduling and many private health insurer's policies to support the provision of some allied health services via telerehabilitation (Allied Health Professions Australia, 2020). During this time, many private practices, hospital services and universities with student-led allied health clinics rapidly transitioned to telerehabilitation models to enable students to complete placements and fulfil requirements to graduate and to continue provision of client care.

The University of Queensland (UQ) offers a number of high-quality student-led allied health clinics, collectively known as the University of Queensland Health and Rehabilitation Clinics (UQHRC). These clinics are largely led by students on clinical placement across the disciplines of audiology (AUD), occupational therapy (OT), physiotherapy (PT) and speech pathology (SP). Students are supervised by discipline-specific clinical educators, with many of these services traditionally using an in-person service delivery model. In 2015, UQ established the innovative teaching and learning Telerehabilitation Clinic, designed to train the next generation of allied health practitioners to deliver telerehabilitation services to members of the community across AUD, OT and SP. Prior to COVID-19, telerehabilitation clinical placements were limited, accounting for only 13% of occasions of service between April to June 2019. In response to

COVID-19, UQHRC underwent a rapid transition and extended their telerehabilitation services across *all* disciplines, accounting for 66% of all occasions of service between April and June 2020 (a 405% increase). Students and clinical educators who were originally assigned to in-person clinical education and service delivery placements were required to transition to delivery of telerehabilitation services to clients who may not have otherwise elected to receive therapy via telerehabilitation.

The aim of this study was to develop an in-depth understanding about the student experience with, and perceptions of, telerehabilitation prior to and following clinical placements that were rapidly transitioned to telerehabilitation in response to COVID-19 restrictions.

## II METHODS

The study adopted a phenomenological approach (Teherani et al., 2015), given that it sought to understand and describe the lived experience of the students who were experiencing delivering consultations via telerehabilitation. This required a qualitative design whereby data were collected via semi-structured in-depth interviews to ascertain students' perspectives on care delivery via telerehabilitation and accompanied by a short demographic questionnaire. Ethical approval was obtained from the University of Queensland Human Research Ethics Committee (Approval number: 2020000940).

### A *Participants*

All students who completed a placement in the UQHRCs across the disciplines of AUD, OT, PT and SP during March to September 2020 and had delivered telerehabilitation consultations as a result of COVID-19 (that is, students who had originally been allocated an 'in-person' clinical placement, which was rapidly transitioned to telerehabilitation) were eligible and invited to participate. Across disciplines, student location (i.e., in clinic or at home) varied, with all patients located in their own homes or place of work.

Participants in the study were recruited through clinic managers. Interested students were emailed the participant information sheet and provided informed consent prior to participating in the interview. All interviews were conducted between July and September 2020.

### B *Data collection*

Semi-structured interviews conducted using videoconferencing software (Zoom) were selected as an appropriate method to collect in-depth data about the student experience of a rapid transition to telerehabilitation (Gray et al., 2020). Semi-structured interviews are well suited for the exploration of attitudes and beliefs regarding complex and potentially sensitive issues, and allow probing for more information and clarification of responses (Barriball & While, 1994).

Questions focussed on students' preconceptions, their lived experience and their post placement reflections of their preparedness and perceived competence, knowledge, and skills to deliver telerehabilitation. Interviews were conducted at the conclusion of the student's placement and were between 19 to 40 minutes in duration. Audio recordings were transcribed verbatim using a professional transcription service and stored confidentially on the University's research database management system.

Semi-structured interviews (Appendix A) were conducted with students by an experienced qualitative researcher (MHR). The interview guide was developed and refined by the research team who has extensive experience across clinical education (AW, LJ), telerehabilitation (AH, TR) and qualitative research methodology (MHR, NH, AH). Demographic data were collected online (www.qualtrics.com) following the interview.

### C *Analysis*

A thematic conceptual content analysis of interview transcripts was performed using NVivo software (NVivo qualitative data analysis software, 2012) which is designed to support the organisation and analysis of qualitative interview data. The preliminary coding protocol for content analysis was developed by one researcher (MHR) and refined collaboratively at regular meetings with the entire research team. This ensured the inherent knowledge and multidisciplinary nature of the research team was utilised, and all pertinent insights and relationships were captured. A minimum of 10% of the data were double coded (DA) at the outset to ensure credibility of the analysis prior to finalising the coding protocol and systematically analysing the data. All authors contributed to generation of final themes and interpretation of the data.

Qualitative analysis occurred concurrently to data collection, which ceased once saturation was achieved. Study rigour was guided by Tracy (2010) who outlines eight key markers of qualitative research quality including worthy topic, credibility, significant contribution, and meaningful coherence. Reporting rigour follows the Consolidated Criteria for Reporting of Qualitative Research (COREQ) (Tong et al., 2007) and relevant markers and criteria have been addressed.

## III RESULTS

A total of 112 students who completed placements at the UQHRCs that were rapidly transitioned to telerehabilitation between March and September 2020 were eligible. Of these, 22 provided consent to be contacted and 18 (16%) participated in an interview. Student participants were aged 20 to 31 years, predominantly female (72%) and the majority were from the SP (39%) and PT (39%) disciplines, with smaller numbers of OT and AUD students (11% respectively). One student completed their telerehabilitation placement from outside of Australia, with the remainder in a metropolitan region of Australia (94%). PT students conducted consultations from the UQHRC, whereas the remainder were from home. Further detailed participant demographics are provided in Table 1. Key themes and subthemes are described under each heading (pre-conceptions, lived experiences and reflections). Additional supporting quotes for each subtheme are provided in Appendix B.

**Table 1**
**Participant characteristics (n = 18)**

| Characteristic | Subcategory | n (%) |
|---|---|---|
| Age* | | 24.1 (3.1) (20 to 31)* |
| Gender | *Female* | 13 (72.2) |
| | *Male* | 5 (27.8) |
| Discipline | *Speech Pathology* | 7 (38.9) |
| | *Physiotherapy* | 7 (38.9) |
| | *Occupational Therapy* | 2 (11.1) |
| | *Audiology* | 2 (11.1) |
| Clinic attended | *Speech Pathology* | 7 (38.9) |
| | *Physiotherapy - Musculoskeletal & Sports Injury Clinic* | 4 (22.2) |
| | *Physiotherapy - Neurological Aging & Balance Clinic* | 3 (16.7) |
| | *Occupational Therapy* | 2 (11.1) |
| | *Audiology* | 2 (11.1) |
| Region | *Metropolitan* | 17 (94.4) |
| | *Overseas* | 1 (5.6) |
| | *Regional* | 0.0 |
| | *Rural* | 0.0 |
| | *Remote* | 0.0 |
| Living situation | *Living with parents* | 7 (38.9) |
| | *Renting a room (shared accommodation)* | 5 (27.8) |
| | *Living in rented apartment* | 3 16.7) |
| | *Living in own home* | 1 (5.6) |
| | *Living in rented home* | 1 (5.6) |
| | *Other (please specify):* | 1 (5.6) |
| Internet connection | *ADSL/WiFi* | 10 (55.6) |
| | *National Broadband Network (NBN)* | 7 (38.9) |
| | *Mobile (3G/4G)* | 1 (5.6) |
| Previous experience with telerehabilitation | *No* | 12 (66.7) |
| | *Yes* | 6 (33.3) |

* mean (SD) (range)

## A *Student reflection on their preconceptions of telerehabilitation prior to clinical placement*

Students were expecting to undertake a traditional in-person placement prior to COVID-19 enforced restrictions requiring the transition to deliver consultations via telerehabilitation. In response to this change, students reported concerns and considerations across four broad themes. These high-level themes were represented through several sub-themes.

1 *Theme: Clinical effectiveness*

Students reflected that prior to placement they were concerned about *performing accurate assessments*, *delivering effective interventions via telerehabilitation* and *quality of care*. Across all disciplines, these concerns were primarily related to how to modify in-person assessment and treatment approaches to a telerehabilitation model. For example, with regard to modifying standardised assessment

> …a very common language assessment that requires pictures and pointing, would be hard to do over Zoom, so that was one concern. (SC077)

Additional concerns from physiotherapy students included the inability to perform 'hands-on' assessments and interventions, for example:

> …there's also a lot of physical treatment involved…Another part would be manual therapy and massage and taping, as part of treatment. Obviously, that's very difficult to do. (SC028)

In terms of *quality of care*, students' perceptions prior to commencing placement were mixed. Overall, SP students appeared to be confident that they would be able to deliver quality care via telerehabilitation, for example

> I knew that telehealth definitely works because we've had lectures about it and there's the whole telerehabilitation clinic actually set up and running. So I knew it definitely did work. (SC076)

Students from other disciplines were less sure about the *quality of care* they would be able to provide via telerehabilitation. These concerns were related to the efficacy of telerehabilitation compared to in-person consultations, for example

> I didn't have any real expectations since it was my first time, but I had doubts that it might have been not as effective as a face-to-face…because I had literally zero experience and no expectations, I was neutral but I had major doubts…especially with complex patients." (SC056)

> …even in a clinic setting, [audiology patients] sometimes have difficulties hearing or understanding. I was really worried because first, I have an accent, and delivering through the computer, the electrical sound is not something that you're familiar with, especially for people with hearing aids... (SC075)

2 *Theme: Interacting and communicating with clients via telerehabilitation*

Students across each discipline expressed concerns about *interacting and communicating with clients via telerehabilitation*. These concerns were related to two main subthemes, *being able to build rapport* and *keeping clients engaged*. Students were unsure how rapport building would occur via telerehabilitation and felt that it may be more difficult to build a therapeutic relationship via a screen rather than during in-person interactions. For example

> I think because a big thing about OT and our values is the rapport building process and developing a therapeutic relationship with our clients…I was most worried about how that would be conveyed through a screen. (SC035)

Some students provided insight as to why they did not think it would be as good as in-person, and these reasons included it being "awkward via Zoom" (SC065) and due to the inability to properly "read body language" (SC080).

Many students, particularly those managing paediatric populations, expressed concerns about *keeping clients engaged* during telerehabilitation consultations. For example, one student was concerned

> …because my clients were fairly young…Keeping three and four-year-olds engaged in tasks in person is somewhat difficult at times. (SC024)

This was usually related to the physical distance between the student clinician and the client, for example

> …my main concern was how to get them (the paediatric client) to do what you want them to do without being there, and not being able to provide that same hands-on assistance readily. (SC026)

Students were also concerned about keeping clients with behavioural difficulties engaged during telerehabilitation sessions (Appendix B).

3 *Theme: Technology*

Students reflected on concerns they had about *technology* prior to placement. These concerns were related to perceived *technical ability* and *technical issues* they may face during telerehabilitation consultations. Students were primarily concerned about the *technical ability* of the clients they would be managing, particularly when these were older clients who may be less familiar with telerehabilitation platforms. For example,

> I was a bit worried about seeing older clients…I didn't know how well they would go with the whole telerehab program. (SC020)

Many students felt confident in their own technical ability, for example,

> I was already familiar with the platform…So I felt like it would be okay, I suppose there's always a little bit of hesitation around if the users on the other end will be able to work the technology, being a little bit new. (SC026)

This was not always the case, and some students expressed concerns about their own ability:

> I had a concern that I wasn't technologically savvy enough…I wasn't sure that I'd be able to know the system, that I would be able to cope if things went sideways. (SC082)

> Students who did not feel confident in their own technical ability were more worried about how they would be able to help their clients with technological issues. One student was concerned they would not know what to do "…if the computer doesn't work…or if they don't know how to turn the video on…all those technological problems, internet connection, and what if I don't know what to do...". (SC075)

Students expressed feeling additional 'nervousness' about their telerehabilitation placement due to *technical issues* that they may encounter during consultations and how these difficulties may interfere with delivering effective therapy. Despite some nervousness they expected with any clinical placement, with telerehabilitation, students felt

> it was more so the fear that the technology would stop working and I wouldn't be sure what to do…I was in control of the session, so I had to be sharing the screens…making sure that this worked and then if they didn't what would I need to do. (SC076)

Students were also concerned that technical issues may interfere with their ability to deliver effective therapy, for example,

> …in terms of internet or technological issues…it's quite plausible that my activities weren't going to work because they might not have access…I just thought there would be a few technological hiccups…that would prevent effective therapy. (SC024)

4 *Theme: Anticipation about a telerehabilitation placement*

Students expressed *anticipation about their telerehabilitation placement* which was related to three intersecting subthemes: *feeling uncertain*, *feelings of positivity* and *feeling prepared*. Many students said they felt *uncertain* about how to deliver therapy via telerehabilitation and relayed anxiety or nervousness about whether telerehabilitation would work and what it would look like because it was new.

> I wasn't entirely sure because I was a student, I had a little bit of uncertainty…I've never worked in this field before, so that's probably an added layer of complexity. I've never done telerehab before, I suppose I didn't really have any expectations walking into it, but I knew it was something that was done…in the beginning, there was a lot of the uncertainty of what was I going to have to change and adapt in that moment to work with a family. (SC026)

Despite this uncertainty, students were largely positive about their telerehabilitation placement. Many students described feeling "excited though to try it out" and "interested to have a go" (SC007) (refer to Appendix B). While for most, anticipation about the rapid transition to a telerehabilitation placement was positive, two students recalled feeling frustration and disappointment about the prospect of a telerehabilitation placement (see Appendix B).

Overall, most students felt they were well *prepared* by their clinical educators and clinic managers. Key factors students described as helping them to feel prepared included: watching recorded sessions, demonstrations and being provided with telerehabilitation training modules and resources. For example,

> …we watched a video of a previous student delivering a Telehealth session, I think that kind of…built a picture for us of what it would be like coming into it…I was quite happy with how UQ prepared me, and what resources they had available for the sessions…I think I was well equipped with resources and assessments. (SC035)

Conversely, some students did not feel prepared for their telerehabilitation placement. Lack of time to prepare due to the immediacy of COVID-19 restrictions was a significant factor. One student said

> Definitely not, no…There wasn't much preparation at all…I learned a lot and I'm very glad…but I think there could have definitely been more preparation…except we are also in the middle of a global pandemic, so I understand why there wasn't. (SC082)

Limited clinical educator familiarity with telerehabilitation was also identified as contributing to students' feelings of preparedness:

> My clinical educator hadn't really had much experience doing telehealth. So, we were all working through it together which was fine, but obviously if I'd had a [clinical educator] that had a lot of experience with tele, I might have been somewhat more prepared. (SC024)

### B *Student experiences of telerehabilitation during clinical placement*

The participants' experiences of delivering consultations via telerehabilitation during clinical placement were nested under four key themes, similar to those identified prior to their clinical placement, yet with distinct differences in lived experience.

#### 1 *Theme: Clinical effectiveness*

Student experiences of clinical effectiveness during telerehabilitation placements were related to four subthemes: performing assessment, delivering intervention, client outcomes and improvement and quality of care.

Students reported that performing *accurate assessments* via telerehabilitation was especially difficult, and even more so when these were standardised assessments. For example,

> …we did sort of like elements of standardised assessments, so they were a bit informal. But we realised, as a whole, it wouldn't work to do some of the standardised assessments, as a whole over tele, and then it wouldn't produce meaningful results. (SC026)

For PT students, difficulties with performing accurate assessments included not being able to effectively observe deficits through a camera and relying on clients to perform palpation, neurological assessments and manual muscle tests on themselves, and to relay meaningful information to the student clinician:

> Measuring differences in range of motion…even with power and manual muscle tests it was just a bit hard because…those things have been validated as tools where someone else is doing them…you don't know how reliable the information you're getting is. (SC020)

Other difficulties with assessment included having the correct equipment and resources available for motor assessments, difficulties performing language assessments due to audio quality, and creating communication opportunities due to restrictions with manipulating the environment. Students also felt that performing assessment via telerehabilitation was inferior when compared to in-person assessments. They discussed the need to *modify assessments* to be performed via telerehabilitation and their experience with this. Some students described this process as challenging, for example, "…it was actually very hard for me…to think about not having my hands on the patient" (SC031) and that they spent time "…troubleshooting how to present that stimulus with them" (SC080).

Modifications primarily included opting for functional assessments over standardised assessments. For example,

> …in clinic, I probably wouldn't have thought of doing functional tests first up, but over telehealth…I think a functional test is a really important thing that you definitely need to do…to really get an idea of how someone's presenting... (SC031)

With these modifications, some students felt they were able to perform more accurate assessments via telerehabilitation:

> … we did a lot more…functional assessments rather than standardised assessments because [they] were a bit too challenging to deliver over Zoom…functionally, we could still look at how the child was playing…their gross…and fine motor skills…But it was a bit challenging to…look at it via a video. (SC026)

Students across all disciplines described difficulties *delivering effective interventions* and the need to *modify interventions for telerehabilitation*. Difficulties were primarily described in relation to techniques or interventions requiring hands-on facilitation (e.g., applying joint glides, massage and proprioceptive facilitation), applying or adjusting external devices (e.g., strapping tape, hearing aids) and play-based learning. For example

> …people with really bad back pain and neck pain…there was a lot of muscle spasm and they weren't getting much relief from other forms of therapy…manual therapy might have been more indicated. (SC020)

Modifications to interventions included increased parent coaching, self-massage and taping, greater reliance on functional activities (opposed to standardised outcomes), and focusing on advice, education, and exercise prescription (refer to Appendix B). Students had mixed perceptions regarding the effectiveness of modifying their approach, with many describing modified interventions as being inferior to those they would deliver in-person. For example, "…you can do self-massage, to some extent, but again, it's just never going to be as good." (SC028)

Overall, most students felt that client outcomes and improvement were approximately the same as would be expected with in-person consultations. Students felt "…people definitely improved over the time. Across the board, probably about the same." (SC020)

Students acknowledged that despite modifying their approach to delivering care (for example, using equipment readily available in the client's home or training parents to provide instructions) and adjusting client goals, clinical outcomes were achieved because clinical reasoning remained the same.

> I think because the activities…weren't that different to what I would be doing…face-to-face. The base of the activities, the reasoning behind them, were all the same clinical reasoning that I would provide face-to-face. It was just they were slightly modified for them to do at home, or I had to change my delivery of the activities, so the instructions were coming from the parent, not me. I think the activities and the intent behind them was the same…. (SC026)

> Similarly, most students perceived they were able to deliver the same quality of care via telerehabilitation. Particularly when assessment and treatment did not differ greatly (or have to be modified) from the approach that would be taken in-person. For example, "… the advice and education…and the exercises, they're delivered to a quality…the same as they were face-to-face." (SC056)

Some (fewer) students felt that limitations of telerehabilitation in terms of physical distance did not allow them to provide care that was of equivalent quality (see Appendix B).

2 *Theme: Interacting and communicating with clients via telerehabilitation*

Experiences interacting and communicating with clients via telerehabilitation were embedded around three subthemes; building rapport, communicating via telerehabilitation, and keeping clients engaged.

Student experiences with building rapport were mixed. Although some students felt their approach was different compared with in-person, they did not perceive differences in their ability to develop rapport across the modalities. For example,

> …it's a good way to get to know someone…it's kind of the same as face-to-face…all my patients, I think have built a pretty good rapport with them, regardless of them being telehealth or face-to-face. (SC031)

Alternatively, some students found developing rapport challenging via telerehabilitation. Many challenges related to inability to complete activities frequently used for rapport building (e.g., playing games on the floor with children) or feeling they missed non-verbal cues as they were

unable to visualise the client's whole body. For students who found developing rapport difficult in-person, it was increasingly challenging via telerehabilitation. For example,

> …I initially had issues with building rapport face-to-face as well. So, doing it via tele was even more difficult…I think it did affect building rapport negatively, or at least influence it… (SC056)

Similarly, student experiences with *communication* varied. Some students found they were able to communicate with clients effectively via telerehabilitation and did not perceive differences in their communication style compared with in-person sessions. Some students even felt that their explanations were enhanced through the use of technology to supplement their instruction:

> …I could explain things much clearer over Zoom than in person…I used PowerPoint slides a lot, so I was able to show them the instructions visually, with pictures, simple words, and using animations... (SC077)

Conversely, some students found verbal and non-verbal communication (e.g., maintaining eye contact) more challenging. PT students found giving verbal instructions more challenging over video, as they were unable to use their body language, tactile facilitation, or physical demonstration in the client's environment to supplement their verbal instructions (refer to Appendix B). Students reflected on modifications they made to facilitate effective communication with clients, for example, using clearer verbal cues or practicing giving instructions (see Appendix B).

Particularly with paediatric clients, *keeping clients engaged* was challenging for many students. Students found it difficult and at times frustrating to maintain the attention and engagement of children via the screen due to not being physically present and able manage the child's attention, particularly when clients were in their own homes with more distractions:

> The only concern that arose…is when children often became disengaged, it was hard to bring them back to the screen because they could just run off…Whereas in a clinical environment, they can't just run out of the room, they're sort of limited and restricted in the area. (SC026)

3 *Theme: Practical aspects of delivering telerehabilitation*

Experiences with the *practical aspects of delivering telerehabilitation* were related to two subthemes: *additional time and administration* and *the environment*. Students reported *additional time and administration* was largely related to emailing clients or parents prior to and post-consultations. For consultations with children, students relied on greater parental involvement to assist in preparing resources, games, and toys for successful consultations. For example,

> There was a lot of emailing back and forwards, which added to your workload…instead of setting up the environment and having the child come in, you'd have to email the mum, ask them to prepare certain toys and games…that created extra admin time, and you really had to consider that in your session planning, which then made it longer and more difficult. (SC081)

The client *environment* was a key practical consideration for students when delivering services via telerehabilitation. Students found it difficult when clients did not have access to sufficient *resources* or physical space to complete specific tasks and identified that it may have been beneficial to spend more time supporting clients to *set up their home environment for rehabilitation* (see Appendix B). Due to safety concerns, some students did not challenge their clients over telerehabilitation in their home environment as much as they would have in-person. For example,

> It just comes back to the limitation of telehealth, not able to put hands on, not able to challenge the client…we do tend to tune down the difficulty a bit so that they are safe... (SC027)

Students identified a number of *limitations related to not being in the same physical space as their clients.* In SP, articulation therapy was at times difficult due to sound quality. Other students reported limitations associated with being unable to observe the client in "real-life" situations (e.g., the classroom or a coffee shop, as is generally done in SP clinic). PT students found it challenging that they were unable to palpate or provide hands-on treatment

> …there's certain limitations, being able to correct someone's movement or getting hands-on with facilitating the correct movement that you want. (SC054)

Overall, students recognised the *benefits of conducting therapy in the client's own environment*. Students said clients felt more comfortable in their own homes, and for some, telerehabilitation facilitated greater parental involvement. It also allowed activities to be more functionally relevant and practical

> …I really liked it because it was contextually relevant for the client, so they were using objects that they would use at home, and they were in a familiar environment. (SC026)

For some students, their own *environment* was also difficult to configure adequately for a telerehabilitation consultation, with small numbers finding it challenging to find a suitably quiet place to conduct consults when not in the University clinics.

4 *Theme: Technology*

Student experiences with *technology* in telerehabilitation delivery were related to eight key subthemes. Many students commented on the *ease of use of telerehabilitation software,* and this was influenced by the fact that many clients and students were already familiar with the Zoom platform prior to commencing. Some students reported using a wider range of resources in their consultations and found resource development more efficient than relying on paper-based resources

> I felt tele was just so effective and efficient in terms of making resources and activities and games that were fun and easily interactive." (SC076).

Conversely, as many students were accustomed to using paper-based resources, some found using or modifying resources that work with telerehabilitation time consuming: "…it was more of planning activities that could work over Zoom and then using online resources..." (SC035) and "…what didn't work was fetching resources…I spent a lot of time finding resources that were suitable (SC082).

Given that many were already familiar with the Zoom platform, very few students reported software issues and concerns, beyond getting the link to work and reminding clients to check their emails pre-consultation (see Appendix B). Hardware issues and concerns related to client awareness of which technology to use for their consultations; for example, clients who had difficulty participating in their PT consultations as they were wearing wired headphones, or SP clients who connected via an iPhone. Some students also noticed differences with client interaction when using functionalities such as "share screen," depending on whether the client connected via an iPad compared to a desktop or laptop (refer to Appendix B).

Although few students commented on image quality, the key issue with video related to camera positioning for the client. Students across disciplines reported having difficulties being able to see their whole client, whether it was for observing movements in PT, breathing in SP, or handwriting in OT. For example.

> …the quality of the video was fine…I think it was more of the angle that it was positioned…it was sometimes hard to see the performance of the client, but it was nothing to do with the quality... (SC035)

Students were able to instruct clients to move the camera to facilitate consultations, although some recalled difficulties when the client was using a fixed camera (e.g., an iPad or built-in webcam).

Students experienced technological challenges related to audio issues, most often a result of connection issues resulting in poor sound quality, lagging and difficulty hearing the client (see Appendix B). Audio issues had the potential to interfere with therapy, and students recalled at times modifying their communication style to facilitate the consultation. This included speaking more loudly to compensate for client speaker volume, longer pauses to account for latency, increasing detail included in explanations and instructions, or to "…alter the way we were communicating…using short, sharp sentences" (SC020).

Students became adept at troubleshooting to resolve technical issues, either on the student or client end through use of the chat function in Zoom, supplementing the consultation with a phone

call and emailing a list of workarounds to clients prior to consultations (Appendix B). Issues with technology did not tend to result in significant disruption to consultations

> …give them a call and talk them through what to do over the phone…majority of time that would be enough. (SC056)

### C *Student reflections on telerehabilitation upon completion of placement*

Student reflections following telerehabilitation clinical placements were related to five key themes and represented through several sub-themes.

1 *Theme: Experiencing telerehabilitation as a student in a global pandemic*

Students described mixed experiences of learning a new clinical area and telerehabilitation concurrently, during a global pandemic. Students recalled being concerned about telerehabilitation:

> …I was less confident because there were a lot of other things that I need to care about. My internet connection…their internet…I just couldn't focus on what I need to do as a student audiologist... (SC075)

They were also concerned about additional stress and pressure due to multi-tasking and performing assessments and treatments for the first time while simultaneously using telerehabilitation technology for the first time. For example,

> …it was just hard because it was the very first time…I was doing intervention and assessments that I'd never done before, and I was also doing telehealth for the first time… (SC081)

Conversely, many students reflected on their experience positively and described enjoying it

> …I did really enjoy this placement and I had fun… (SC076)

They reflected on the benefits of the opportunity to deliver therapy via telerehabilitation and the implications for entering their profession as a new graduate:

> I would consider myself really, really lucky to have gotten this telehealth experience because this is definitely something I know not every student gets… (SC076) and

> …it's just been a good opportunity…it will be great entering the profession, having had some telehealth experience…it's a growing area and it's here to stay…I value having the learning opportunity. (SC081)

2 *Theme: Benefits of technology and telerehabilitation*

Students discussed the *benefits of combining and incorporating technology* into their telerehabilitation consultations. The perceived benefits for clients included facilitating *engagement and enjoyment* through interactive games and activities. For example,

> …just having that interactive component of an online activity was very engaging…I think that helps build the relationship. (SC035)

> …I felt like there was some really fun games that you could play over telehealth that you couldn't do [in-person]…through power point, all the special-effects that you can do or online games… (SC080)

Benefits of incorporating technology for students to *facilitate their learning* included ease of recording *audio*/video samples, reducing volume of paper-based resources and in planning and preparation for consultations. For example,

> I liked that there was less paper to deal with on an administration end…easy to carry resources around, just on a USB stick…You were able to make personalised resources quite easily, just over PowerPoint. (SC080)

3 *Theme: Convenience for clients*

Students perceived telerehabilitation to be more *convenient for clients*, particularly for those who were at risk/vulnerable, lived a distance away from the University, had busy schedules and those who were anxious about attending in-person (see Appendix B). For example,

…parents said they preferred telerehabilitation because it meant they didn't have the travel…worry about calming their person down on the way home…two clients I was seeing are on the [autism] spectrum…they found it more calming to do the video than in-person. (SC082)

4 *Theme: Thoughts about the future*

Many students would have *preferred to deliver in-person consultations*. Preference appeared to be dependent on the complexity of the presentation or patient cohort, for example,

…for non-complex patients, I'm willing to continue to provide telehealth consults. But with complex patients, I prefer a face-to-face consult. (SC031)

Students were receptive to *using telerehabilitation in a hybrid model in the future*, but this was also contextual. Students expressed that they would be happy to consider using telerehabilitation under certain circumstances, including in a mixed-model of care; when paediatric clients were older, for non-complex clients, when consultations were 'reviews' or 'check-ups' and if that was what the client would prefer. For example,

I probably would consider it as…a mixed model of care…if you'd seen them in clinic and then you're following up over tele-rehab…they live in a rural area or they're not easily accessible…Or it's just easier for them to receive early rehab in the home. Particularly when they've got a home exercise program that they need to implement there…I think it's definitely something I'd consider as part of my practice. (SC020)

5 *Theme: Knowledge, skills and confidence following placement*

Overall, student reflections suggested that *knowledge, skills and confidence to deliver telerehabilitation improved* following the experience of a telerehabilitation clinical placement:

I feel like my skills have definitely improved tenfold…and my confidence as well, which I think is a big part of it… there is definitely always learning opportunities, and no one is ever fully equipped…but I definitely feel like I've dipped my toes in, and it's been a really, really good experience, and I'm glad I've done it and…I feel way more informed now than I did at the start... (SC076)

Students reflected on their telerehabilitation skills separately from their clinical skills:

…you're never going to be perfect as a student clinician…if I had to compare my clinical skills and my telerehab skills, I think my telerehab skills are quite good… what lets you down is a lack of maybe clinical experience or clinical knowledge, not the fact that you're using Zoom… (SC081)

A small number of students did not feel as though their confidence, knowledge or skills improved following their placement, and these aspects appeared to be related. That is, when students did not feel as though their clinical knowledge and skills had improved, they did not feel confident in their ability to deliver telerehabilitation consultations (refer to Appendix B).

Across all disciplines, improvements in knowledge, skills and confidence appeared to be *contextual*. Students' perceptions about their own *confidence, knowledge and skills* to deliver telerehabilitation were dependent on, and specific to, the complexity, population and/or clinical area of the clients they were managing while on their current placement. For example,

…there are certain conditions that I'd be quite confident with…other conditions…the really complex ones, I definitely don't think that I would feel confident trying to approach those… (SC020)

…it depends on caseload…I've only had experience with paediatrics over tele, I think with paediatrics I'd be confident…other age groups and other clients it would be different…I don't think I'd be as confident. (SC035)

## IV DISCUSSION

This is the first study to explore allied health students' experiences of a rapid transition to a telerehabilitation model of service delivery in response to COVID-19 in university student-led clinics at three time points along the adoption process. Despite initial anticipation and concerns about effectiveness, communication and technology, students in this study were able to rapidly transition to telerehabilitation and effectively deliver quality care, make modifications to

assessment and treatment techniques, and achieve positive client outcomes. Student skills, knowledge and confidence improved with rapid exposure to telerehabilitation and learning on the go, and many indicated willingness to continue to use telerehabilitation in the future, albeit preferably in a hybrid model.

Student experiences of telerehabilitation under "normal" circumstances have been reported in the literature. Recent literature demonstrates that student experiences of telerehabilitation are positive, particularly regarding students' ability to obtain varied clinical experiences, experience different learning approaches and to develop new skills (Bridgman et al., 2018; Serwe et al., 2020). In our study, students were excited to try telerehabilitation, appreciated the benefits of combining technology and telerehabilitation, and enjoyed learning and using telerehabilitation as an additional 'tool' in their toolkit. Noting the changing landscape for providing health services in response to COVID-19, students felt experience in telerehabilitation would be useful for them when entering the workforce, and some reported feeling lucky to have had the experience and opportunity. Clinician acceptance is reported to be the key factor on the successful uptake and operation of telerehabilitation (Brewster et al., 2014), and students' willingness to engage in the service following graduation is a positive sign for the future of telerehabilitation.

Students identified the benefits of completing a telerehabilitation placement in terms of developing their skills. Knowledge, skills and confidence prior appeared to be dependent on year level, discipline and level of exposure and training received in undergraduate coursework. In SP, students reported feeling confident in the use of telerehabilitation with their clients due to information provided to them in academic coursework. This is consistent with the structure of the academic programmes at UQ, where SP students are exposed to telerehabilitation as a mode of service delivery earlier and more consistently than students in other programmes (33% of students in this sample had some prior experience with telerehabilitation), such as PT. Notwithstanding, knowledge, skills, and confidence delivering telerehabilitation improved with exposure and experience throughout the clinical placement for students across all disciplines. Students felt better prepared to incorporate technology into their rehabilitation sessions and deliver services via telerehabilitation in the future. Research investigating readiness to adopt telerehabilitation technologies demonstrates that education and hands-on experience can positively influence students' perceptions of telerehabilitation (Nissen & Brockevelt, 2016) and that overall, students are receptive to using telerehabilitation in the future (Glinkowski et al., 2013).

Across all disciplines, students acknowledged the benefits of telerehabilitation for many of their clients. In addition to enabling greater access to rehabilitation (Bull et al., 2016) while maintaining physical distancing (for those who were vulnerable from a virus transmission perspective), students identified benefits of telerehabilitation which are consistent with previous research. Convenience, from travel, cost and time perspectives, (Brewster et al., 2014; Cottrell, Hill, et al., 2017) and the ability to contextualise rehabilitation to the client's own home or work environment (Signal et al., 2020) were most commonly discussed. In addition to these benefits, students also felt they were able to deliver effective rehabilitation, achieve positive client outcomes, and deliver care that was of equivalent quality to in-person rehabilitation. This is consistent with systematic reviews showing that telerehabilitation can provide similar outcomes for clients when compared to rehabilitation delivered in-person (Cottrell, Galea, et al., 2017; Dario et al., 2017; Jiang et al., 2018; Regina Molini-Avejonas et al., 2015; Weidner & Lowman, 2020).

While perceptions and reflections of telerehabilitation were predominantly positive, students reported areas of concern that may be useful to understand to facilitate future adoption of telerehabilitation. Students across all disciplines described concerns about communicating and interacting with clients, and about managing technical and practical issues associated with telerehabilitation prior to commencing placement. These concerns are consistent with those previously reported in the literature (Bridgman et al., 2018; Rutledge et al., 2017; Serwe et al., 2020). Prior to hands-on experience with, or education about telerehabilitation, students' perceived challenges include a lack of knowledge about benefits, types, and use of telerehabilitation, technology errors, and upkeep of technology (Nissen & Brockevelt, 2016). Consistent with findings from this study, direct exposure to telerehabilitation changes students'

perceptions including an increase in knowledge (Serwe et al., 2020) and changes in attitudes and impressions, including seeing the value and benefits of telerehabilitation (Randall et al., 2016; Rutledge et al., 2017).

Concerns about technology and the practical aspects of delivering telerehabilitation were reported across all disciplines. While most students were confident in their own technical ability, they expressed concerns about client technical ability, and reported challenges around camera positioning and modifying therapy to fit a telerehabilitation model. These challenges were more discipline specific; for example, PT students reported additional barriers in relation to the lack of hands-on therapy and client safety, whereas SP and OT students delivering care to paediatric clients identified client engagement as their biggest concern. These are challenges that even experienced clinicians report when engaging with telerehabilitation (Akamoglu et al., 2018; Cottrell et al., 2018).

Previous research has identified that students engaging in telerehabilitation experience communication issues related to technology, struggle with the added complexity involved in client interactions, and find it more difficult to establish rapport with clients when compared to an in-person model (Randall et al., 2016). Students in this study were similarly concerned about their ability to develop rapport over a screen prior to their clinical placement, especially when they were unable to read their client's body language or use tactile cues to aid their verbal instructions. In contrast to previous research where clinical educators observed that students had difficulties establishing rapport via telerehabilitation (Overby, 2018), in this study, student perceptions of their own ability to establish rapport and develop effective therapeutic relationships upon completion of clinical placement were positive.

The findings of this study provide some key recommendations for student-led clinics wishing to establish or increase their delivery of telerehabilitation services. Firstly, curricula should embed teaching on both theoretical and practical components of telerehabilitation into the pre-clinical years of their programmes. This should include training manuals and videos, hands on experience using the technology, opportunities for demonstration and simulation (including in standardised patient models), troubleshooting tips, strategies for optimising communication, clinician and client resources (i.e., digital troubleshooting guides, information handouts), and clinical strategies for modifying traditional approaches to assessment or treatment to fit a telerehabilitation mode of delivery. Additionally, modifications to standardised assessments or assessments that traditionally require physical contact should be made. Services should also ensure they have access to appropriate infrastructure, such as adequate equipment and technology, including for clients of the service. In the development of these resources, services should consider the learning needs of their students, as adequate training and preparation of students prior to their clinical placement is key to ensuring optimal student success (Grace & O'Neil, 2014).

### A *Limitations*

Generalisability of the findings of this study is limited by several factors. First, results reflect the perception of students at one University in Brisbane, Australia, and mostly represent the opinions of the student groups in SP and PT (with limited representation from AUD and OT) who had varying pre-clinical exposure to telerehabilitation. The small sample size is also a consideration. It should be acknowledged that these are the perceptions of students who did not elect to participate in a telerehabilitation model of clinical education, and as such there is likely to be little bias in the sample.

## V CONCLUSION

Allied health students were able to rapidly transition to a telerehabilitation model of service delivery and despite initial concerns, were able to deliver therapy they perceived to be of equal quality to traditional in-person models of care. Students effectively modified assessment and management approaches and achieved client improvements. Knowledge, skills, and confidence

improved with exposure and experience, and these students report willingness to incorporate telerehabilitation in their future practice, most likely in a hybrid model.

## References


Akamoglu, Y., Meadan, H., Pearson, J. N., & Cummings, K. (2018). Getting connected: Speech and language pathologists' perceptions of building rapport via telepractice. *Journal of Developmental and Physical Disabilities*, *30*(4), 569-585. https://doi.org/10.1007/s10882-018-9603-3

Allied Health Professions Australia. (2020). *Media release: Expansion of COVID–19 telehealth measures to include more MBS allied health services*.

Barriball, K. L., & While, A. (1994). Collecting data using a semi-structured interview: a discussion paper. *Journal Advanced Nursing*, *19*(2), 328-335.

Brennan, D., Tindall, L., Theodoros, D., Brown, J., Campbell, M., Christiana, D., Smith, D., Cason, J., & Lee, A. (2010). A blueprint for telerehabilitation guidelines. *International Journal of Telerehabilitation*, *2*(2), 31.

Brewster, L., Mountain, G., Wessels, B., Kelly, C., & Hawley, M. (2014). Factors affecting front line staff acceptance of telehealth technologies: A mixed-method systematic review. *Journal of Advanced Nursing*, *70*(1), 21-33.

Bridgman, K., Pallathil, K., Ford, N., Tran, J., Lam, D., Wee, W., & Kefalianos, K. (2018). Attitudes and experiences of SLP students from a pilot telehealth stuttering clinic. *Journal of Clinical Practice in Speech-Language Pathology*, *20*(1), 14-20. https://speechpathologyaustralia.cld.bz/JCPSLP-March-2018/16/

Bull, T. P., Dewar, A. R., Malvey, D. M., & Szalma, J. L. (2016). Considerations for the Telehealth Systems of Tomorrow: An Analysis of Student Perceptions of Telehealth Technologies. *JMIR Med Educ*, *2*(2), e11. https://doi.org/10.2196/mededu.5392

Cottrell, M. A., Galea, O. A., O'Leary, S. P., Hill, A. J., & Russell, T. G. (2017). Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: A systematic review and meta-analysis. *Clinical Rehabilitation*, *31*(5), 625-638. https://journals.sagepub.com/doi/10.1177/0269215516645148?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed&

Cottrell, M. A., Hill, A. J., O'Leary, S. P., Raymer, M. E., & Russell, T. G. (2017). Service provider perceptions of telerehabilitation as an additional service delivery option within an Australian neurosurgical and orthopaedic physiotherapy screening clinic: A qualitative study. *Musculoskeletal Science and Practice*, *32*, 7-16.

Cottrell, M. A., Hill, A. J., O'Leary, S. P., Raymer, M. E., & Russell, T. G. (2018). Clinicians' perspectives of a novel home-based multidisciplinary telehealth service for patients with chronic spinal pain. *International Journal of Telerehabilitation*, *10*(2), 81.

Dario, A. B., Cabral, A. M., Almeida, L., Ferreira, M. L., Refshauge, K., Simic, M., Pappas, E., & Ferreira, P. H. (2017). Effectiveness of telehealth-based interventions in the management of non-specific low back pain: A systematic review with meta-analysis. *The Spine Journal*, *17*(9), 1342-1351.

Dias, J. F., Oliveira, V. C., Borges, P. R. T., Dutra, F. C. M. S., Mancini, M. C., Kirkwood, R. N., Resende, R. A., & Sampaio, R. F. (2021). Effectiveness of exercises by telerehabilitation on pain, physical function and quality of life in people with physical disabilities: A systematic review of randomised controlled trials with GRADE recommendations. *British Journal of Sports Medicine*, *55*(3), 155. https://doi.org/10.1136/bjsports-2019-101375

Glinkowski, W., Pawłowska, K., & Kozłowska, L. (2013). Telehealth and telenursing perception and knowledge among university students of nursing in Poland. *Telemedicine Journal and e-Health*, *19*(7), 523-529. https://doi.org/10.1089/tmj.2012.0217

Grace, S., & O'Neil, R. (2014). Better prepared, better placement: An online resource for health students. *Asia-Pacific Journal of Cooperative Education*, *15*(4), 291-304. https://eric.ed.gov/?id=EJ1113558

Gray, L. M., Wong-Wylie, G., Rempel, G. R., & Cook, K. (2020). Expanding qualitative research interviewing strategies: Zoom video communications. *The Qualitative Report*, *25*(5), 1292-1301. https://doi.org/https://doi.org/10.46743/2160-3715/2020.4212

Green, T., Hartley, N., & Gillespie, N. (2016). Service provider's experiences of service separation: The case of telehealth. *Journal of Service Research*, *19*(4), 477-494.

Hui, K. Y., Haines, C., Bammann, S., Hallandal, M., Langone, N., Williams, C., & McEvoy, M. (2021). To what extent is telehealth reported to be incorporated into undergraduate and postgraduate allied health curricula: A scoping review. *PLOS ONE*, *16*(8), e0256425. https://doi.org/10.1371/journal.pone.0256425

Iacono, T., Stagg, K., Pearce, N., & Hulme Chambers, A. (2016). A scoping review of Australian allied health research in ehealth. *BMC Health Services Research*, *16*(1), 543-543. https://doi.org/10.1186/s12913-016-1791-x

Jiang, S., Xiang, J., Gao, X., Guo, K., & Liu, B. (2018). The comparison of telerehabilitation and face-to-face rehabilitation after total knee arthroplasty: A systematic review and meta-analysis. *Journal of Telemedicine and Telecare*, *24*(4), 257-262.

Kairy, D., Lehoux, P., Vincent, C., & Visintin, M. (2009). A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation. *Disability and Rehabilitation*, *31*(6), 427-447. https://doi.org/10.1080/09638280802062553

Mair, F. S., Hiscock, J., & Beaton, S. C. (2008). Understanding factors that inhibit or promote the utilization of telecare in chronic lung disease. *Chronic Illness*, *4*(2), 110-117.

Nissen, R., & Brockevelt, B. (2016). The effect of education on student perceptions about telehealth. *International Journal of Health Sciences*, *4*(4), 5-10. https://doi.org/https://doi.org/10.15640/ijhs.v4n4a2

Overby, M. S. (2018). Stakeholders' qualitative perspectives of effective telepractice pedagogy in speech–language pathology. *International Journal of Language & Communication Disorders*, *53*(1), 101-112. https://doi.org/https://doi.org/10.1111/1460-6984.12329

Randall, K., Steinheider, B., Isaacson, M., Shortridge, A., Byrd, S., Ciro, C., Ross, H., & Loving, G. (2016). Measuring knowledge, acceptance, and perceptions of telehealth in an interprofessional curriculum for student nurse practitioners, occupational therapists, and physical therapists. *Journal of Interactive Learning Research*, *27*(4), 339-353.

Regina Molini-Avejonas, D., Rondon-Melo, S., de La Higuera Amato, C. A., & Samelli, A. G. (2015). A systematic review of the use of telehealth in speech, language and hearing sciences. *Journal of Telemedicine and Telecare*, *21*(7), 367-376.

Russell, T. G. (2009). Telerehabilitation: a coming of age. *Australian Journal of Physiotherapy*, *55*(1), 5-6. https://doi.org/10.1016/s0004-9514(09)70054-6

Russell, T. G., Buttrum, P., Wootton, R., & Jull, G. A. (2011). Internet-based outpatient telerehabilitation for patients following total knee arthroplasty: A randomized controlled trial. *Journal of Bone and Joint Surgery (American Volume)*, *93*(2), 113-120. https://doi.org/10.2106/JBJS.I.01375

Rutledge, C. M., Kott, K., Schweickert, P. A., Poston, R., Fowler, C., & Haney, T. S. (2017). Telehealth and eHealth in nurse practitioner training: Current perspectives. *Advances in Medical Education and Practice*, *8*, 399.

Scott Kruse, C., Karem, P., Shifflett, K., Vegi, L., Ravi, K., & Brooks, M. (2018). Evaluating barriers to adopting telemedicine worldwide: A systematic review. *Journal of Telemedicine and Telecare*, *24*(1), 4-12.

Serwe, K. M., Heindel, M., Keultjes, I., Silvers, H., & Stovich, S. (2020). Telehealth student experiences and learning: A scoping review. *Journal of Occupational Therapy Education*, *4*(2), 6.

Signal, N., Martin, T., Leys, A., Maloney, R., & Bright, F. (2020). Implementation of telerehabilitation in response to COVID-19: Lessons learnt from neurorehabilitation clinical practice and education. *New Zealand Journal of Physiotherapy*, *48*(3) 117-126.

Teherani, A., Martimianakis, T., Stenfors-Hayes, T., Wadhwa, A., & Varpio, L. (2015). Choosing a qualitative research approach. *Journal of Graduate Medical Education*, *7*(4), 669-670. https://doi.org/10.4300/JGME-D-15-00414.1

Theodoros, D., & Russell, T. (2008). Telerehabilitation: Current perspectives. *Studies in Health Technology and Informatics*, *131*, 191-209. https://www.ncbi.nlm.nih.gov/pubmed/18431862

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, *19*(6), 349-357.

Tracy, S. J. (2010). Qualitative quality: Eight “big-tent” criteria for excellent qualitative research. *Qualitative Inquiry*, *16*(10), 837-851.

Wade, V. A., Eliott, J. A., & Hiller, J. E. (2014). Clinician acceptance is the key factor for sustainable telehealth services. *Qual Health Res*, *24*(5), 682-694.

Wade, V. A., Taylor, A. D., Kidd, M. R., & Carati, C. (2016). Transitioning a home telehealth project into a sustainable, large-scale service: A qualitative study. *BMC Health Services Research*, *16*(1), 1-10.

Weidner, K., & Lowman, J. (2020). Telepractice for adult speech-language pathology services: A systematic review. *Perspectives of the ASHA Special Interest Groups*, *5*(1), 326-338. https://doi.org/10.1044/2019_PERSP-19-00146

## Appendix A

**Interview guide**

| |
|---|
| What discipline are you from? |
| Prior to your first telerehabilitation consultation |
| How did you feel the consultation would go? |
| Did you receive adequate information to prepare for the first consultation? |
| Thinking back to your telerehabilitation sessions. In general… |
| From a technical perspective: What worked and what didn't work? |
| From a treatment perspective – what worked / what didn't work? |
| What did you like about providing care via telerehabilitation in the home? |
| What did you dislike about providing care via telerehabilitation in the home? |
| What would you have changed about the interaction? |
| Did you have any concerns about any aspect of the consultation? What were these? |
| Do you feel the consultations helped your clients? If so do you think they improved more / less / same as if you had an in-person consultation? Why do you think this? |
| Do you have any suggestions to make the service better? |
| If you have previously completed an in-person clinical placement, do you feel you were able to deliver the same level/quality of care via telerehabilitation as you would have in an in-person consultation? |
| Do you feel like you needed additional training in order to have provided a better service via telerehabilitation? If so, what elements of training do you think would have been helpful? |
| Now that you have provided telerehabilitation service, how would you rate your skills to deliver care in this way? |
| Now that you have provided telerehabilitation service, how would you rate your knowledge to deliver care in this way? |
| Now that you have provided telerehabilitation service, how would you rate your confidence to deliver care in this way? |
| Would you like to provide services via technology in the future? Why / why not? |
| What would you have changed in order to have been more prepared to deliver a telerehabilitation service? |

## Appendix B

**Key themes and subthemes generated during qualitative analyses with supporting quotations**

Participants are identified by participant number (i.e., SC020).

| |
|---|
| **A) Student reflection on their pre-conceptions of telerehabilitation prior to clinical placement** |
| **Theme 1: Clinical effectiveness** |
| *Performing accurate assessments* |
| I'm thinking that would be the hardest part of it, especially because, in the normal musculoskeletal assessment you're getting someone to change positions a lot and wanting them lying down or on a plinth or positioned a certain way and just worrying that we wouldn't be able communicate, effectively, with them to get the right assessment. (SC020) |
| That not being able to have a feel of doing – not able to do palpation or any sort of manual therapy, a looked-down thing at first, but it was mainly because I wasn't aware of the sort of patient profiles that were presenting at the clinic… Not being able to have a have a look from different angles and whatnot, and again that manual palpation and manual therapy side of things, that was concerning me initially. (SC056) |
| *Delivering effective interventions via telerehabilitation* |
| I think maybe the treatment session, because if it's over telehealth, like if someone needs some glide, it's really hard to do some self-glide or use a TheraBand or use the belt with the glide, if they're not there if you, if that makes sense. (SC031) |
| *Quality of care* |
| I knew of telehealth from my previous subjects, and an assignment I did on telerehab and aphasia intervention, all the studies seemed very positive and had good outcomes and showed that you can do it effectively. So I thought…why would it be any different for me. (SC081) |
| So we are still applying the same knowledge, but what I felt before was, I felt like a whole, a big part of what I can do as a physio student or physio, whatever it is, is taken away by not having the chance to be physically there. So because what I perceive is a lot of times physio, we do a lot of things hands-on so that might differ from other Allied Health perspectives or – well, I know OTs do a lot of hands-on as well, but at a different stage. So that's what I felt from my aspect for physio, because we do a lot of hands-on. And with telehealth, if we can't do hands-on, then I feel it is quite hard to do it and that's why I felt good care might not be available for the client before I had one. (SC027) |
| **Theme 2: Interacting and communicating with clients via telerehabilitation** |
| *Being able to build rapport* |
| I was quite nervous because I wasn't sure I'd be able to connect with the child or with the parent in being able to read body language… I was definitely nervous about my ability to connect to them as a student and without the tips and tricks for a speech pathologist. (SC080) |
| It's very important to bond with the client, to build a good rapport. But during the Zoom, it's very awkward. (SC065) |
| *Keeping clients engaged* |
| And then also just interacting with the client, I was a bit sceptical that they were going to be engaged with it, versus just hearing my voice and my face through a computer. (SC032) |
| I was very nervous because I often have this like – I guess this stigma with telerehabilitation was that it was harder, especially because I was working with the paediatric population, like harder to engage and I guess feeling a little distance and not there in the moment. That was – yeah, that was all prior. (SC076) |
| I guess another concern would be behavioural difficulties, so if in the session there's a child who has behavioural or attention difficulties, just how to manage that because it's easier to manage it when you are physically with the child. But it's a bit hard, like in my session once the child stands |

| |
|---|
| up, I can't even see their faces. If they walk away and it's gone like I've lost them from the screen. So that was a concern, yeah. (SC077) |
| **Theme 3: Technology** |
| *Technical ability* |
| But some of the older people, they are not very good with technics, so they don't use Zoom if there's a call. When you call, I can't see your lips and they can't see my face. So a lot of information is missing, it's not very effective to communicate in this way…But in the first Zoom meeting, I was so nervous and myself, I was not very familiar with Zoom myself. (SC065) |
| The patients are generally, like, older – older than just the general population. So I was really worried about what happened – what if the computer doesn't work for them or if they don't know how to turn the video on…all those technological problems, internet connection, and what if I don't know what to do, and, you know, like, certain situations that are not expected. (SC075) |
| *Technical issues* |
| Things not working technically. So like it disconnecting or video not working, microphone's not working. Other than the technical side of things, it was just mainly the technical things and then being able to see what the patient's doing and have them set up the camera correctly for me to be able to see that. (SC032) |
| I guess I was feeling very nervous for those and then additionally with the technology, praying it would work for me and then if something were to go wrong on their end, would I be able to explain how to help them from their end when I'm not seeing what they're seeing.<br>I was nervous about placement, but that would have been in any ordinary placement with clients. But in terms of specifically telehealth, I think it was more so the fear that the technology would stop working and I wouldn't be sure what to do and organising myself, because obviously I had all the resources on my computer and I was in control of the session, so I had to be sharing the screens, making sure I had these open, making sure that this worked and then if they didn't what would I need to do. (SC076) |
| **Theme 4: Anticipation about a telerehabilitation placement** |
| *Feeling uncertain* |
| I think it's more like with the uncertainty…So with how to actually perform those aspects and also I guess one thing is, what else is a concern, just over with – I guess the most concern is that unfamiliarity before doing one, because it's more like a new thing for me. (SC027) |
| I was honestly really nervous that I wouldn't be able to run therapy sessions. I was very nervous, I didn't feel secure. (SC082) |
| *Feelings of positivity* |
| I was excited though to try it out. I think just because this year with COVID and everything, like there seems to be a lot of talk about tele, and so I was interested to have a go at trying it out. But I didn't really know what to expect with it, do the online module on Blackboard, beforehand, yeah. So that was kind of a good general introduction, some very general tips, but other than that, no, not many thoughts or feelings, apart from getting excited for the opportunity. (SC077) |
| I guess, even disappointed to have received a telerehabilitation placement. (SC020) |
| I was a bit frustrated because, first, I didn't have any idea of the tele-rehabilitation itself and, second, I just didn't know how it's going to happen because what we've been doing, it was mostly practical at the clinic, and then it suddenly changed to something technological and something's really different method – I mean, the method has been just changed. So I was just depressed because I didn't expect to do anything, that was my first – I mean, expectation towards tele-rehab, yeah. (SC075) |
| *Feeling prepared* |
| In preparation to the first consultation session I had, in our orientation weeks, we watched a video of a previous student delivering a Telehealth session, and I think that kind of framed or built a picture for us of what it would be like coming into it. I think because I'm more of a visual learner, I think having that video demonstration of a previous student prepared me a lot because, for my placement, we had a two week orientation that was just introducing us to the clinic, and also |

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| introducing us to tele. But I think that video demonstration helped a lot. I wouldn't say I felt fully prepared, but I do feel like I was ready to begin tele.<br>I think I was quite happy with how UQ prepared me, and what resources they had available for the sessions…I think I was well equipped with resources and assessments and things like that… I don't think more training would have been necessary. I think because as a fourth-year student, I have the knowledge to adapt to the telerehab service. I think if this was my first placement, I think it would have been a lot more difficult, I guess, and more training would have been required. But as a fourth-year student, I think it was fine for me. I think I was prepared enough for my first session. (SC035) |
| Definitely not, no…There wasn't much preparation at all. The preparation we got was 'this is the platform, do a Zoom meeting with your friend, play around with the settings, practice with a friend or a family member and we will update you as we go.' I learned a lot and I'm very glad that I learned a lot, but I think there could have definitely been more preparation than there was, except we are also in the middle of a global pandemic, so I understand why there wasn't much preparation. (SC082) |
| **B) Student experiences of telerehabilitation during clinical placement** |
| **Theme 1: Clinical effectiveness** |
| *Performing assessment* |
| It didn't work so well for — things like stroke patients, it was really difficult for me to see the deficits. Some things in the gait, you just don't notice whatsoever in tele-health. And some of those clients then came in person over the next couple of weeks… And then it was immediately obvious looking at them in person, that there was some deficit there. (SC032) |
| Because initially, obviously, every one of us were learning for a face to face consult, initially. So it was actually very hard for me at the first place, to think about not having my hands on the patient. (SC031) |
| Like speech, was fine with the surveys but just kind of troubleshooting how to present that stimulus with them, I think it was best when it was on like a PowerPoint or something, directly on the screen rather than through the document cam video. It was just more engaging I guess by colours, et cetera. (SC080) |
| I think functional testing is something that's really important in telehealth, for example, a single squat when they have SIJ. Usually, when they have glute med weakness. But whereas in clinic, I probably wouldn't have thought of doing functional tests i first up, but over telehealth, because you couldn't do much as anyway…I think a functional test is a really important thing that you definitely need to do via telehealth, to really get an idea of how someone's presenting... (SC031) |
| *Delivering intervention* |
| Where taping is, sort of, indicated as a good first line form of treatment…it would have been really helpful, I think, for some patients. And teaching them to self-tape, just, you know you weren't quite getting the same results. Same with some people with really bad back pain and neck pain. And you could just see that there was a lot of muscle spasm and they weren't getting much relief from other forms of therapy. And that was, maybe, when manual therapy might have been more indicated. (SC020) |
| Sometimes you can ask them to do self-massage, but a lot of the time you'd just have to give — you couldn't really — you can't really — you just have to say, you can come in for a session if you want to have manual therapy, but it's not necessarily a vital part of management all the time. (SC028) |
| Like you can do self-massage, to some extent, but again, it's just never going to be as good. (SC028) |
| So I think that treatment technique that we have been giving to patients were mainly exercise and provide some education and some kind of massaging trigger point and some kind of cold or heat therapy. Yeah, not really any passive technique, I would say. (SC031) |
| I think we were able to still deliver really family-centred interventions, but also I think our intervention changed slightly because through tele-rehab it relied a bit more on us conversing with the parents, and having them be more involved in the therapy. So there was a lot more parent coaching, as well as intervention with the child. (SC026) |

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| You definitely had to make adjustments in terms of everything. It was difficult for younger kids, like two year olds, it was definitely all parent coaching…<br>You just kind of said hi and just tried to I guess show pictures over the screen. You weren't really able to engage with it, but it was kind of support for parents.<br>I guess generally it was comprehensive in most cases but for some clients like the younger one where you do the parent coaching, it felt like an absence when you weren't able to give them a model of how you would build on their speech in play…build on their language in play. So I guess that felt like there was an absence there, giving them that full model to support their learning.<br>I don't think it's changed what I've chosen to target, because you've been able to target that generally. Just with an adjusted kind of – activities or approach. Yeah, it's just mainly that parent coaching and with those younger kids where you've missed some areas I guess. (SC080) |
| *Client outcomes and improvement* |
| Yeah, I do [feel like the consultations helped my clients]. Definitely. And I think there were many clients who it would have been more helpful having a tele-rehab appointment than it would have been if they did come in face to face.<br>But in this way, they were getting — they were having to do their own exercise program, having to do their own things. And people definitely improved over the time. And yeah, we actually saw a lot of people, yeah, getting better and doing their exercises.<br>Across the board, [clients improved] probably about the same [as face to face]. Yeah. I mean, obviously there were some that improved more, some that didn't. So yeah, I think, on average, about the same. (SC020) |
| Once I got to the end and looked back it was — I realised that they had made the progress that they needed to make.<br>I think they improved the same amount. I just think that if it was in person that improvement would have come along a bit quicker. (SC024) |
| I think from a telehealth point of view, it would be comprehensive, because there is a limit to things that we could do with telehealth. But I think most of my patients, even though we didn't put hands on them, but they do come back with improved results. So I think it would be a pretty comprehensive treatment.<br>So I think most of my clients come back in the next appointment with improvement. So I definitely think telehealth could give a similar result as the face to face for some clients.<br>Most of my patients via telehealth, they do come back with an improvement. Even though we kept them on telehealth for the past few weeks, like for those few weeks…they have been making progress and I think they could probably get the same results, even though like, regardless if they're coming in or not. (SC031) |
| *Quality of care* |
| I think I could give the same level of care. So, in terms of exercising, prescriptions and also, advice and education, I think that…would be identical, regardless of being telehealth or face-to-face. (SC031) |
| …probably not to the same level quality of care… (SC020) |
| **Theme 2: Interacting and communicating with clients via telerehabilitation** |
| *Building rapport* |
| I didn't feel like telehealth posed a barrier for me to build rapport. Like if I were to compare it with my inpatient experiences, I don't think there would be any difference in that. (SC054) |
| I actually thought it was quite good [building rapport]. Yeah, that was like an aspect that it wasn't too hard… for the most part, I think, people embraced the experience and you were still able to build relationships. And I think it helped that we were seeing a lot of people quite consistently. Maybe more so than was totally necessary or that you would see them in a normal private practice setting, when they were paying for the appointments. But because they were essentially free for the patient, there was — yeah, we were seeing them quite often so we could build a relationship. (SC020) |
| That was something my CE mentioned I was really – had a knack for, and I find that I do. In face-to-face intervention as well I really am comfortable in building rapport, and so I felt – I thought that tele would impact that but it like – my expectations went out the water. Like I really, really did enjoy building rapport with the clients, and I thought it was really, really easy to do that. So, yeah. Yeah, no difficulties I would say. (SC076) |

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| But quality of care, yeah, sometimes, based on personal preference and how I think the rapport and relationships with patients, would probably be — I think it just translates a bit better in person… And that rapport building's a little bit easier in that environment. Especially when you're much more able to pick up on visual cues and things like that. (SC020) |
| I think that [building rapport] was one of the major challenges for me personally, because I initially had issues with building rapport face-to-face as well. So doing it via tele was even more difficult for me. Again, not having that face-to-face environment, I think it did affect building rapport negatively, at least influence from my perspective. But again, after you see a patient once, you fairly have a good idea of who they are, what they want to achieve and how to approach them as well. After a session or two, it was easy, but maybe it's because of them being them being familiar with you and your face and whatnot. But compared to face-to-face, it was a bit difficult.<br>I think my personality, as a student practitioner at least, is more suitable for face-to-face. Again, that building rapport aspect of things, I felt like it could have been easier and quicker as well if I were seeing them face-to-face<br>(SC056) |
| But when you do, we want to build the rapport, it feels much more natural to talk face-to-face. Because telehealth means she can't see my face, I can't see her face, so we can't see each other's body language and to talk, or something like that. (SC065) |
| The thing that I really enjoyed in the clinic before was I just – building a rapport with the patient and in order to build the rapport with the patient you need to see them and then you – in real life and then you just get – you just feel more how they really feel about the session and how they feel about you in the real setting. It's easier to see their reaction than – rather than just having the conversation through the monitor, because they don't – yeah, all the behavioural thing, like, body language and stuff, it's pretty much – it's so limited through the computer because the only thing you see is just a half of the body. So yeah, I think that's what I was really worried, yeah, around the rapport building and stuff. (SC075) |
| I had a delay on reading non-verbals because some aspects of what they were doing, I couldn't facilitate in-person. Anyway, so I think that the bits that were missing in telerehabilitation that I can do better in-person are establishing rapport quicker and maintaining it easier, reading non-verbals quicker and maintaining those easier. (SC082) |
| *Communicating via telerehabilitation* |
| …you have obviously your ability to communicate and verbally instruct patients but once you take out your ability to say correct the movement by hands and facilitate like that, then I think you're limited on that communication and that patient's ability to do the thing by just verbal cueing. Verbal cueing works to a certain degree with some people but then you kind of hit a wall when someone can't do anything. (SC054) |
| I think that the good about providing care with telerehab is that actually I feel like that I'm a little bit more confident with talking then like, over telehealth. (SC031) |
| I think telerehab really challenges your communication skills because you have to be very explicit in what you're saying because they're only getting a basic form of communication with limited gestures and that in-person experience. So I found that a lot of the time I had to communicate more of what I wanted them to do or if I was thinking because it was a bit awkward because there was a bit of a delay over Zoom…<br>I found that I've had to explain when I was thinking and pausing because it wasn't as natural over technological medium, so it can sometimes appear a bit non-responsive to clients on the other end. That was one of my biggest challenges. (SC026) |
| Only that the communication aspect becomes a lot more challenging over Zoom because I think you need to be a lot more literal and explicit in your explanations….And maybe just being a bit clearer in instructions because you're not able to as easily model what you're doing over telehealth as you could in real life. (SC026) |
| I think for me, probably change a little bit more of my – probably get a little bit more prepared about my instructions of the exercise, because previously, with face-to-face consults, it's easy that you demonstrate the exercise to the patient, so they actually know…So in that way, you need a better communication or explanation skills. So I think that's something that I needed to improve on, in order to have a more efficient telehealth consult. (SC031) |
| I think telerehab really challenges your communication skills because you have to be very explicit in what you're saying because they're only getting a basic form of communication with limited |

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| gestures and that in-person experience. So I found that a lot of the time I had to communicate more of what I wanted them to do or if I was thinking because it was a bit awkward because there was a bit of a delay over Zoom.<br>Only that the communication aspect becomes a lot more challenging over Zoom because I think you need to be a lot more literal and explicit in your explanations.<br>I found that I've had to explain when I was thinking and pausing because it wasn't as natural over technological medium, so it can sometimes appear a bit non-responsive to clients on the other end. That was one of my biggest challenges. (SC026) |
| *Keeping clients engaged* |
| …it got really frustrating, at times, with a couple of my clients. Just because they would be distracted by things in their own home environment. So keeping them on task was a lot of effort. And by the end of the session you'd just be exhausted because you'd spend half the time trying to keep them engaged, rather than just being able to focus on the intervention. (SC024) |
| one of my clients, he had a lot of attention and behavioural difficulties. He can't sit still for too long and he's not – like it's harder for him to get him to engage with you on the screen. So for him, I modified the entire assessment in a sense where – I mean I still kept it as standardised as possible, but the format that I delivered it was not as you would normally do it because what I did was basically make everything into a game format. (SC077) |
| **Theme 3: Practical aspects of delivering telerehabilitation** |
| *Additional time and administration* |
| I know for one session I wanted to do – I'd told the parent what games and things were appropriate for doing practice sessions with, and I was relying on them to have that available for the session, and they didn't. So then I lost the opportunity, because we didn't have something to use for the practice session. And so then, because they hadn't seen an example, they didn't feel comfortable, and just decided that they wouldn't start implementing the treatment. (SC081) |
| *The environment* |
| I think it just comes back to the limitation of telehealth, not able to put hands on, not able to challenge the client in a setting that they are safe but still challenging. Often times for telehealth we do tend to tune down the difficulty a bit so that they are safe. Basically, what we think about in a telehealth session is the exercise have to be safely done for the client independently. Whereas in face-to-face, we can challenge them into a – maybe difficulty can be one supervision, or one light assist and then we can slowly press them back to try an independent – maybe just try some independently or just wean off the – I guess with the assistance. And then so that's why I think there's a difference. (SC027) |
| I really liked it because it was contextually relevant for the client, so they were using objects that they would use at home and they were in a familiar environment. Yeah, but I also liked how the parents were there, as well, or at least one parent, just because parents when they come in for face-to-face sessions, they're not always involved. (SC026) |
| Because you're unable to do anything other than – verbally directing them, like you're not going to have hands to replace any of their movements. All you can do is give a visual demonstration and verbal correction…But there's certain limitations like being able to correct someone's movement or getting hands on with facilitating the correct movement that you want. (SC054) |
| **Theme 4: Technology** |
| *Ease of use of telerehabilitation software* |
| I felt tele was just so effective and efficient in terms of making resources and activities and games that were fun and easily interactive. (SC076) |
| Using or modifying resources that work with telerehabilitation |
| I disliked that we had to make so many new resources and that, yeah, you had to make new resources, couldn't use the physical ones that we're used to using face-to-face. (SC080) |
| So a lot of the resources I had just weren't going to work out of a video, and it's frustrating a little bit because – what worked was having everything online. What didn't work was fetching the resources. I spent a lot of time finding resources that were suitable. (SC082) |
| *Software issues and concerns* |

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| I didn’t have too many, but there were a couple of times where Zoom would crash or it would just quit suddenly… A few times where the code didn’t work. You just had to set it up again, but no major technical issues that I have experienced. (SC026) |
| So what we do for Zoom is send a Zoom link and then the client joins at the assigned time. Some of the time the client just did not check. (SC027) |
| I think there were a few missed like zoom links or like the email didn’t arrive, which I think was the blanket for quite a few people at the start. (SC080) |
| *Hardware issues and concerns* |
| I guess, not necessarily just with the software at hand but sometimes it was, apparent, using a phone and it would be moving around as a speech pathologist, you need to be able to see the child’s mouth and really hear what they’re saying. So sometimes, we couldn’t really hear whether the child had made a sound or not, especially if it was, I guess, a soft sound. So we had to check in with the parent if they did make that sound correctly. But, overall, we definitely worked around all the hiccups. There was nothing that stopped us from doing what we needed to do. (SC024) |
| If patients has headphones in that was always, straight up, you knew that wasn't going to work…I think it'd be okay if they had air pods or wireless headphones. But a lot them were attached to their computer so when you wanted them to go and move them into a position or see something from a certain angle, they would just yeah, they, obviously had to disconnect the headphones or some of them would try and keep them in if they had a lot of noise and that, kind of, wouldn't work. (SC020) |
| Because the clients were on iPads, they found it really difficult to like click and drag things on those PowerPoints or interact with those PowerPoints, which was difficult. So you had to consider for the skills they had on iPads versus the skills that were on laptops and like who could – who could interact with your slides, well in the screen that you were sharing. (SC076) |
| *Video concerns* |
| I guess the quality of the video was fine…I think it was more of the angle that it was positioned at, it was sometimes hard to see the performance of the client, but it was nothing to do with the quality of the video or anything like that. And if not, like if I couldn’t see their handwriting, I would just say, “Could you please pull it up to the camera a bit closer.” So I could see, so it was fine. (SC035) |
| …of course the camera, the change in the camera angle could be an issue, but it's more with on client side. We can't really change it. So if they're using an iPad instead of a computer, then setting up an angle could be hard. (SC027) |
| And then I guess for some things, like with one client, we were trying to teach him diaphragmatic breathing, and it could be a little difficult while he was sitting, to view his upper body, to see if he was doing correctly, because you couldn’t see his stomach, for example, so you had to rely on him putting his hand on his stomach and then saying, oh, yes, it’s expanding or… (SC081) |
| *Audio concerns* |
| Sometimes if it was really bad audio, we would have to, kind of, just end the call and then contact them via e-mail and ask them, even to call back on a different device. Because a lot of people they have a computer or a phone or other things like that. And that happened a few times where they could switch devices and get a better connection or better quality audio, yeah. (SC020) |
| If they had a lot of background noise or a poor connection, it really affected what was going on. Especially if there was a lag in the audio. I remember having a few consults like that and every time you went to speak they were, still, answering your last question. And yeah, so that made it quite tricky.<br>Sometimes if they just have, like, a really bad wi-fi connection…we basically just had to work through it and, kind of, alter the way we were communicating a little bit. Just using short, sharp sentences. (SC020) |
| Occasionally there was a bit of lag. So, as in you'd say something and then it would come through 10 second or so later on the other end… The audio was always clear, it just occasionally lagged. (SC032) |
| *Connection issues or concerns* |
| In terms of a technical perspective, I don’t think I ran into many issues with the technology. Well, on my behalf, I didn’t. Sometimes the client, maybe the internet would cut off or such like the iPad |

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| heating up, so they exit the Zoom meeting for two minutes and then come back. But that was easily resolved because most of the parents that I was dealing with were quite tech-savvy, so they understood how to fix the technology issues. (SC035) |
| Particularly at the start, I'm not sure what setting it is, but one of them – we missed maybe two, two and a half sessions because of Internet connection problems and reduced visual quality of my video of them, and reduced audio quality on both ends, was really slow. (SC080) |
| I had to run an audio-only session because the connection was that bad– that happened a couple of times and that's incredibly hard. It's manageable but it's difficult, especially when you're trying to test receptive language. (SC082) |
| I just found it very stressful and all of the technical difficulties where the audio would sometimes not work, the video was lagging, sometimes clients just couldn't connect and they would get really stressed and then the time is almost up. I had three clients that I had to take down my clinical hours for on my sheet because they were consistently late, because they couldn't figure out the tech and something had gone wrong. And it's not their fault, it was just the situation. (SC082) |
| *Troubleshooting* |
| Yeah, so we usually just used the chatbox sometimes, if we couldn't hear them. Like if their mic was turned off, you could just use the chatbox, quickly type in what I wanted to say and that was a quick way to resolve any issues we had. Or we'd just call them, otherwise. We could talk them through how to resolve any issues… Just to talk them through or talk the parents through how to resolve any issues they were having. (SC026) |
| Just take them through step-by-step process, just asking them what they're experiencing, so what they're seeing on the screen and whatnot. If they can't connect at all, give them a call and talk them through what to do over the phone, and the majority of time that would be enough. (SC056) |
| But sending an email home was really helpful because we just kind of listed things that they could try and fix, like yeah, okay, have this all set up before next session. So I'd make it so he can see his whole face, try and reduce the glare from the window with a curtain, troubleshoot any Internet connection problems and there was a document that they could refer for that, but I don't think they needed to. (SC080) |
| **C) Student reflections on telerehabilitation upon completion of placement** |
| **Theme 1: Experiencing telerehabilitation as a student in a global pandemic** |
| I just emotionally felt that I was less confident because there were a lot of other things that I need to care about. My internet connection problem, their internet connection problem and there's another person involved in the session, assistant, I mean, she helped a lot, but, still, when there are more than – multiple things that I need to care about, I just couldn't focus on what I need to do as a student audiologist especially. (SC075) |
| I think it was just hard because it was the very first time, so I was doing intervention and assessments that I'd never done before, and I was also doing telehealth for the first time. So I think with time you would get better at it, and things would just go more smoothly. I don't think there's anything specifically that I could have done differently, really, except just giving myself or having more time.<br>… you're never going to be perfect as a student clinician, but I think, if I had to compare my clinical skills and my telerehab skills, I think my telerehab skills are quite good… what lets you down is a lack of maybe clinical experience or clinical knowledge, not the fact that you're using Zoom, most of the time… (SC081) |
| **Theme 2: Benefits of technology and telerehabilitation** |
| I liked that there was less paper to deal with on an administration end, and I guess yeah, more easy to carry resources around, just on a USB stick. It felt very neat. You were able to make personalised resources quite easily, just over PowerPoint. So maybe it took a bit of time but like it was quite useful and clear, so for literacy rather than writing things out.<br>… I felt like there was some really fun games that you could play over telehealth that you couldn't do [in-person]…through power point, all the special-effects that you can do or online games, like dress a bear or something like that. Just stuff you can't – well, you could do, but you'd probably choose to do something more physical. That you could write notes without it being so distracting to a parent, that you could have notes and yeah, you could have notes and play with the child and do the activities, but it didn't really distract how you interacted. (SC080) |

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| I feel like because – I definitely feel like the – even just like the use of iPads and technology in a classroom – not in a classroom, in face-to-face sessions, using online games and online resources, is something that I never really considered before with face-to-face because I'd also thought print, paper-based, so they can touch, feel that they can play with these resources, but actually like games on iPads and everything like that can be really, really helpful for kids because obviously this generation is growing up in more and more depth to technology and so they enjoy it. They do enjoy iPads and they see it as a reward, and like activities on the iPads as rewards, which I just, like I said, never really got through my head. So I think it has changed my practice in that I'll probably be incorporating more technology based like apps and games and activities in face-to-face sessions. (SC076) |
| I liked making PowerPoint slides, just because I actually realised like before Tele I've never thought of using PowerPoint slides for therapy, and I never think of bringing my laptop and showing kids a PowerPoint presentation. But I realised that's actually really beneficial, as I mentioned before, for giving instructions, but also in teaching concepts. You can add so many pictures on PowerPoint and include effects like animations and stuff that are really sometimes very helpful in teaching them new concepts, but also that I realise in spending the time to create the PowerPoint slides that it forces me to think through very thoroughly about how I intend to introduce this idea to teach this concept. Whereas in-person you might have an idea like this is what you want to cover in a session, and this is how you want to do it like you have a plan, but when you actually get to the nitty-gritty of saying it or teaching it, you realise that yeah, and even when I was writing the PowerPoint slide, you realise that there's actually a lot more thought you need to put into how best to start introducing it? How do I continue from there the sequence of teaching something? Making PowerPoint slides as teaching slides or activity slides really forces you to have that thorough planning so that I felt that my lessons were a lot clearer. I myself was very prepared for each session like I didn't need to be in presentation mode, in a sense, like I already was familiar enough with my slides knowing what I would be talking about next, and exactly how I want to teach something. Yeah, so I felt that was really good (SC077) |
| What worked really, really well, was being able to easily record conversation samples for fluency, and being able to, for one client, where we were doing the Lidcombe Program, she was feeling a little unsure about what to do, because English was a second language. And so we were able to just record the entire session, upload it to – I think it was like OneDrive or something, and then she was able to share the entire session with her husband, who couldn't be there. (SC081) |
| **Theme 3 Convenience for clients** |
| Yeah, so I think telerehab's really good for people who live rurally and can't necessarily travel to clinical placements as often. Or maybe people who are a vulnerable population as well, especially with COVID happening at the moment. I think it's been a good way to maintain people being able to still participate in their therapy. But also time, as well; it's less time consuming for people to just log onto a telerehab session and not have to travel. (SC026) |
| I guess I'm feeling it from the client's perspective so, if they don't have the luxury to come every week, maybe they are far from Brisbane metro or just whatever reason and having a telehealth session to keep them exercising and keep just pretty much – yeah, have a physio session with them.<br>Having something is better than having nothing and what I like with telehealth is, with some of the I guess more able clients, again they do not have to come. So for some of the – say, we have got some Parkinson's clients, if they are quite mild then sometimes the dose or the exercise that we can provide in a telehealth session is effective enough for them. (SC027) |
| I think the benefit – the next benefit is the safety, health and safety, because you know, the reason why we did that was just for us – I mean, to us, it was because of the COVID virus, and it was good that both I and patient didn't need to worry about the virus infection and stuff. I mean, it was very – I feel still safe to deliver the tele-rehabilitation session<br>I also thought that because the patient – there were some patients living really far from us. So yeah, distance is something that they thought would be very convenient, yeah, but, yeah, in terms of distance or safety and health, yeah, that would be the – definitely the advantage of having tele-rehab. (SC075) |
| And I think it even worked better for some of my clients, because some of them were busy uni students, so I think particularly for that cohort of people it's very convenient to be able to just jump on a computer and get the information or the therapy that they want, and then jump off, versus coming in to campus. (SC081) |

| **Theme 4: Thoughts about the future** |
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| So that's something that I can put on my resume, that's something that I can use in the future if I need to use it or when I need to use it. Or even if it's just more appropriate for children who live too far away to come into clinics. So I'm really happy with that, yeah, and just playing around with the different options and, kind of, working outside of the box to come up with different ideas, I think, was enjoyable for me… I think I would love to just have that [telerehabilitation] as an option. Especially with some of the older kids that are more likely to be able to sit down and pay attention to you. So yeah, I think I definitely would, and I would definitely love it to be an option. (SC026) |
| Yes, I think, because some clients find it more beneficial than face to face. I think where appropriate it should definitely be integrated into our care… I think just some clients themselves said that they found it more helpful doing it over tele-health. And I think we should be giving those clients that option. Not forcing them down the route of face to face, because that's what we prefer. We should be doing the client-centred care, asking them what they would like to do. Which one they're finding most beneficial for them. And then giving them that option. (SC032) |
| I think I definitely want to [provide services via technology in the future]. I think it's so beneficial for people where travelling is a barrier for them or for us to access them. And also in our current situation and even like I said, I feel that PowerPoint slides are great, like I may even consider doing it in-person sessions. So I definitely feel there are many benefits of Tele that you don't really see in--person. You don't realise when you do in-person until you actually do a Tele placement, and so I definitely think I will want to continue. (SC077) |
| **Theme 5: Knowledge, skills and confidence following placement** |
| I only have done a limited amount of time with telehealth, so there are definitely things that I'm not sure how to change up – change up from the original version of the test or the original version of the treatment component. So I think I'm still lacking in a little bit of the knowledge on how to – actually lacking in a moderate amount of knowledge on how to really deliver an extremely efficient telehealth. (SC031) |
| I think it depends on the caseload because I've only had experience with the paediatrics caseload over tele, I do think with paediatrics I'd be confident. But I think with other age groups and other clients it would be different and I don't think I'd be as confident. (SC035) |
| I guess there are certain conditions that I'd be quite confident with. But other conditions, like the really complex ones, I definitely don't think that I would feel confident trying to approach those, especially when you've got multiple hypotheses and then not improving over time. I still wouldn't be confident with that but with simple presentations and just, sort of, the basic musculoskeletal conditions with a pretty straightforward presentation, I felt really quite confident with. (SC020) |
| I would say I'd be a moderate to mediocre sort of level skilled person if it comes to telehealth, because I haven't really done a lot of assessments by telehealth. I mean, I had experience in telehealth with Parkinson's disease, strokes and TBI patients – for their specific goals. But I would probably think a person with shoulder pain would be a lot better to look – take through a session in terms of assessment and treatment. So I would say I'm sort of like a mid to lower level in terms of skill by telehealth.<br>My confidence… I would say it would be the same as my skill level. I think they go hand-in-hand to some degree. Yeah, so moderate to low level confidence… I would say I have a moderate level of knowledge like in terms of what is required to deliver treatment over telehealth. (SC054) |