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## Abstract

Clinical placements and interprofessional practice for healthcare students are often met with anxiety, unpreparedness and a lack of confidence. Whilst interprofessional simulations may address these concerns, there are gaps in the literature. This study aimed to: (i) investigate the impact of interprofessional simulations on students' perceived confidence, anxiety and preparedness for placements and their attitudes toward interprofessional practice and education, and, (ii) understand students' experiences and satisfaction with the simulation. Pre-simulation and post-simulation survey results were collected from 25 speech pathology and 25 occupational therapy graduate-entry Masters degree students from one Australian university. Quantitative data was analysed using descriptive statistics and the Wilcoxon signed-rank test while qualitative data was reviewed through content analysis. Statistically significant ($p<0.05$) improvements across students' confidence, anxiety and preparedness ratings were observed. Students' attitudes towards interprofessional practice and education revealed statistically significant positive changes on 8/10 questions and they described the simulation to be a meaningful learning experience. Results indicate that following participation in an interprofessional simulation, students' perceptions of their confidence, anxiety and preparedness for an adult inpatient hospital placement improved. Moreover, students' attitudes towards interprofessional practice and education were more positive and the experience was reported to be beneficial. Future studies could explore timing-related considerations and simulation anxiety itself.

# I INTRODUCTION

Although clinical placements are an integral part of healthcare education programs (Nyoni et al., 2021), they are often met with student anxiety which can impact on their confidence (Gilligan et al., 2014; Page et al., 2021). Clinical placement anxiety is defined by negative physiological, psycho-cognitive and psycho-emotional responses associated with placement experiences (Simpson and Sawatzky, 2020). Previous research suggests that clinical placement anxiety is significant amongst healthcare students, with as many as 84% of occupational therapy students (Kramer et al., 2004) and 76% of speech pathology students (Shorland et al., 2018) reporting such symptoms. Feelings of unpreparedness, or perceived inadequacy in training or experience, may also contribute to students' anxiety levels (Porter et al., 2013). Given that anxiety and confidence are generally negatively correlated (Goette et al., 2015), students experiencing clinical placement anxiety may also tend to feel less confident with their own ability, judgement and decisions in clinical situations. Anxiety, unpreparedness and a lack of confidence can be detrimental to a student's clinical performance during clinical placements (Cheung & Au, 2011; Porter et al., 2013). These factors should thus be carefully considered in designing the university curriculum for healthcare students.

Clinical placements are an important part of the university curriculum in speech pathology and occupational therapy programs as they play a crucial role in helping students bridge the gap between theory and practice (Davies et al., 2019; Golos & Tekuzener, 2019). Placement requirements for university accreditation differ depending on programs. Occupational therapy programs are required to provide a minimum of 1000 hours of practice placement opportunities for students to develop their clinical skills (World Federation of Occupational Therapists, 2016). These hours of placement opportunities can be provided through a combination of clinical placement and simulation experiences. Comparatively, speech pathology programs are competency-based whereby students are required to demonstrate appropriate levels of competency prior to entering the workforce (Speech Pathology Australia, 2019). Despite this difference, the commonality is that placements provide students with fertile grounds for active, hands-on learning through direct involvement in patient care (Nyoni et al., 2021) and are therefore crucial for work readiness upon graduation (Greenlees et al., 2021).

Opportunities for interprofessional practice are becoming an increasingly key area of student learning for their development as effective healthcare professionals (Naumann et al., 2021). For learning about interprofessional practice to be effective, two conditions must be fulfilled; firstly, students from two or more disciplines must come together to "learn about, from and with each other" (World Health Organization, 2010, p. 10); secondly, both disciplines must be intentionally working collaboratively towards to a shared goal, that is often maximising patient outcomes (Sibbald et al., 2020). Successful interprofessional practice is found to improve personal attitudes towards working in a team, understanding the roles of other disciplines and job satisfaction (Rosen et al., 2018). In addition, clinicians are more likely to develop better conflict management skills, share responsibility and work efficiency (Rosen et al., 2018). Finally, interprofessional practice brings about positive changes to patient safety, performance outcomes and quality of patient-centred care (Rosen et al., 2018). As such, there is an increasingly recognised need for interprofessional practice to be embedded into student curriculum (Naumann et al., 2021).

Various approaches have been developed to enhance learning about interprofessional practice. A commonly used approach is simulation learning experiences (Alfes et al., 2018), which is an educational activity utilising created scenarios to mirror realistic clinical situations (Al-Elq, 2010). Simulations provide students with an opportunity to develop their clinical skills in a safe and controlled environment (Alanzi, 2017). Interprofessional simulations occur when two or more disciplines come together to participate in a clinical scenario that is reflective of typical healthcare practice. The learning process typically includes a prebriefing phase to establish ground rules and learning objectives, a simulation phase where students actively engage with the given scenario, and a debriefing phase to guide reflection and feedback about the experience (INACSL Standards Committee, 2016). Additionally, interprofessional simulations often involve simulated

patients or actors playing the role of patients, whereby students assume the role as their treating clinicians (Curran et al., 2015). This method of learning has been found to improve various interprofessional practice competencies such as attitudes towards collaboration, shared patient education and patient-centred care (Ferri et al., 2018).

Simulations are most effective when they are underpinned by robust theories and pedagogy (INACSL Standards Committee, 2016). The constructivist theory argues that learning happens through an active process of organising and ascribing meaning to experiences, rather than passive absorption of information (Niederriter et al., 2020; Wadsworth, 1996). Simulation learning experiences provide students with a platform for active involvement in the learning process through direct interaction with the simulated patient and within an interprofessional simulation interaction with interprofessional team members. Kolb's (1984) theory of experiential learning is another theory used to guide interprofessional simulations. It is a four-step cyclical model describing how students learn through direct hands-on experience and proposes that learning occurs when a student has a concrete experience upon which they reflect (Poore et al., 2014). The reflection then triggers a conceptualisation of the experience in a novel way. This new concept can then be put to test in future clinical scenarios, which consequently generates a fresh set of learning experiences. Therefore, when simulations incorporate reflection, it is more likely that students can transfer their learning from the simulation to other environments, such as clinical settings (Husebø et al., 2015; Mayville, 2011).

There is an existing body of literature that supports the inclusion of interprofessional simulations in health professional education. A systematic review and meta-analysis by Marion-Martins and Pinho (2020) promotes the use of interprofessional simulations in enhancing various student learning outcomes and competencies. Statistically significant improvements were reported on various validated interprofessional scales and across all collaborative competencies including communication, appreciation of roles and responsibilities, taking a collaborative patient-centred approach, conflict management skills and teamwork. This was consistent with Mills et al.'s (2020) study, where undergraduate occupational therapy, speech pathology and dietetics students reported improved knowledge and a deeper appreciation of the roles of other healthcare professionals after an interprofessional simulation. Furthermore, both studies found increased student satisfaction and positive attitudes towards interprofessional education post-simulation (Marion-Martins and Pinho, 2020; Mills et al., 2020). While the positive effects of interprofessional simulations on various interprofessional practice outcome measures and student satisfaction were demonstrated, there was limited investigation of the influence of participation in interprofessional simulation on student anxiety, confidence and preparedness for clinical placements.

There is an emerging body of literature that explores confidence and anxiety in the context of healthcare simulations. Wright et al. (2020) observed a statistically significant increase in dietetic students' confidence levels upon completion of a clinical simulation involving simulated patients in an acute hospital setting. However, this study was discipline-specific and there was a significant drop-off rate which may have resulted in attrition bias. Another study by Weir-Mayta et al. (2020) found that incorporating interprofessional simulation into graduate-level speech pathology curriculum with nursing students improved their confidence and preparedness in collaborating with nurses within an acute hospital setting. However, the study had a disproportionate number of nursing to speech pathology students. As nursing students tend to have greater prior experience in interprofessional simulations than other disciplines (Marion-Martins and Pinho, 2020), over-representation by nursing compared to speech pathology students may have reduced its reliability and generalisability to other disciplines.

The current study aimed to address existing gaps in the literature by exploring student perspectives and experiences of interprofessional simulation. The aims of the study were:

1. To explore whether interprofessional simulation learning experiences support speech pathology and occupational therapy students' perceived confidence, anxiety and preparedness for clinical placement;

2. To determine the influence of participating in an interprofessional simulation learning experience on speech pathology and occupational therapy students' attitudes towards interprofessional practice and education; and
3. To understand speech pathology and occupational therapy students' perceptions and satisfaction with participating in an interprofessional simulation.

## II METHOD

A mixed-methods study with a concurrent triangulation design was used where quantitative and qualitative data were collected simultaneously using surveys conducted prior to and following an interprofessional simulation experience. Data from both methods were analysed separately, and then compared against each other. Triangulation of qualitative and quantitative data with this method allows for a more thorough and holistic understanding of the research questions (Creswell, 2014). Ethical clearance for this study was obtained from The University of Queensland Human Research Ethics Committee (approval number 2020/HE000224).

### A *Participants*

All graduate-entry Masters speech pathology and occupational therapy students enrolled in relevant courses from one Australian university were invited to participate in this study. These students were enrolled in a 2.5 year graduate-entry Masters program in either speech pathology or occupational therapy and were in their third semester of the program. Participation in this study was voluntary and informed consent was obtained via written consent forms. At the introductory lecture for each of the relevant courses in speech pathology and occupational therapy, course staff who were also members of the research team informed students of the research project and provided a participant information sheet. Subsequently, at the following learning activity in each of the courses a member of the research team not directly involved in their teaching or assessment distributed and collected signed consent forms. For those students who were not present at the time of the learning activity, a copy of the participant information sheet and consent form was emailed prior to their participation in the interprofessional simulation-based learning activity.

### B *Integration of simulation into academic coursework*

The interprofessional simulation was embedded into academic coursework for students from both disciplines. All students received prior learning regarding relevant course content specific to the interprofessional simulation. The relevant course content included knowledge of adult motor speech disorders and assessment processes (speech pathology) and occupational performance for adults with acute and chronic medical conditions (occupational therapy). Whilst participation in the interprofessional simulation was compulsory, students' clinical performance was not assessed.

### C *Preparation for the simulation*

Information relevant to the interprofessional simulation was provided to students early in the teaching semester, including a student workbook outlining the learning objectives, processes related to participation in the simulation and learning resources about the relevant assessments they were to administer. Specifically, these were the Montreal Cognitive Assessment (Julayanont et al., 2012) for occupational therapy students and an informal apraxia screening assessment for speech pathology students. The clinical case handover was provided to students one week prior to the simulation. Students were expected to individually familiarise themselves with all resources before engaging in the interprofessional simulation.

Five professional actors were recruited in accordance with standard faculty procedures and provided with two hours of simulated patient training prior to commencing the interprofessional

simulation. Additionally, the simulated patients received training in providing feedback to students. Clinical Educators (CEs) also participated in 2 hours of training prior to simulation. This training covered elements of simulation processes, provision of feedback to students, the clinical setting and case details.

### D *Simulation delivery*

The interprofessional simulation took place on university campus in a simulated ward which mimicked the specific context of an adult inpatient rehabilitation hospital. The simulated patient was a 44-year-old who had been admitted to rehabilitation after experiencing a stroke.

Five pairs of students (i.e., one occupational therapy student paired with one speech pathology student) and two CEs (one from each discipline), constituted 'one clinical group'. In the ward, CEs first prebriefed each group about the simulation process. Together, during the prebriefing time, the student pairs reviewed the documentation and discussed within their pairs and with the CEs information regarding the case. Following the prebriefing, student pairs entered the simulation and conducted a joint assessment session with the simulated patient. There was then opportunity to receive feedback from the simulated patient specifically regarding how the simulated patient felt about the interaction from the patient's perspective. The students were given time to discuss potential treatment approaches as an interprofessional pair, reflect on the learning experience and provide feedback to each other with the guide of prompting questions provided in the student workbook. Before concluding the simulation, students participated in a debrief within their clinical pairs and with their CEs to discuss their overall learning experience, key learning points and how they would transfer what they learnt to their future placements. This process is outlined in Table 1.

**Table 1**
**Outline of interprofessional simulation delivery**

| Time | Activity |
|---|---|
| **45 mins** | • Prebrief and preparation<br>• Group introduction and briefing by Clinical Educators (CEs) about the simulation experience and processes<br>• Review of documentation relating to the simulation (including clinical handover document, assessment and observation forms and manuals) within occupational therapy-speech pathology student pairs and with CEs<br>• Discussion about case and joint session within occupational therapy-speech pathology student pairs and with CEs |
| **45 mins** | • Simulation<br>• Occupational therapy-speech pathology student pairs interacted with an adult patient who presented following a stroke within an inpatient adult rehabilitation hospital setting<br>• Occupational therapy student conducted the Montreal Cognitive Assessment while speech pathology student conducted an informal apraxia screener within a joint session<br>• Opportunity for student feedback from simulated patient |
| **15 mins** | • Debrief in student pairs<br>• Discussion in student pairs about a specific and relevant treatment approach for the presenting motor speech disorder/ cognitive/perceptual impairments<br>• Peer feedback within occupational therapy-speech pathology student pairs<br>• Reflection on simulation experience in student pairs guided as by student workbook questions |
| **15 mins** | • Debrief in whole clinical groups<br>• Reflection on, and discussion of simulation experience and learning as guided by CEs in whole clinical groups<br>• Transfer discussion with students including how to transfer their knowledge and skills to future clinical placement experiences |

## E *Data collection*

Paper survey forms were distributed pre-simulation and post-simulation by a researcher not involved in the delivery of the simulation, teaching or assessment of any component of the relevant speech pathology or occupational therapy courses. The survey gathered information about students' self-reported confidence, anxiety and preparedness in working with adult clients in an inpatient rehabilitation hospital setting. The survey questions used were adapted from Hill et al.'s paper (2018) to specifically answer the research questions in this study. The Students' Perceptions of Interprofessional Clinical Education Revised (SPICE-R) tool was used to investigate students' attitudes toward interprofessional practice and education (Dominquez et al., 2015). Using a 5-point Likert scale, students rated themselves from 1 (not confident, not anxious, not prepared, strongly disagree) to 5 (extremely confident, extremely anxious, extremely prepared, strongly agree) respectively for each of the sections. Additional data about students' satisfaction and experience of the simulation were gathered post-simulation using a modified version of the Satisfaction with Simulation Experience (SSE) scale (Levett-Jones et al., 2011). Qualitative, open-ended survey questions explored the students' hopes and concerns about the interprofessional simulation during pre-simulation, what they liked most/least about the simulation experience and an opportunity for additional comments during post-simulation.

## F *Data analysis*

*Quantitative data.* Non-parametric statistics were chosen as the Shapiro-Wilks test revealed that the data was not normally distributed, $p<0.05$. Both speech pathology and occupational therapy students' data were then pooled together as distributional differences were largely statistically insignificant, as revealed by Mann-Whitney U Test, $p>0.05$. Using IBM SPSS 28.0, descriptive statistics were used to summarise the median (Md) and interquartile range (IQR) of students' pre-simulation and post-simulation ratings. Analysis of the ratings was done using the Wilcoxon signed-rank test to determine whether the difference between pre-simulation and post-simulation results were statistically significant, $p<0.05$, as this test allows for multiple comparisons between repeated data set on a single sample (Marino, 2018). Effect sizes (r) were also calculated and benchmarked against Cohen's (1988) criteria, where $r\geq0.1$ denotes a small effect, $r\geq0.3$ denotes a medium effect and $r\geq0.5$ denotes a large effect.

*Qualitative data.* Open-ended responses were analysed using content analysis process, as per Graneheim and Lundman (2004). Meaning units, which are words, phrases or sentences that identify the component of the text that carry meaning were extracted from the responses, reduced into condensed meaning units and then subsequently labelled into codes. All similar codes were grouped together into sub-categories. The final stage of this process involved grouping the sub-categories into categories. Speech pathology and occupational therapy data were analysed separately for each question and then combined together in the final step of synthesising categories from smaller sub-categories. Outliers were omitted throughout the process. Within each step of this process, a small proportion of the data was first analysed in the presence of all three researchers for accuracy and consensus. Once this was achieved, author EBT completed the remainder of the data analysis at each step. Authors AP and FP cross-checked, refined and reviewed the analysis to ensure meaningful interpretation of the data to increase data analysis rigour.

# III RESULTS

While a total of 57 graduate-entry Masters students consented to participate in this study, full data sets (i.e., pre-simulation and post-simulation surveys) were collected from 50 students, half of whom were speech pathology students (n=25) and half occupational therapy students (n=25). Participants were aged between 22 and 51 years (mean=27 years) and 49/50 were female. This gender distribution is typical of general Australian workforce data for both speech pathology and

occupational therapy (Department of Health, 2016; NSW Ministry of Health, 2018). All students reported having some prior simulation experiences.

### A *Quantitative data*

*Confidence.* Students' confidence ratings across all three sub-sections of the survey (foundation skills, information gathering skills, interaction skills) showed statistically significant improvements following participation in the simulation (see Table 2). Large effect sizes (r≥0.5) were observed on all but one foundation skills question "*Introduce yourself to an adult client*" which showed a medium effect size (r≥0.3).

**Table 2**
**Students' confidence, anxiety and preparedness ratings for working in an adult inpatient rehabilitation setting**

| Survey Item: How confident did you feel to…? | Pre-simulation median ratings (interquartile range) | Post-simulation median ratings (interquartile range) | Wilcoxon signed-rank test values | Cohen's r value | Effect size |
|---|---|---|---|---|---|
| **Foundation Skills** | | | | | |
| **Approach an adult client in a hospital or rehabilitation setting** | 3 (2-3) | 3.5 (3-4) | $z$ = -4.67, $p$ = 0.000 | 0.66 | Large |
| **Introduce yourself to an adult client** | 3 (3-4) | 4 (3-4) | $z$ = -2.62, $p$ = 0.009 | 0.37 | Medium |
| **Establish rapport with an adult client** | 3 (3-4) | 4 (3-4) | $z$ = -3.88, $p$ = 0.000 | 0.55 | Large |
| **Explain your professional role** | 3 (2.25-3) | 4 (3-4) | $z$ = -4.41, $p$ = 0.000 | 0.64 | Large |
| **Use appropriate nonverbal communication including eye contact, body language, facial expression and gesture** | 4 (3-4) | 4 (3.75-5) | $z$ = -3.56, $p$ = 0.000 | 0.50 | Large |
| **Use appropriate verbal communication** | 3 (3-4) | 4 (3-4) | $z$ = -4.85, $p$ = 0.000 | 0.69 | Large |
| **Avoid jargon in explanations for an adult client** | 3 (2-3) | 4 (3-4) | $z$ = -5.19, $p$ = 0.000 | 0.73 | Large |
| **Interact in a professional manner with an adult client** | 3 (3-4) | 4 (3.75-5) | $z$ = -3.77, $p$ = 0.000 | 0.53 | Large |
| **Instil confidence in an adult client** | 3 (2-3) | 4 (3-4) | $z$ = -5.10, $p$ = 0.000 | 0.72 | Large |
| **Manage your time well when working with an adult client** | 3 (2-3) | 4 (3-4) | $z$ = -3.99, $p$ = 0.000 | 0.56 | Large |
| **Support an adult client safely during session activities** | 3 (2-3) | 3 (3-4) | $z$ = -4.75, $p$ = 0.000 | 0.67 | Large |

| Survey Item: How confident did you feel to…? | Pre-simulation median ratings (interquartile range) | Post-simulation median ratings (interquartile range) | Wilcoxon signed-rank test values | Cohen's r value | Effect size |
|---|---|---|---|---|---|
| **Conclude your session with an adult client** | 3 (2.75-4) | 4 (3-4) | $z$ = -4.60, $p$ = 0.000 | 0.65 | Large |
| **Information Gathering Skills** | | | | | |
| **Gather information from an adult client about the reason for their admission** | 3 (2-3) | 3 (3-4) | $z$ = -4.02, $p$ = 0.000 | 0.57 | Large |
| **Use active listening skills** | 3.5 (3-4) | 4 (4-5) | $z$ = -5.25, $p$ = 0.000 | 0.74 | Large |
| **Use a mix of open and closed questions** | 3 (2-4) | 4 (3-4) | $z$ = -5.48, $p$ = 0.000 | 0.77 | Large |
| **Provide information to an adult client about their condition/s or presentation** | 2 (2-3) | 3 (3-4) | $z$ = -5.34, $p$ = 0.000 | 0.76 | Large |
| **Confirm an adult client's understanding of their condition/s or presentation** | 3 (2-3) | 3 (3-4) | $z$ = -4.99, $p$ = 0.000 | 0.71 | Large |
| **Interact with a challenging adult client** | 2 (1-3) | 3 (2-4) | $z$ = -5.57, $p$ = 0.000 | 0.79 | Large |
| **Conduct a screening assessment within an interprofessional team** | 2 (2-3) | 4 (3-4) | $z$ = -5.85, $p$ = 0.000 | 0.83 | Large |
| **Conduct a functional assessment safely** | 2 (2-3) | 3 (3-4) | $z$ = -5.43, $p$ = 0.000 | 0.77 | Large |
| **Interpret observations and findings from assessments (clinical reasoning skills)** | 2 (2-3) | 3 (3-4) | $z$ = -5.86, $p$ = 0.000 | 0.83 | Large |
| **Interaction with Others** | | | | | |
| **Interact in a professional way with an adult client** | 3 (3-4) | 4 (4-5) | $z$ = -5.09, $p$ = 0.000 | 0.72 | Large |
| **Consider an adult client's needs in the organisational context (e.g., inpatient hospital/rehabilitation setting)** | 3 (2-3) | 4 (3-4) | $z$ = -5.22, $p$ = 0.000 | 0.74 | Large |
| **Respond to adult client's needs** | 3 (2-3) | 4 (3-4) | $z$ = -5.04, $p$ = 0.000 | 0.71 | Large |
| **Provide feedback to student peers** | 3 (2-3) | 4 (3-4) | $z$ = -5.23, $p$ = 0.000 | 0.74 | Large |

| Survey Item: How confident did you feel to…? | Pre-simulation median ratings (interquartile range) | Post-simulation median ratings (interquartile range) | Wilcoxon signed-rank test values | Cohen's r value | Effect size |
|---|---|---|---|---|---|
| **How anxious do you feel about working with adult clients in an inpatient rehabilitation hospital setting?** | 3 (2-4) | 2 (2-3) | $z$ = -4.53, $p$ = 0.000 | 0.65 | Large |
| **How prepared do you feel to work with adult clients in an inpatient rehabilitation hospital setting?** | 3 (2-3) | 3 (2.5-4) | $z$ = -3.57, $p$ = 0.000 | 0.51 | Large |

Note: Responses were ranked on a Likert scale of 1-5, where 1 = not at all, 2 = slightly, 3 = moderately, 4 = very and 5 = extremely.

*Anxiety.* A statistically significant reduction in anxiety levels from working within an adult inpatient rehabilitation setting was identified pre-simulation (Md=3) to post-simulation (Md=2), $z$ = -4.53, $p$<0.001, with a large effect size (r≥0.5).

*Preparedness.* There was a statistically significant increase in preparedness levels for working with adult patients within an inpatient hospital setting following the simulation, $z$ = -3.57, $p$<0.001, with a large effect size (r≥0.5).

*Students Perceptions of Interprofessional Clinical Education Revised (SPICE-R).* Statistically significant improvement in student attitudes towards interprofessional practice and education were evident in eight of ten questions in the SPICE-R post-simulation (see Table 3). Three questions showed large effect sizes (r≥0.5), four showed moderate effect sizes (r≥0.3) and one had a small effect size (r≥0.1). There was no significant difference in ratings for the questions "*Participating in educational experiences with students from another health profession enhances my future ability to work on an interprofessional team*" pre-simulation (Md=5) to post-simulation (Md=5), $z$ = -1.09, $p$ = 0.275, and "*All health professional students should be educated to establish collaborative relationships with members of other health professions*" pre-simulation (Md=4.5) to post-simulation (Md=5), $z$ = -1.88, $p$ = 0.061.

**Table 3**
**Students Perceptions of Interprofessional Clinical Education Revised (SPICE-R) ratings**

| SPICE-R Survey Items | Pre-simulation median ratings (interquartile range) | Post-simulation median ratings (interquartile range) | Wilcoxon signed rank test values | Cohen's r value | Effect size |
|---|---|---|---|---|---|
| **Working with students from another health profession enhances my education** | 4 (4-5) | 5 (4-5) | $z$ = -2.50, $p$ = 0.012 | 0.35 | Medium |
| **My role within an interprofessional healthcare team is clearly defined** | 4 (3.75-4) | 4 (4-5) | $z$ = -3.96, $p$ = 0.000 | 0.56 | Large |

| | | | | | |
|---|---|---|---|---|---|
| **Health outcomes are improved when patients are treated by a team that consists of individuals from two or more health professions** | 4.5 (4-5) | 5 (4-5) | $z$ = -2.04, $p$ = 0.041 | 0.29 | Small |
| **Patient satisfaction is improved when patients are treated by a team that consists of individuals from two or more health professions** | 4 (4-5) | 5 (4-5) | $z$ = -3.11, $p$ = 0.002 | 0.44 | Medium |
| **Participating in educational experiences with students from another health profession enhances my future ability to work on an interprofessional team** | 5 (4-5) | 5 (4-5) | $z$ = -1.09, $p$ = 0.275 | 0.15 | - (p-value was not significant) |
| **All health professional students should be educated to establish collaborative relationships with members of other health professions** | 4.5 (4-5) | 5 (4-5) | $z$ = -1.88, $p$ = 0.061 | 0.27 | - (p-value was not significant) |
| **I understand the roles of other health professionals within an interprofessional team** | 4 (3-4) | 4 (4-5) | $z$ = -4.12, $p$ = 0.000 | 0.58 | Large |
| **Clinical rotations are the ideal place within their respective curricula for health professional students to interact** | 4 (3-4.25) | 4 (4-5) | $z$ = -4.21, $p$ = 0.000 | 0.59 | Large |
| **Health professionals should collaborate on interprofessional teams** | 5 (4-5) | 5 (4-5) | $z$ = -2.24, $p$ = 0.025 | 0.32 | Medium |
| **During their education, health professional students should be involved in teamwork with students from other health professions in order to understand their respective roles** | 4 (4-5) | 5 (4-5) | $z$ = -2.56, $p$ = 0.011 | 0.36 | Medium |

Note: Responses were ranked on a Likert scale of 1-5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

*Satisfaction with Simulation Experience (SSE) scale.* A median rating of 4 to 5 (very to extremely satisfied) in 15 out of 17 questions relating to students' satisfaction and experience of the interprofessional simulation was observed (see Table 4). There were two questions, however, with a median rating of 3 to 3.5 (moderately to between moderately and very satisfied) which included, *"How prepared did you feel for the simulation-based learning activities"* (Md=3, IQR=3-4), and *"How well did the pre-briefing to the simulation-based learning activities prepare you for participation?"* (Md=3.5, IQR=3-4).

**Table 4**
**Satisfaction with Simulation Experience (SSE) ratings**

| SSE Survey Items: | Median | Interquartile Range |
|---|---|---|
| **How realistic was the content of the simulations?** | 4 | 4-5 |
| **How realistic were the simulated patients' portrayal of the simulations?** | 5 | 4-5 |
| **How useful was the feedback provided by the clinical educator?** | 4 | 4-5 |
| **How useful was the feedback and discussion provided by fellow students?** | 4 | 4-5 |
| **How useful was the feedback provided by simulated patients?** | 5 | 3-4 |
| **How prepared did you feel for the simulation-based learning activities?** | 3 | 3-4 |
| **How well did the pre-briefing to the simulation-based learning activities prepare you for participation?** | 3.5 | 3-4 |
| **Did the simulation-based learning activities help you to apply what you had learned in lectures and tutorials?** | 4 | 3-5 |
| **Did the simulation-based learning activities provide the opportunity to practice important clinical skills in a safe environment?** | 4 | 4-5 |
| **Did the simulation-based learning activities allow you to reflect and plan for improvement?** | 5 | 4-5 |
| **Did the simulation-based learning activities allow you the opportunity to learn with others in an environment which promoted discussion?** | 5 | 4-5 |
| **Were the simulation-based learning activities appropriate for your style of learning?** | 4.5 | 4-5 |
| **Did the simulation-based learning activities promote self-directed learning?** | 4.5 | 4-5 |
| **Did the simulation-based learning activities develop your skills in management of adult patients in an inpatient rehabilitation setting?** | 4 | 4-5 |
| **Did the simulation-based learning activities assist in your retention of knowledge related to adult clients with physical conditions (e.g., stroke, orthopaedic injuries, etc.)?** | 4 | 4-5 |
| **Did the simulation-based learning activities provide a stimulating learning environment?** | 5 | 4-5 |
| **How useful was the interprofessional simulation-based learning activity for working with adult clients in an inpatient rehabilitation hospital setting?** | 5 | 4-5 |

Note: Responses were ranked on a Likert scale of 1-5, where 1 = not at all, 2 = slightly, 3 = moderately, 4 = very and 5 = extremely.

## B *Qualitative data*

Content analysis of the qualitative data revealed a total of 11 categories across the five different open-ended survey questions asked of the participants. For the two questions included in the survey at the pre-simulation timepoint, six categories emerged. For the three post-

simulation questions, a total of five categories were identified. Table 5 outlines the analysis process, listing the categories and sub-categories that emerged from each of the five questions with an illustrative quote for each.

**Table 5**
**Qualitative content analysis process according to Graneheim and Lundman (2004)**

| Question (Q) | Category | Sub-category | Quote |
|---|---|---|---|
| **Pre-simulation** | | | |
| **What do you hope to learn while participating in this interprofessional simulation-based learning experience with adult clients?** | Working collaboratively with another health professional | Speech pathology students: Opportunity to work with another health professional | *"How occupational therapy and speech pathology can collaboratively administer assessment and then create intervention plans."* (SP8) |
| | | Speech pathology students: Interacting with another professional | *"How to interact with another student without stepping on each others' toes."* (SP14) |
| | | Occupational therapy students: Working collaboratively with other health professionals | *"… how two people from different professions engage with a client simultaneously."* (OT9) |
| **What are your concerns about undertaking this interprofessional simulation-based experience with adult clients?** | Feeling unprepared and nervous | Speech pathology students: Going into simulation unprepared and nervous | *"I find the experience of sim clinics very nerve wrecking and always feel anxious in the lead up."* (SP1) |
| | | Occupational therapy students: Going into simulation unprepared and nervous | *"I can become quite anxious in simulation based experiences which may cause me to become flustered, forget what to say or come across as disorganised/ lacking confidence."* (OT1) |
| **Post-simulation** | | | |
| **What did you like most about learning in the simulation clinic? Why?** | Learning in a safe, practical and realistic environment | Speech pathology students: Safe practical learning environment | *"I liked the low stakes of injury in a supportive environment to trial things out."* (SP12) |
| | | Speech pathology students: Realistic experience | *"Felt realistic."* (SP1) |
| | | Occupational therapy students: Positive | *"I liked that it was in a safe and encouraging environment."* (OT9) |

| | | | |
|---|---|---|---|
| | | learning and practice environment | |
| **What did you like least about learning in the simulation clinic? Why?** | Students did not like some aspects of the simulation design | Speech pathology students: Feeling underprepared and nervous | *"The … nerves getting in were not wonderful."* (SP12) |
| | | Occupational therapy students: Felt unprepared, anxious or stressed | *"It was daunting because it was unfamiliar."* (OT2) |
| **Is there anything else you would like to say or comment on?** | Interprofessional simulation is a beneficial experience for learning | Speech pathology students: Opportunity for feedback | *" The comments from the Simulated Patients are really valuable."* (SP21) |
| | | Speech pathology students: Enjoyed interprofessional simulation | *"This was a lovely sim clinic."* (SP17) |
| | | Occupational therapy students: Simulations are beneficial for learning and practice | *"… I have found was the most informative to learn relevant skills and knowledge."* (OT8) |
| | | Occupational therapy students: Enjoyed interprofessional simulation | *"I love the simulation experiences."* (OT5) |

*Pre-simulation: What do you hope to learn while participating in this interprofessional simulation-based learning experience with adult clients?* Content analysis revealed four categories about what students hoped to learn from the experience. The first category revealed that students hoped to learn how to work collaboratively with another health professional. As an occupational therapy student stated, *"how to work collaboratively … and be more holistic in our care"* (OT16) with another health professional. Another student was interested in finding out how to *"integrate knowledge from both (disciplines) to improve patient outcomes"* (OT17). Students also reported wanting to learn about interacting with interprofessional team members, such as *"how two … different professions (could) engage with a client simultaneously" (OT9) and "without stepping on each other's toes"* (SP14).

The second category focused on students' hopes to learn about interacting with adult patients. This included *"communication skills with clients"* (OT18) such as explaining information *"in lay terms"* (SP13), responding to *"clients that are uncooperative"* (OT16) and answering *"questions directed from an adult regarding their performance and diagnosis"* (SP24).

The third category was that students wanted to learn about what other professionals do and their roles. For instance, an occupational therapy student described their wish to know "*what techniques speechies (speech pathologists) use (and) how (to) use these in … practice with patients with speech and language issues*" (OT19). Both speech pathology and occupational therapy students were equally curious to learn about each other's roles.

The last category was about developing skills for future practice. Students identified clinical skills such as clinical reasoning, administering assessment and analysing *"results to make decisions (regarding) treatment"* (SP16). Another student hoped to improve their reflective practice and understand more about their *"strengths and weaknesses to improve (when) working in similar environments in the future"* (OT8).

*Pre-simulation: What are your concerns about undertaking this interprofessional simulation-based experience with adult clients?* There were two categories regarding students' concerns

about the interprofessional simulation. Firstly, students from both disciplines felt unprepared and nervous. Students reported insufficient knowledge about one another's profession and role and *"minimal experience in this field"* (SP3). Feelings of anxiety were also evident from the students' responses: *"I can become quite anxious in simulation-based experiences"* (OT1), *"the experience of sim clinics (is) very nerve wrecking"* (SP1).

Secondly, students were worried about interacting with adult patients. Challenging patients, such as those who are *"displeased/agitated"* (OT8) or present with *"severe apraxia of speech"* (SP5), were highlighted. The therapist-patient interaction itself was also a point of concern. For instance, SP13 did not want to appear "*condescending"* to the patient, while OT17 anticipated difficulty in *"responding to patient questions on the spot"*.

*Post-simulation: What did you like most about learning in the simulation clinic? Why?* Content analysis revealed two categories and one stand-alone sub-category regarding what students found enjoyable about the simulation. The first category related to learning in a safe, practical and realistic environment. Students appreciated that the interprofessional simulation was a "*safe place to practise … (that) won't 'damage' a real patient*" (SP17) which enabled "*practical application of knowledge and skills learnt*" (OT8). OT5's response reinforced this point, as they explained that "*it is a realistic opportunity to practice without the pressure of a real client or being assessed. This allows for a genuine chance to practice and reflect on how to improve before being in a live clinic environment*." Many students expressed how valuable the feedback from the simulated patients was in helping them understand *"the patient's perspective"* (OT16) better, especially when the feedback was *"constructive"* (SP18), *"specific"* (SP24) and *"on the spot"* (OT24).

The second category discovered that students enjoyed working collaboratively with another profession. SP15 felt that it was *"good to actually work with someone, not just watch videos"*. OT6 corroborated the students' satisfaction in collaborative practice: *"Working with another allied health professional was useful, supportive and provided important perspectives."* Emerging only from the occupational therapy students was a separate sub-category which identified that the simulation allowed them to learn skills for future practice. The experience provided students with a *"chance to use skills in real life context"* (OT7), where they could *"practise the assessment with a patient"* (OT1) or develop interpersonal skills like *"building rapport"* (OT7).

*Post-simulation: What did you like least about learning in the simulation clinic? Why?* Two categories emerged relating what students disliked about the experience. Firstly, students reported feeling anxious and unprepared: *"I felt nervous and unsure about what to expect"* (SP7), *"It was daunting because it was unfamiliar"* (OT3). Secondly, students described that timing related issues was their least favourite aspect of the simulation. Different students held different expectations for the duration of the simulation experience. While some students *"felt time-pressured"* (SP8), other students *"wish(ed) (they) could practise longer"* (OT23).

*Post-simulation: Is there anything else you would like to say or comment on?* Content analysis identified a single category regarding additional comments. Students found the interprofessional simulation to be a beneficial experience for learning. Most students expressed their appreciation for the simulation, describing that simulations "*are such advantageous learning opportunities*" (OT17) and that *"they truly solidify learning and build confidence*" (OT5). Other students were particularly satisfied with the interprofessional aspect of this simulation: *"I enjoy working with other professionals"* (SP11).

## IV DISCUSSION

The primary aim of this study was to investigate whether interprofessional simulations support students' perceived confidence, anxiety and preparedness for clinical placements. The secondary aims were to determine the influence of participating in an interprofessional simulation learning experience on speech pathology and occupational therapy students' attitudes towards interprofessional practice and education and to understand speech pathology and occupational

therapy students' perceptions and satisfaction with participating in an interprofessional simulation. Previous studies revealed that healthcare students can feel anxious and unprepared when working with adult patients within an interprofessional team (Gilligan et al., 2014; Page et al., 2021) which may impact their confidence in participating in related placement experiences (Aggar et al., 2020). In the current study, students reported increased confidence and preparedness levels with reduced levels of anxiety, improved attitudes towards interprofessional learning and education and high satisfaction levels post-simulation.

Significant improvements in confidence levels across all three sub-sections (foundational skills, information gathering skills, interaction skills) were observed following the interprofessional simulation. These results are consistent with Watters et al.'s (2015) large-scale comparative study (n=156), which showed significant improvements in medical and nursing students' confidence levels upon participation in an interprofessional simulation. While students in the current study described that the interprofessional simulation allowed them to learn and practise skills within a realistic environment, students from previous studies similarly attributed familiarisation, skill development and an authentic learning environment as to how simulations influence their perceived confidence levels (Wright et al., 2020). Another important aspect highlighted by students in the current study was receiving simulated patients' feedback, which may be helpful for learning, self-awareness and confidence (Qureshi & Zehra, 2020). As previous interprofessional simulation studies exploring student confidence levels had simulated adult acute care settings (Kaldheim et al., 2021; Watters et al., 2015), the current study demonstrates that improvements in student confidence for clinical placements may also be generalisable to the inpatient adult rehabilitation hospital setting.

Interprofessional simulations can also impact student anxiety and self-perceived readiness for placements in adult hospital settings. Whilst quantitative data revealed a large effect in reduction in anxiety and improvement in self-perceived preparedness ratings, qualitative data found that feelings of unpreparedness and anxiety participating in the simulation itself was a cause of concern both prior to and following the simulation. Considering that all students have participated in discipline-specific simulations prior to this study, these findings suggest that the interprofessional aspect to this simulation could be unfamiliar territory (Reitsma et al., 2019) and feelings of anxiety and unpreparedness may have come from limited exposure to working collaboratively with other disciplines (Collins et al., 2021). Consistent with the results of this current study, Collin et al.'s (2021) qualitative results revealed reduced anxiety levels after an interprofessional simulation involving physiotherapy and OT students, while increased self-perceived preparedness levels were observed following an interprofessional simulation-based dysphagia training simulation involving speech pathology and dietetic students (Southall & MacDonald, 2021). Debrief and reflection may play an important role in reducing anxiety and its associated negative feelings (Madsgaard et al., 2021; Pai, 2016). In this study, as time was specifically allocated for student pairs and the whole clinical group to debrief and reflect, this might have been a contributing factor to the reduced anxiety levels. While the findings of this study imply that interprofessional simulations can positively impact students' anxiety and self-perceived preparedness levels for clinical placements, future interprofessional simulations designs could also consider the impact of student anxiety and unpreparedness with the interprofessional simulation itself.

Another key area the current study investigated was students' attitudes towards interprofessional practice and education. Quantitative results revealed overall significant positive attitude changes toward interprofessional practice and education on the SPICE-R post-simulation. These results are comparable to Burford et al.'s (2020) study that found improved attitudes towards interprofessional practice in the areas of teamwork, collaboration and professional identity following participation in an interprofessional simulation. However, in the current study, questions probing information regarding "*Participating in educational experiences with students from another health profession enhances my future ability to work in an interprofessional team*" and "*All health professional students should be educated to establish collaborative relationships with members of other health professions*" showed no significant

difference pre-simulation to post-simulation. A plausible explanation could be that attitude ratings were already high pre-simulation (Md=4.5 and 5), and hence further improvements in attitude scores were less likely to be significant. Students clearly saw the value of interprofessional practice and education even prior to the simulation, as qualitative results found that many students were looking forward to collaborating and interacting with another health professional and hoped to learn more about their partner's roles. The interprofessional simulation appeared to meet students' expectations to "*learn about, from and with*" (World Health Organization, 2010, p. 10) another discipline, as evidenced by overall improvement in SPICE-R ratings. While previous literature has explored students' expectations about what they hoped to learn and its correspondence with their actual experiences within discipline-specific simulation learning experiences (Keskitalo & Ruokamo, 2016), future research could further explore in detail what students hope to achieve from interprofessional simulations and how to best meet their needs in future delivery of these learning activities.

Overall, students found the interprofessional simulation to be a valuable learning experience. Quantitative SSE ratings found that students were generally "*very to extremely satisfied*" for 15/17 questions as indicated by descriptive statistics. This is consistent with qualitative results that revealed students enjoyed the simulation and found it to be a beneficial and meaningful one. These results were also reflected in Zheng et al's (2015) study where 91% of students (n=193) in their study found that interprofessional simulation was a valuable learning experience. Also consistent with other research findings, the current study demonstrated that students appreciate being able to develop skills in a safe, practical and authentic learning environment (Wright et al., 2020), as well as the opportunity to collaborate and learn with another healthcare student (Zheng et al., 2015). Timing related issues (e.g., prebrief duration, simulation duration) were highlighted when students were asked about what they liked least about the interprofessional simulation in this study. Importantly, this study revealed that students perceive the benefit of interprofessional simulations to bridge the theory-practice gap through active engagement in a "*real-life*" clinical case, a notion also supported by the constructivist learning theory (Niederriter et al., 2020; Wadsworth, 1996).

## V STRENGTHS

Using a mixed-methods study design that triangulated quantitative and qualitative data provided a more holistic understanding of the results. Equal representation of both speech pathology and occupational therapy participants in this study increased its external validity especially when both cohorts were pooled together for analysis (Elwood, 2013). Furthermore, students from both disciplines were at similar progression levels in their degrees, which improved the sample's homogeneity and validity of the analysis (Bareinboim & Pearl, 2016), hence being a valid strength in this work.

## VI LIMITATIONS AND FUTURE DIRECTIONS

Data were collected from students from only one university which may impact on the generalisability of the findings to other settings and other simulation experiences such as involving other disciplines. Future research could explore simulation experiences involving other disciplines, clinical activities and settings. Moreover, data collection at only two time points (i.e., pre-simulation and post-simulation) may not be sufficient to determine the impact the simulation experience has on students' perceived confidence, preparedness and anxiety at the time they commence clinical placements. Future research using a longitudinal study could include a third time-point immediately prior to clinical placements within an interprofessional setting to ascertain transfer of students' learning from the interprofessional simulation experience to the clinical environment. Additionally, future directions could explore manipulating timing as a variable (e.g., prebrief duration, simulation duration) and its potential influence on students' experience and learning outcomes.

## VII CONCLUSION

In conclusion, this study found that students' confidence, anxiety and preparedness for clinical placements in an adult inpatient hospital setting improved following participation in an interprofessional simulation. Overall attitudes towards interprofessional learning and education were more positive following the interprofessional simulation, and students found it to be a valuable learning experience. The current study also identified some implications for the design of future interprofessional simulations such as the consideration of timing and the impact of anxiety about participating in simulations itself.


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