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RESEARCH REPORT

Speech–language pathology students' perceptions of simulation-based learning experiences in stuttering

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Abstract

Background: Research suggests that some speech–language pathologists are uncomfortable treating people who stutter. Accessing quality clinical education experiences in stuttering is difficult given the ongoing rise in students enrolled in speech–language pathology programmes and the limited number of stuttering-specific placements available. Simulation-based learning is a viable option for providing speech–language pathology students with practical experience in a safe learning environment. Whilst research has found that simulation-based learning experiences in stuttering assist in the development of students' clinical skills, students' perceptions of participating in stuttering simulation-based learning are yet to be explored.

Aims: To investigate speech–language pathology students' comfort, anxiety, knowledge and confidence in the management of stuttering at the commencement of an academic stuttering course and before and following participation in a stuttering simulation-based learning programme.

Methods & Procedures: This study used a cross-sectional survey design. Participants were 105 undergraduate and graduate entry masters speech–language pathology students enrolled at an Australian university. Students engaged in a stuttering simulation-based learning programme embedded within an existing academic course on the management of stuttering. A purposefully developed survey was administered at three time points: pre-course (T1), pre-simulation (T2) and post-simulation (T3) in order to explore students' comfort and anxiety levels, and perceptions of their knowledge and confidence in stuttering management. Descriptive statistics were used to report the medians and range of students' responses. Changes across all time points and between each of the time points were determined using the Friedman test and the Wilcoxon signed rank test, respectively.

Outcomes & Results: Statistically significant differences ($p < 0.001$) were observed on all matched survey items ($n = 96$) across all time points. Between each time point, a significant difference in students' perceived knowledge levels was found with small to large effect sizes. However, there was no difference in students' perceived comfort and anxiety levels between the time points of pre-course and pre-simulation. Open-ended responses on the post-simulation

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survey revealed that students valued learning about stuttering within a simulation-based learning environment.

Conclusions & Implications: Simulation-based learning experience in stuttering management was valued by students. When accompanied by theoretical content, participation in a stuttering simulation-based learning programme supported students to feel more comfortable and less anxious about working with people who stutter. This finding has implications for the development of clinical skills in the assessment and treatment of adults who stutter.

KEYWORDS

simulation, stuttering, simulation-based learning, speech and language pathologists, student learning

WHAT THIS PAPER ADDS

What is already known on this subject

- Simulation is a teaching approach used within speech–language pathology to support the development of students' clinical skills. Simulation provides a safe learning environment for students, an opportunity for repeated practice and is valued by students.

What this paper adds to existing knowledge

- This study explored students' perceptions of their comfort, anxiety, knowledge and confidence in working with people who stutter before and following participation in a simulation-based learning programme. It describes a stuttering simulation-based learning programme that can be embedded into speech–language pathology programme curricula.

What are the potential or actual clinical implications of this work?

- The stuttering simulation-based learning programme detailed in this study can be applied and embedded in speech–language pathology curricula. It can be used to support the development of students' confidence in the assessment and management of stuttering.

INTRODUCTION

Stuttering is a communication disorder present in approximately 1–2% of the adult population and 4–5% of children (Bloodstein 1995). Speech–language pathologists are responsible for the assessment and treatment of stuttering across the lifespan, ensuring the management plan meets the needs of the individual and their family (Enderby *et al.* 2009, Speech Pathology Association of Australia (SPAA) 2017). However, over the past three decades, research has revealed that speech–language pathologists do not always feel comfortable working with people who stutter (e.g., Brisk *et al.* 1997, Kelly *et al.* 1997, Tellis *et al.* 2008). Research has also found that there is limited training in fluency disorders which includes stuttering for both speech–language pathology students in university programmes and practising speech–language pathologists in the workforce (Tellis *et al.* 2008).

The notion of speech–language pathologists feeling uncomfortable treating stuttering is recognized internationally (Block *et al.* 2005, Cooper and Cooper 1996). Research related to clinicians' comfort and confidence levels when treating people who stutter was primarily conducted in the United States in the 1990s and 2000s. The finding that clinicians are uncomfortable working with this population has largely been attributed to university

programmes not providing enough training in this clinical practice area, and thus speech–language pathology graduates perceiving that they lack skills and knowledge in stuttering management (Yaruss and Quesal 2002). Early research in the delivery of stuttering treatment determined that many treatment approaches conducted by speech–language pathologists were unsuccessful, an outcome linked to lack of opportunity to treat people who stutter, and therefore resulting in speech–language pathologists not feeling comfortable treating stuttering (Ainsworth 1974). Research exploring speech–language pathologists' clinical skills, confidence and comfort in the area of stuttering treatment continued over the next three decades with similar outcomes reported to the results found in the early work of Ainsworth (1974).

Clinical preparation for working with people who stutter

Speech–language pathologists' preparation and clinical proficiency levels when working with people who stutter were explored in a survey study by Kelly *et al*. (1997) within the United States. Outcomes of the survey responses were two-fold: first, participants felt that their current level of skills in stuttering were not adequate; and second, they perceived that their university academic and clinical preparation for working with people who stutter was not sufficient (Kelly *et al*. 1997). Whilst the majority of speech–language pathologists in the study indicated that they sought professional development opportunities to further develop their skills in stuttering management following graduation, they reported insufficient availability of such opportunities (Kelly *et al*. 1997). Furthermore, participants reported that they found stuttering training presentations, seminars and workshops had limited practical effectiveness, with such training perceived to be difficult to apply within their caseload management (Kelly *et al*. 1997).

In contrast, a survey study by Brisk *et al*. (1997) revealed more positive outcomes in relation to speech–language pathologists' confidence levels and views of treating stuttering in school-age children. Speech–language pathologists Brisk *et al*. reported improved confidence levels following specific training in treating fluency disorders, but indicated that they would value assistance from a 'fluency specialist' to manage school-age clients, a concept also reported by Ainsworth (1974). A total of 77% of the speech–language pathologist participants in Brisk et al. (1997) had completed either undergraduate and/or graduate courses in fluency disorders, with 90% having also completed continuing education in stuttering in the 10 years prior to the study. This additional training that clinicians undertook to support their professional development in stuttering may explain the discrepancy in results from Brisk *et al*. (1997) and Kelly *et al*. (1997). A key outcome of the study conducted by Brisk *et al*. (1997) was the recommendation that university programmes provide clinical learning opportunities in stuttering for speech–language pathology students prior to graduation.

Tellis *et al*. (2008) later explored the association between speech–language pathologists' perceived lack of stuttering treatment knowledge and reduced comfort levels, with research outcomes supporting the earlier findings of Ainsworth (1974). The survey data obtained by Tellis et al. (2008) found that speech–language pathologists perceived that they lacked knowledge about suitable stuttering treatment options for clients who stutter, with 46.5% of participants reporting that they felt uncomfortable working with people who stutter. Tellis *et al*. therefore highlighted the importance of revisiting the training offered to speech–language pathology students in university programmes and practicing speech–language pathology clinicians to support their professional development in the assessment and treatment of stuttering.

University training requirements

As suggested by Tellis et al. (2008), academic and clinical education training within university programmes is an important factor to consider in the investigation of comfort levels for speech–language pathologists working with people who stutter. Yaruss and Quesal (2002) explored how fluency disorders are addressed in speech–language pathology clinical education and academic curricula within university programmes accredited by the American Speech–Language–Hearing Association (ASHA). Of the 159 surveyed programmes, approximately one-quarter of the programmes permitted students to graduate without completing relevant coursework in fluency disorders (Yaruss and Quesal 2002). The remaining 77.4% of programmes reported the inclusion of a required course specifically for fluency disorders (Yaruss and Quesal 2002), although few, if any, included practical teaching hours focused on development of skills in stuttering management. The limited clinical and academic experience in the management of stuttering revealed in this survey study was consistent with previous research highlighting limited training opportunities for students in fluency disorders (e.g., Brisk *et al*. 1997, Kelly *et al*. 1997, St Louis and Lass 1981).

Mandated requirements for speech–language pathology student training programmes differ across the world. In Australia, speech–language pathology students are required to demonstrate competency in all areas of speech–language pathology practice, including stuttering

management, prior to graduation (Speech Pathology Australia (SPA) 2010). Students enrolled in speech–language pathology programmes across the United States require a minimum of 400 h in supervised speech–language pathology clinical practice (The Council for Clinical Certification in Audiology and Speech–Language Pathology of ASHA 2018) whereas, in the UK, graduating students must complete 150 practice education sessions (Royal College of Speech and Language Therapists (RCSLT) 2018). Given increasing student enrolments in speech–language pathology programmes, it is becoming increasingly difficult to provide all students with quality clinical education experience in all clinical areas, including stuttering (SPA 2018). This paucity of placement opportunities combined with speech–language pathologists' feelings of discomfort in the management of stuttering means that other opportunities for clinical learning in stuttering must be explored. One approach that could be used to achieve this within university programmes is simulation-based learning.

Simulation-based learning

Simulation-based learning is increasingly being implemented in university health education programme curricula (Dudding and Nottingham 2018, Hewat *et al*. 2020). Through simulation, students are provided with real-world clinical learning opportunities within a safe learning environment (Ker and Bradley 2014) and are provided with an opportunity to prepare for clinical practice (Larue *et al*. 2015). A number of studies in speech–language pathology have investigated the use of simulation-based learning activities to support student learning with reported improvements in students' perceived skills, knowledge and confidence levels (e.g., Hill *et al*. 2013, Miles *et al*. 2016, Penman *et al*. 2020a). Studies investigating the use of simulated patients to portray specific communication difficulties, such as in the area of aphasia (e.g., Zraick *et al*. 2003) and/or swallowing difficulties (e.g., Miles *et al*. 2016), have reported their positive contribution to speech–language pathology student education. Simulated patients are often used in simulation activities and traditionally are actors trained to portray the qualities of a patient (Barrows 1993). Medical education has utilized simulated patients in student learning for decades (Zraick 2020). Within speech–language pathology, Dudding and Nottingham (2018) identified that the use of simulated patients is the most common variant of simulation used to support students' clinical education.

Whilst simulation-based research in speech–language pathology has grown significantly in recent years, there has been limited research exploring the use of simulation to develop students' clinical skills in stuttering management. Hughes *et al*. (2019) and Vermeulen (2010) explored the benefits of using simulated patients to assist with stuttering competency development. Hughes *et al*. (2019) explored speech–language pathology students' perceptions of their interactions with, first, a peer and then with a simulated patient playing the role of a parent of a child who stuttered. Results indicated that students experienced a perceived increase in confidence in explaining the nature of stuttering to a simulated patient as opposed to their peer. Student participants in Vermeulen's (2010) study observed an intervention session with a simulated patient who was portraying the role of an adult with a stutter following an academic course in fluency disorders. Students perceived an increase in their competency following observation of the intervention session (Vermeulen 2010). Both studies (Hughes *et al*. 2019, Vermeulen 2010) highlighted the positive application of using simulation-based learning in stuttering education. However, in these studies, the students did not have direct clinical involvement with a simulated patient who presented with a stutter. The interactions were either with a parent of a child who stuttered or the students observed an intervention session. Enhanced learning opportunities that enable speech–language pathology students to practice assessment or intervention techniques directly with simulated patients is required to maximize the development of student confidence in managing stuttering.

The current study forms part of a larger project which sought to evaluate the development of speech–language pathology students' clinical skills in stuttering management within a simulation-based learning program embedded in an academic fluency course (Penman et al. submitted). The focus of the current study was to explore students' perceptions about their experience in the stuttering simulation-based learning programme. Specifically, it aimed to investigate speech–language pathology students' perceptions of changes in their comfort, anxiety, knowledge and confidence in managing stuttering following completion of an academic course in fluency disorders and participation in a stuttering simulation-based learning programme.

METHODS

Procedure

Ethical clearance for this study was obtained from The University of Queensland.s Human Research Ethics Committee (approval number 2009001668). At the beginning of the academic semester, all speech–language pathology

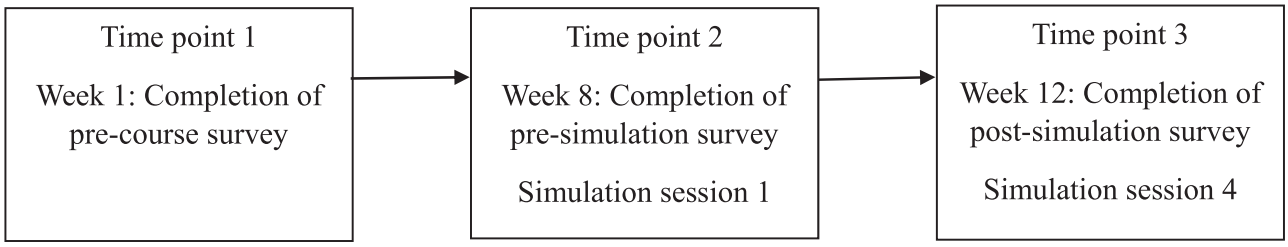

FIGURE 1 Schematic representation of the research timeline.

students enrolled in a fluency disorders course were invited to participate in this research. All students participated in the scheduled learning activities, including lectures, in-class practical sessions and a simulation-based learning activity because these were linked to course assessment. However, only data from consenting students were included in the research.

Study design

This study used a cross-sectional survey approach. Quantitative survey data were obtained via completion of a survey across three time points during the semester: (1) prior to the commencement of academic coursework (in the first week of semester); (2) pre-participation in the simulation-based stuttering learning activity (simulation session 1, prior to commencing academic coursework in week 8); and (3) post-participation in the simulation-based stuttering learning activity (immediately following the final simulation session 4) (figure 1). Participant surveys were matched using a unique identifier code.

Participants

Participants in this study were 105 speech–language pathology students enrolled at an Australian university in either their third year of a 4-year undergraduate program ($n = 83$) or in their first year of a 2.5-year graduate-entry masters program ($n = 22$). The age range of participants in the undergraduate programme was from 19 to 46 years ($M = 21$ years), while the graduate-entry master's students ranged in age from 21 to 48 years ($M = 25$ years). There were 78 female participants (93.9%) in the undergraduate programme and 21 female participants (95.5%) in the graduate-entry master's programme. Students in both programmes were provided with comparable academic content knowledge in fluency disorders and clinical education experience prior to their participation in the simulated-based learning activity.

Academic coursework and in-class practical sessions

The fluency disorders course spanned 13 weeks and consisted of weekly 2-h lectures and 1-h practical sessions. Lectures incorporated teaching of theoretical and practical clinical skills in the assessment and management of stuttering across the lifespan as indicated in table 1. Prior to completing the academic course, students did not have any practical experience in managing fluency disorders. Practical sessions focused on stuttering identification and measurement (e.g., stuttering identification, recording stutter count or calculating percentage of syllables stuttered (%SS), calculating speech rate or syllables per min (SPM) and assigning a severity rating) and treatment using a smooth speech approach (table 1). Smooth speech, prolonged speech, easy speech and fluency shaping are different speech restructuring approaches commonly used with adults who stutter (SPAA 2017). Speech restructuring treatment for persistent stuttering is an evidence-based approach to treating adults who stutter (Packman *et al.* 2000).

Stuttering simulation-based learning programme

The stuttering simulation-based learning programme was embedded within the fluency disorders course, and consisted of a total of four sessions, completed across weeks 9–12 of the academic semester (table 1). Sessions 1 and 4 of the stuttering simulation-based learning programme consisted of the simulation sessions whereby students interacted with simulated patients, and sessions 2 and 3 were clinical workshops. Prior to the simulation-based learning programme, students were allocated to a clinical group and assigned to a student peer to complete the stuttering simulation sessions 1 and 4 in a paired model. A clinical group, defined as one clinical educator and 8–10 students, completed clinical learning activities in sessions 2 and 3 as a group.

TABLE 1 Academic course outline for fluency disorders

University semester week	Lecture/practical	Topic
1	Lecture	Introduction to fluency disorders: stuttering behaviours, facts and figures, stuttering theories
	Practical	Guest speaker presentation 'Living with a Stutter'
2	Lecture	Introduction to childhood fluency disorders: assessment and treatment of early stuttering
	Practical	Stuttering identification, severity rating
3	Lecture	Management of childhood fluency disorders: outline of available treatment approaches
	Practical	Introduction to online rating
4	Lecture	Management of childhood fluency disorders: The Lidcombe Program
	Practical	Guest speaker presentation 'Being a Parent of a Child Who Stutters'
5	Lecture	Assessment and management of fluency disorders in the school-age population
	Practical	Online rating, severity rating
6		Mid-semester examination
7	Lecture	Introduction to adolescent and adult fluency disorders: assessment and treatment of stuttering
	Practical	Assessment: case history, opportunity to practise identifying stuttering behaviours and rating of %SS, SPM and SR
8	Lecture	Management of fluency disorders for adolescents and adults: outline of treatment approaches
	Practical	Treatment: speech restructuring (smooth speech and prolonged speech programmes)
9		Stuttering simulation-based learning programme (formative session)
10	Lecture	Management of fluency disorders for adolescents and adults: outline of other treatment approaches (assistive devices, stuttering modification, rate control, behavioural and time out)
	Practical	Stuttering simulation-based learning programme (tutorial session)[a]
11	Lecture	Other fluency disorders: stuttering after acquired neurological disorders, cluttering, the role of cognitive restructuring and relaxation in stuttering treatment
	Practical	Stuttering simulation-based learning programme (tutorial session)
12		Stuttering simulation-based learning programme (summative session)
13	Lecture	Stuttering maintenance and relapse

Notes: [a]A 1-h simulation clinical workshop session for student pairs.
%SS, percentage of syllables stuttered; SPM, syllables per min; SR, severity rating.

In stuttering simulation sessions 1 and 4, a standard university clinic room was used to simulate a speech–language pathology clinic space. Prior to the stuttering simulation sessions, six professional actors, three females and three males, completed 2 h of simulated patient training with an experienced trainer (first author). The training focused on basic education about stuttering, stuttering behaviours and application of this knowledge to accurately portray four different cases. These cases were designed based on real case data and each actor learnt to portray two separate cases: one case for stuttering simulation session 1 (formative session) and another for stuttering simulation session 4 (summative session).

Stuttering simulation session 1 (formative session)

Approximately 24 h prior to the stuttering simulation session 1, students received a workbook with learning objectives, relevant case details and a detailed session plan to review. On the day of the simulation students firstly engaged in a 5-min pre-brief with their clinical educator only, then the students conducted the formative simulation activity (25 min) with the simulated patient, and finally completed a 5-min debrief facilitated by their clinical educator (figure 2). These three phases of simulation are necessary to ensure optimal learning within a

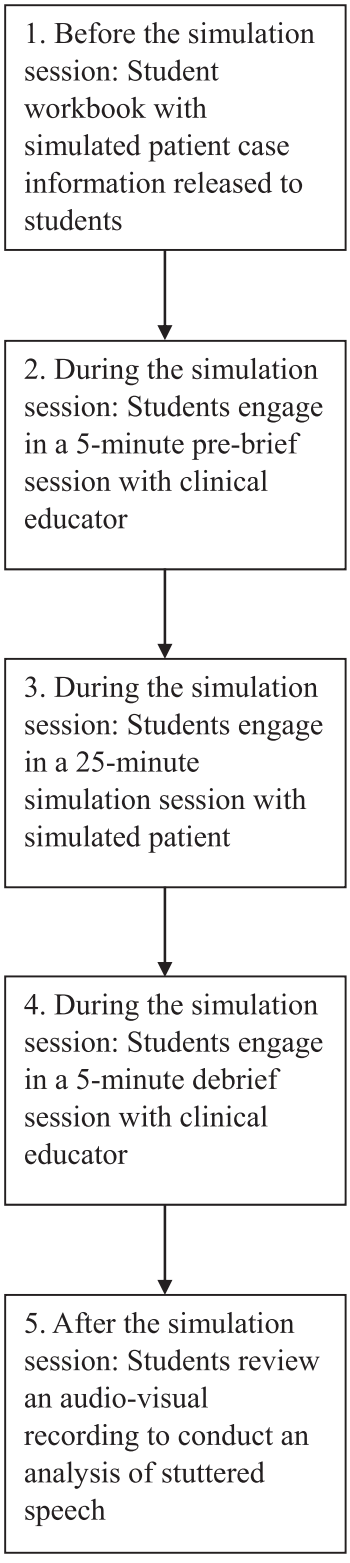

FIGURE 2 Overview of student learning activities included in the stuttering simulation session (formative and summative).

simulation learning process (Kelly *et al.* 2016, Ker and Bradley 2014). Stuttering simulation session 1 involved the assessment and treatment of a simulated patient who presented with stuttering behaviours and was completed with the clinical educator in the room. During the session, students were required to obtain information from the simulated patient regarding the impact of stuttering on daily life, obtain a speech sample to analyse, identify stuttering behaviours, record a measure of stuttering severity, and then provide information and education to the simulated patient regarding the chosen treatment programme. Following the session, students individually watched recorded audiovisual footage of the simulated patient engaging in a monologue. The students were required to transcribe a speech sample, identify the stuttering behaviours demonstrated by the simulated patient in the audiovisual recording, calculate %SS and SPM, and assign a severity rating.

Stuttering simulation sessions 2 and 3 (clinical workshop sessions)

Students in their clinical groups attended stuttering simulation clinical workshop sessions 2 and 3 in weeks 10 and 11 of the semester (table 1). Stuttering simulation clinical workshop sessions were led by two speech–language pathology clinical educators (first author and a clinician not involved in the research) experienced in stuttering management, clinical education and simulation. Students had an opportunity to practise particular components of the stuttering simulation session 1 that they or their clinical educator had identified as requiring attention in these clinical workshop sessions. Specific verbal formative feedback was provided to the students on their clinical skills by the clinical educators and their peers.

Stuttering simulation session 4 (summative session)

In week 12, the students completed stuttering simulation session 4, which replicated stuttering simulation session 1. The stuttering simulation session 4 was a summative assessment and contributed to the students' overall course grade. Prior to session 4, the students received written feedback from their clinical educator/assessor following session 1, and then verbal feedback from the clinical educator

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and peers in the stuttering simulation clinical workshop sessions 3 and 4. Different clients were also assigned to the students for the week 12 session. If the students had been allocated a male-simulated patient in stuttering simulation session 1, in stuttering simulation session 4 they were assigned a female-simulated patient.

Data collection tools

The surveys used in this study were adapted from those used by Cardell and Hill (2013). Some survey questions were modified to reflect critical skills incorporated into learning objectives for stuttering management specifically in a simulation-based learning environment. All surveys contained four sections seeking students' perceptions of their: (1) level of comfort; (2) anxiety; (3) knowledge; and (4) confidence. Tables 2 and 3 include survey items related to knowledge and confidence, respectively. For each item, participants rated themselves on a five-point Likert scale ranging from 1 = very uncomfortable (not anxious, no knowledge, strongly disagree) to 5 = very comfortable (extremely anxious, very good knowledge, strongly agree). The post-simulation survey included an additional 10 items asking students to respond to statements describing their experience in the stuttering simulation clinic using a scale from 1 to 5 (where 1 represented disagreement and 5 indicated very high agreement). Table 4 outlines the additional survey items.

Data analysis

Survey data was entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) v. 25. Descriptive statistics were used to report the medians and range of students' responses. A non-parametric Friedman test[1] measured medians of each survey item across all time points to determine statistical significance: time point one (T1), prior to the commencement of theoretical coursework or pre-course; time point two (T2), pre-simulation stuttering session; and time point three (T3), post-simulation stuttering session (figure 1). The Wilcoxon signed rank test was used to determine significance of the change between each of the data collection points, that is, between T1 and T2, and between T2 and T3. Effect sizes were calculated according to Cohen's (1988) guidelines.

RESULTS

Although 105 students agreed to participate in the study, data from surveys at all three time points were available for 96 participants only (91.4%). Median values across comfort, anxiety, knowledge and confidence are discussed below.

Comfort

There was no statistically significant difference in students' comfort levels between T1 (median = 3) and T2 (median = 3; $z = -1.928$, $p = 0.054$). However, comfort levels between T2 and T3 (median = 4) significantly improved ($z = -7.528$, $p = 0.000$) with a large effect size ($r = 0.55$), indicating that students felt more comfortable specifically after participating in the stuttering simulation-based learning programme.

Anxiety

Median values of three were constant from T1 to T2 and decreased to two at T3. Students' level of anxiety decreased significantly across the three time points ($\square^2$ (2, $n = 93$) = 81.25, $p < 0.001$). There was no significant change in perceived anxiety levels between T1 and T2 ($z = -1.915$, $p = 0.055$), but between time periods 2 and 3 there was a significant decrease in anxiety levels ($z = -6.658$, $p = 0.000$) with a medium–large effect size ($r = 0.48$). Students therefore perceived that their levels of anxiety reduced between the time points of pre- to post-simulation.

Knowledge

The pre-course, pre-simulation and post-simulation knowledge levels documented by participants are reported in table 2. Students indicated they had 'no knowledge' or 'little knowledge' prior to the commencement of the course. However, Wilcoxon signed rank test results revealed a significant difference in students' perceived knowledge levels between T1 and T2 (large effect size) and then between T2 and T3 (small–large effect size) (table 2). Specifically, significant increases in knowledge levels across the three separate time points were observed for students' *understanding of key components involved in the treatment of stuttering* ($\square^2$ (2, $n = 95$) = 166.53, $p < 0.001$), *specific treatment techniques for stuttering in adults* ($\square^2$ (2, $n = 96$) = 166.51, $p < 0.001$), and *overall knowledge in the area of stuttering* ($\square^2$ (2, $n = 95$) = 166.90, $p < 0.001$).

Confidence

Students' perceived confidence levels at the three time points are shown in table 3. A significant increase in

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TABLE 2 Students' ($n = 96$) median pre-course (T1), pre-simulation (T2) and post-simulation (T3) perceived ratings of knowledge in the area of stuttering

Survey item	Pre-course ratings median (range)[a]	Pre-simulation ratings median (range)[a]	Post-simulation ratings median (range)[a]	Friedman test values	Wilcoxon signed rank test values T1 and T2 (effect size)	Wilcoxon signed rank test values T2 and T3 (effect size)
1. The cause and nature of stuttering	3 (1–4)	4 (2–5)	4 (3–5)	$\square^2$ (2, $n = 96$) = 163.12, $p < 0.001$[b]	$z = -8.337$, $p = 0.000$[b] (0.60)	$z = -3.024$, $p = 0.002$[b] (0.22)
2. The onset and development of stuttering	2 (1–4)	4 (2–5)	4 (3–5)	$\square^2$ (2, $n = 96$) = 163.77, $p < 0.001$[b]	$z = -8.315$, $p = 0.000$[b] (0.60)	$z = -4.243$, $p = 0.000$[b] (0.30)
3. The assessment of stuttering	2 (1–4)	4 (2–5)	4 (3–5)	$\square^2$ (2, $n = 96$) = 163.07, $p < 0.001$[b]	$z = -8.355$, $p = 0.000$[b] (0.60)	$z = -5.324$, $p = 0.000$[b] (0.38)
4. The impact that stuttering has on a person	3 (1–5)	4 (3–5)	4 (3–5)	$\square^2$ (2, $n = 95$) = 137.71, $p < 0.001$[b]	$z = -7.635$, $p = 0.000$[b] (0.55)	$z = -4.564$, $p = 0.000$[b] (0.33)
5. The understanding of key components involved in the treatment of stuttering	2 (1–5)	4 (2–5)	4 (3–5)	$\square^2$ (2, $n = 95$) = 166.53, $p < 0.001$[b]	$z = -8.186$, $p = 0.000$[b] (0.59)	$z = -7.429$, $p = 0.000$[b] (0.53)
6. Specific treatment techniques for stuttering in adults	1 (1–5)	3 (2–5)	4 (2–5)	$\square^2$ (2, $n = 96$) = 166.51, $p < 0.001$[b]	$z = -8.118$, $p = 0.000$[b] (0.59)	$z = -7.456$, $p = 0.000$[b] (0.53)
7. Specific treatment techniques/programmes for stuttering in children	2 (1–5)	4 (2–5)	4 (2–5)	$\square^2$ (2, $n = 96$) = 155.32, $p < 0.001$[b]	$z = -8.374$, $p = 0.000$[b] (0.60)	$z = -4.065$, $p = 0.000$[b] (0.29)
8. Evidence for treatment of stuttering (including different service delivery models)	1 (1–5)	3 (2–4)	4 (2–5)	$\square^2$ (2, $n = 96$) = 156.60, $p < 0.001$[b]	$z = -8.331$, $p = 0.000$[b] (0.60)	$z = -5.867$, $p = 0.000$[b] (0.42)
9. Overall knowledge in the area of stuttering	2 (1–4)	4 (2–4)	4 (3–5)	$\square^2$ (2, $n = 95$) = 166.90, $p < 0.001$[b]	$z = -8.426$, $p = 0.000$[b] (0.61)	$z = -6.760$, $p = 0.000$[b] (0.49)

Notes: [a]Responses were ranked on a Likert scale of 1–5, where 1 = no knowledge and 5 = very good knowledge.
[b]Statistically significant result $p < 0.01$. p-values are two-tailed.

TABLE 3 Students' ($n = 96$) median pre-course (T1), pre-simulation (T2) and post-simulation (T3) perceived ratings of confidence in the area of stuttering

Survey item: 'I feel confident in my ability to …'	Pre-course ratings median (range)[a]	Pre-simulation ratings median (range)[a]	Post-simulation ratings median (range)[a]	Friedman test values	Wilcoxon signed rank test values T1 and T2 (effect size)	Wilcoxon signed rank test values T2 and T3 (effect size)
1. Establish rapport with a client who stutters	3 (1–5)	4 (2–5)	4 (3–5)	χ^2 (2, $n = 96$) = 98.04, $p < 0.001$[b]	$z = -4.707$, $p = 0.000$[b] (0.34)	$z = -6.227$, $p = 0.000$[b] (0.44)
2. Gather appropriate and accurate information during a stuttering assessment	3 (1–4)	4 (2–5)	4 (3–5)	χ^2 (2, $n = 95$) = 126.69, $p < 0.001$[b]	$z = -6.820$, $p = 0.000$[b] (0.49)	$z = -5.931$, $p = 0.000$[b] (0.43)
3. Explain the cause and nature of stuttering	2 (1–4)	4 (2–5)	4 (3–5)	χ^2 (2, $n = 96$) = 145.93, $p < 0.001$[b]	$z = -7.705$, $p = 0.000$[b] (0.56)	$z = -5.413$, $p = 0.000$[b] (0.39)
4. Identify and describe stuttering behaviours	3 (1–4)	4 (2–5)	4 (2–5)	χ^2 (2, $n = 96$) = 133.70, $p < 0.001$[b]	$z = -7.239$, $p = 0.000$[b] (0.52)	$z = -5.688$, $p = 0.000$[b] (0.41)
5. Measure stuttering in real time to obtain information regarding stuttering frequency (e.g., rate a speech sample for % of syllables stuttered (%SS), severity rating)	2 (1–4)	3 (1–4)	3 (2–5)	χ^2 (2, $n = 95$) = 113.83, $p < 0.001$[b]	$z = -6.423$, $p = 0.000$[b] (0.46)	$z = -6.133$, $p = 0.000$[b] (0.44)
6. Integrate all information about the client to guide treatment planning	2 (1–4)	3 (2–5)	4 (2–5)	χ^2 (2, $n = 96$) = 153.23, $p < 0.001$[b]	$z = -7.315$, $p = 0.000$[b] (0.53)	$z = -7.595$, $p = 0.000$[b] (0.54)
7. Select the appropriate treatment programme for client who stutters	2 (1–4)	3 (1–5)	4 (2–5)	χ^2 (2, $n = 95$) = 142.31, $p < 0.001$[b]	$z = -7.610$, $p = 0.000$[b] (0.55)	$z = -5.764$, $p = 0.000$[b] (0.41)
8. Demonstrate and teach to an adult who stutters the correct technique for smooth speech	2 (1–4)	3 (1–4)	4 (1–5)	χ^2 (2, $n = 96$) = 153.91, $p < 0.001$[b]	$z = -6.761$, $p = 0.000$[b] (0.49)	$z = -7.648$, $p = 0.000$[b] (0.55)
9. Demonstrate and teach to a parent of a child who stutters the correct procedures involved in the Lidcombe Program (e.g., praising smooth speech)	2 (1–4)	3 (1–5)	4 (1–5)	χ^2 (2, $n = 96$) = 129.67, $p < 0.001$[b]	$z = -7.629$, $p = 0.000$[b] (0.55)	$z = -4.233$, $p = 0.000$[b] (0.30)

Notes: [a]Responses were ranked on a Likert scale of 1–5, where 1 = strongly disagree and 5 = strongly agree.
[b]Statistically significant result $p < 0.01$. p-values are two-tailed.

TABLE 4 Students' ($n = 104$) median post-simulation (T3) ratings of their experiences in the stuttering simulation clinic

Survey statements: 'The stuttering simulation clinic …'	Median[a]	Range[a]
1. Allowed me to apply what I had learnt in lectures	4	3–5
2. Provided an opportunity to practise important clinical skills in a safe environment	5	3–5
3. Provided an opportunity for me to reflect and refine my clinical skills	4	2–5
4. Developed my skill in the assessment and management of adults who stutter	4	2–5
5. Provided a stimulating learning environment	4	2–5
6. Was a useful learning experience	5	2–5
7. Provided me with a realistic situation of working as a clinician with adults who stutter	4	2–5
8. Developed my confidence in the assessment and management of adults who stutter	4	2–5
9. Provided an opportunity to receive feedback from clinical educators and peers	4	2–5
10. Developed my interest in working with adults who stutter	4	1–5

Note: [a]Responses were ranked on a Likert scale of 1–5, where 1 = disagreement and 5 = very high agreement.

confidence levels was found for the items: *integrate all information about the client to guide treatment planning* ($\square^2$ (2, $n = 96$) = 153.23, $p < 0.001$) and *demonstrate and teach to an adult who stutters the correct technique for smooth speech* ($\square^2$ (2, $n = 96$) = 153.91, $p < 0.001$). Students' perceived confidence levels for all items pertaining to the development of specific clinical skills in stuttering increased significantly between T1 and T2, and then between T2 and T3 with medium to large effect sizes.

Experiences in stuttering simulation session

The 10 additional items asked in the survey at T3 were completed by 104 students (99%). A median of five was found for the items *provided an opportunity to practise important clinical skills in a safe environment* and *was a useful learning experience*. Students' median ratings for the remaining items about their experiences in the simulation sessions were scored as four (table 4), indicating that students perceived that their clinical learning in stuttering was very well supported following their participation in the stuttering simulation-based learning activities.

DISCUSSION

This study explored speech–language pathology students' perceptions of their comfort, anxiety, knowledge and confidence levels in management of people who stutter following participation in lectures, practical sessions and a simulation-based learning programme embedded within an academic course on fluency disorders. Students reported perceived improvements in their knowledge and confidence following engagement in academic coursework (T1 to T2). Notably, students' perceived comfort levels, confidence and knowledge improved, and their anxiety levels reduced prior to and following the simulation-based learning programme (T2 to T3). These results concur with the findings of other simulation-based learning research (Hill *et al.* 2013, Penman *et al.* 2020a) and provide additional confirmation of the value of simulation-based learning experiences alongside academic and practical coursework to support students' development. Specifically, the findings of this study on the benefits of simulation within stuttering education make an important contribution to the simulation literature in speech–language pathology.

Practical experiences assist students to feel more comfortable and less anxious in stuttering management

Comparison of the data at the pre-course time point (T1) and prior to simulation (T2) revealed no statistically significant change in levels of students' perceived comfort or anxiety, indicating that participation in academic stuttering coursework alone did not impact students' levels of comfort and anxiety in the management of stuttering. In contrast, there was a significant positive change in students' perceived levels of comfort and anxiety from pre-simulation (T2) to post-simulation (T3), highlighting that participation in the stuttering simulation-based learning experience together with theoretical coursework, positively influenced students' comfort and anxiety levels. Students strongly agreed at T3 that engaging in simulation was a useful learning experience providing an opportunity to practise important clinical skills in a safe environment. Reduced anxiety levels following students' participation in simulation-based learning activities and students' perceived value of simulation have been reported in previous

speech–language pathology research (e.g., Hill *et al*. 2013, Penman *et al*. 2020a) and similarly in other health disciplines such as nursing (Howard *et al*. 2011). The reduction in students' perceived anxiety levels following simulation experiences is an important finding as students' clinical learning may be impacted by increased anxiety (Chan *et al*. 1994). Reductions in students' anxiety through participation in simulation may therefore have a positive effect on their further clinical learning in the targeted practice area.

The notion that simulation provides a safe learning environment (Ker and Bradley 2014) was verified by the students in the current study, with students strongly agreeing that the simulation provided an opportunity to practise important clinical skills in a safe environment. This finding supports the inclusion of simulation to develop students' comfort levels in stuttering management, especially given literature that suggests that speech–language pathologists do not feel entirely comfortable treating stuttering (Tellis *et al*. 2008). Improving students' comfort levels and reducing their anxiety in delivering stuttering treatment may assist with increasing their overall self-efficacy in managing stuttering as they transition through their academic programme into the speech–language pathology profession. Self-efficacy has been previously explored within student speech–language pathology populations. For example, Pasupathy and Bogschutz (2013) explored the concept of self-efficacy with graduate speech–language pathology students suggesting a positive correlation between their perceived self-efficacy and clinical performance (Pasupathy and Bogschutz 2013). In Pasupathy and Bogschutz (2013), the act of 'doing' or gaining clinical experience assisted in building students' confidence levels which directly fostered their self-efficacy beliefs. More recently, Hough *et al*. (2019) found that physiotherapy students identified positive changes in their self-efficacy in the assessment and treatment of paediatric cases within a simulation-based education setting. The current study's findings that engagement in academic learning and simulation-based learning activities result in increased comfort and decreased anxiety levels, may provide a unique opportunity to increase speech–language pathologists' comfort in working with people who stutter.

Theoretical and practical experiences combined are beneficial to improve students' perceived knowledge and confidence levels in stuttering management

Students' perceived knowledge and confidence levels in this study increased across all survey items from pre-course on stuttering to pre-simulation (T1 to T2) and then following participation in the simulation-based learning experiences (T2 to T3). This result echoes previous research in stuttering education suggesting that students perceived an increase in confidence in their clinical skills following participation in a student-led intensive treatment programme for stuttering (Cardell and Hill 2013, Penman *et al*. 2020b). In the current study, evaluation of student learning outcomes related to discrete clinical tasks in a simulation-based learning environment. Previous student-based stuttering literature, however, explored students' perceptions of their clinical skills following participation in a treatment programme provided to real clients (Cardell and Hill 2013, Penman *et al*. 2020b). Comparable positive outcomes found in the current study are promising given reported difficulties sourcing real clinical experiences for all students to build their knowledge and confidence levels in stuttering management. Therefore, a stuttering simulation-based learning experience may provide speech–language pathology students with the necessary opportunity to practise clinical skills where specific clinical placements in this area do not exist.

Whilst the current study also found that students' perceived knowledge and confidence levels increased following both academic content and the additional simulation-based learning programme, a significant increase was also observed following the academic content only (that is between T1 and T2). These positive outcomes in both perceived knowledge and confidence represent an unsurprising but interesting finding. Data collection in this study did not allow for explication of the relationship between knowledge and confidence and their impact on students' clinical performance. It is plausible that some participants in this study may have experienced the Dunning–Kruger effect, more commonly referred to as the 'bathtub curve' effect (Dunning 2011, Kruger and Dunning 1999). This suggests that with increased knowledge and confidence there is an assumption that one may perceive themselves to be more competent than they are (Dunning 2011). Penman and colleagues (submitted) investigated the development of students' stuttering clinical skills within the stuttering simulation-based learning program discussed in this paper. Findings revealed that there was a statistically significant improvement in students' clinical stuttering skills between simulation session 1 and simulation session 4, that is between T2 and T3 (Penman et al, submitted). Therefore, the Dunning–Kruger effect was challenged by the results of (Penman et al, submitted) study. Taken together, the findings of both studies reveal that students' perceived increased knowledge and confidence levels were associated with concurrent improvements in direct clinical practice skills in stuttering. The association between knowledge, confidence and practice, specifically

the impact of each component on the other, requires further investigation.

Clinical implications

Students perceived a positive change between T1 and T3, suggesting that a combination of academic learning and simulation-based learning activities contributed to this change. Application of theory into practice is attained in a number of ways and simulation-based learning is an innovative way to do this successfully (Morgan *et al.* 2006). In this study, students reported that the simulation-based learning activities were a useful way to learn supporting the inclusion of a stuttering simulation-based learning experience to be embedded within speech–language pathology programme curricula. Providing all students with the opportunity to engage in this experience will directly increase the number of university speech–language pathology student graduates exposed to stuttering learning opportunities.

The results from this perception-based study together with the positive outcomes achieved in the stuttering clinical skill development work conducted by Penman and colleagues (submitted) has determined that there may be a positive association between students' perceptions of their knowledge and confidence and their actual clinical skill development in stuttering. Similar findings regarding competency development were reported in a recent national randomized controlled trial (RCT) (Hill *et al.* 2020). Results from the RCT found equivalent student competency levels when comparing students who engaged in simulation-based learning prior to their traditional placement in contrast with those students who did not (Hill *et al.* 2020). Therefore, simulation-based learning has the capability to build speech–language pathology student clinical skills across all clinical areas, including the management of stuttering.

Limitations and future research

A number of limitations are apparent in this study. First, all student participants were from one Australian university only, thus the results of this study should be interpreted cautiously. Second, this study was conducted within the context of an academic semester whereby students engaged in theoretical learning about stuttering in addition to the embedded simulation-based learning programme. Whilst application of the same study methodology in other education contexts nationally and internationally is encouraged, differences in academic teaching programmes and learner level may lead to different study outcomes. Third, this study was a quantitative cross-sectional survey study. Further qualitative research investigating participants' views of the simulation-based learning experiences in stuttering would be valuable to gain insights into the relative contribution of the simulation-based learning programme to their academic and practical learning.

Future research is required in the area of stuttering and simulation-based learning. It is known that speech–language pathologists are less comfortable in treating stuttering. Simulation-based learning is already being used to train speech–language pathologists in specialized clinical areas such as tracheostomy management (Ward *et al.* 2014). Outcomes of this study may signal the potential success of simulation-based learning experiences to support speech–language pathologists in their stuttering management withing the workplace. The positive results in the current study may signal the potential for future investigation of the inclusion of simulation-based learning professional development opportunities for speech–language pathologists post-graduation. Such opportunities may enhance stuttering skill development and build clinician confidence levels when working with people who stutter.

CONCLUSIONS

Simulation-based learning embedded in a stuttering academic course provides a useful pedagogy for speech–language pathology students. The inclusion of stuttering simulation-based learning activities promoted positive perceived change in students' knowledge, comfort, and anxiety levels. These findings suggest that active involvement in clinically related tasks is important for students to feel more comfortable and less anxious when working with people who stutter. Results of this study indicate that together with engagement in theoretical learning, opportunities to participate in stuttering simulation-based learning experiences are an important inclusion in university programme curricula to assist in the development of students' comfort, confidence and clinical skills when working with people who stutter.

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NOTE

[1] If results across comfort, anxiety, knowledge and confidence are analysed parametrically with one-way repeated measures analysis of variance (ANOVA), the outcome is the same as reported here.

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CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

Ainsworth, S., (1974) The specialist in the treatment for stuttering. *Journal of Fluency Disorders*, 1(3), 48–52. https://doi.org/10.1016/0094-730X(74)90007-2

Barrows, H., (1993) An overview of the uses of standardized patients for teaching and evaluating clinical skills. *Academic Medicine*, 68(6), 443–453. https://doi.org/10.1097/00001888-199306000-00002

Block, S., Onslow, M., Packman, A., Gray, B. & Dacakis, G., (2005) Treatment of chronic stuttering: Outcomes from a student training clinic. *International Journal of Language and Communication Disorders*, 40(4), 456–466. https://doi.org/10.1080/03093640500088161

Bloodstein, O., (1995) *A handbook on stuttering*. 5th ed. (San Diego, California: Singular Publishing Group).

Brisk, D.J., Healey, E.C. & Hux, K.A., (1997) Clinician' training and confidence associated with treating school-age children who stutter: A national survey. *Language, Speech, and Hearing Services in Schools*, 28(2), 164–176.

Cardell, E. & Hill, A.E., (2013) Student-delivered intensive smooth speech programs for adolescents and adults who stutter: A preliminary exploration of student confidence, anxiety, and interest. *Journal of Clinical Practice in Speech–Language Pathology*, 15(2), 54–59.

Chan, J., Carter, S. & McAllister, L., (1994) Sources of anxiety related to clinical education in undergraduate speech–language pathology students. *Australian Journal of Human Communication Disorders*, 22(1), 57–73. https://doi.org/10.3109/asl2.1994.22.issue-1.04

Cooper, E.B. & Cooper, C.S., (1996) Clinician attitudes towards stuttering: Two decades of change. *Journal of Fluency Disorders*, 21, 119–136. https://doi.org/10.1016/0094-730X(96)00018-6

Cohen, J.W., (1988) *Statistical power analysis for the behavioral sciences*. 2nd ed. (Hillsdale, NJ: Lawrence Erlbaum Associates).

Council for Clinical Certification in Audiology and Speech–Language Pathology of the American Speech–Language–Hearing Association, (2018) *2020 Standards for the Certificate of Clinical Competence in Speech–Language Pathology*. Retrieved from https://www.asha.org/certification/2020-SLP-Certification-Standards.

Dudding, C. & Nottingham, E.E., (2018) A national survey of simulation use in university programs in communication sciences and disorders. *American Journal of Speech–Language Pathology*, 27, 71–81. https://doi.org/10.1044/2017_AJSLP-17-0015

Dunning, D., (2011) The Dunning–Kruger effect: on being ignorant of one's own ignorance. In J.M. Olson and M.P Zanna (eds), *Advances in Experimental Social Psychology*, Vol. 44, (pp. 247–296). Academic Press. https://doi.org/10.1016/B978-0-12-385522-0.00005-6

Enderby, P., Pickstone, C., John, A., Fryer, K., Cantrell, A. & Papaioannou, D., (2009) *Resource manual for commissioning and planning services for speech, language and communication needs*. (London, England: Royal College of Speech and Language Therapists (RCSLT)).

Hewat, S., Penman, A., Davidson, B., Baldac, S., Howells, S., Walters, J., et al. (2020) A framework to support development of quality simulation-based learning programs in speech–language pathology. *International Journal of Language and Communication Disorders*, 55(2), 287–300. https://doi.org/10.1111/1460-6984.12515

Hill, A.E., Davidson, B.J. & Theodoros, D.G., (2013) Speech–language pathology students' perceptions of a standardised patient clinic. *Journal of Allied Health*, 42(2), 84–91.

Hill, A.E., Ward, E.C., Heard, R., McAllister, S., McCabe, P., Penman, A., et al. (2020) Simulation can replace part of speech–language pathology placement time: A randomised controlled trial. *International Journal of Speech–Language Pathology*, Early Online, 1–11. https://doi.org/10.1080/17549507.2020.1722238

Hough, J., Levan, D., Steele, M., Kelly, K. & Dalton, M., (2019) Simulation-based education improves student self-efficacy in physiotherapy assessment and management of paediatric patients. *BMC Medical Education*, 19, 463. https://doi.org/10.1186/s12909-019-1894-2

Howard, V., Englert, N., Kameg, K. & Perozzi, K., (2011) Integration of simulation across the undergraduate curriculum: Student and faculty perspectives. *Clinical Simulation in Nursing*, 7, e1–e10. https://doi.org/10.1016/j.ecns.2009.10.004.

Hughes, C.D., Daniels, D.E., Raj, E.X. & Ghent, A., (2019) Using actors and peers in the clinical education of stuttering: Results from a mixed methods study. *Clinical Archives of Communication Disorders*, 4(1), 21–34. https://doi.org/10.21849/cacd.2019.00031

Kelly, E.M., Martin, J.S., Baker, K.E., Rivera, N.I., Bishop, J.E., Krizizke, C.B., et al., (1997) Academic and clinical preparation and practices of school speech–language pathologists with people who stutter. *Language, Speech & Hearing Services in Schools*, 28(3), pp. 195–206.

Kelly, M.A., Hopwood, N., Rooney, D. & Boud, D., (2016) Enhancing students' learning through simulation: Dealing with diverse, large cohorts. *Clinical Simulation in Nursing*, 12(5), 171–176. https://doi.org/10.1016/j.ecns.2016.01.010

Ker, J. & Bradley, P., Simulation in medical education. In T. Swanwick (ed), (2014) *Understanding medical education: Evidence, theory and practice*. (Chichester, West Sussex, UK: Wiley Blackwell).

Kruger, J. & Dunning, D., (1999) Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, 77(6), 1121.

Larue, C., Pepin, J. & Allard, E., (2015) Simulation in preparation or substitution for clinical placement: A systematic review of the literature. *Journal of Nursing Education and Practice*, 5(9), 132–140. https://doi.org/10.5430/jnep.v5n9p132

Miles, A., Friary, P., Jackson, B., Sukula, J. & Braakhuis, A., (2016) Simulation-based dysphagia training: Teaching interprofessional clinical reasoning in a hospital environment. *Dysphagia*, 31(3), pp. 407–415. https://doi.org/10.1007/s00455-016-9691-0

Morgan, P.J., Cleave-Hogg, D., DeSousa, S. & Lam-MacCulloch, J., (2006) Applying theory to practice in undergraduate education using high fidelity simulation. *Medical Teacher*, 28(1), e10–e15. https://doi.org/10.1080/01421590600568488

Packman, A., Onslow, M. & Menzies, R., (2000) Novel speech patterns and the treatment of stuttering. *Disability and Rehabilitation*, 22(1–2), 65–79. https://doi.org/10.1080/096382800297132

Pasupathy, R. & Bogschutz, R.J., (2013) An investigation of graduate speech–language pathology students' SLP clinical self-efficacy. *Contemporary Issues in Communication Science and Disorders*, 40, pp. 151–159.

Penman, A., Hill, A.E., Hewat, S. & Scarinci, N., (2020a) Students' perceptions of simulation-based learning in speech pathology: A pilot study. *International Journal of Practice-based Learning in Health and Social Care*, 8(1), pp. 1–14. https://doi.org/10.18552/ijpblhsc.v8i1.558

Penman, A., Brown, N. & Hill, A.E., (2020b) Speech pathology students' perceived learning outcomes following participation in a fluency booster program. *Focus on Health Professional Education: A Multi-Professional Journal*, 21(2), 32–47. https://doi.org/10.11157/fohpe.v21i2.412

Penman, A., Hill, A.E., Hewat, S. & Scarinci, N., submitted, *Does a simulation-based learning program assist with the development of speech-language pathology students' clinical skills in stuttering management?*

Royal College of Speech and Language Therapists (RCSLT), (2018) *RCSLT Curriculum Guidance for the pre-registration education of speech and language therapists*. (London, England: RCSLT).

Speech Pathology Association of Australia (SPAA), (2017) *Stuttering Management: Stuttering Clinical Guidelines*. (Melbourne, Victoria: Speech Pathology Association of Australia).

Speech Pathology Australia (SPA), (2010) *Accreditation of speech pathology degree programs*. (Melbourne, Victoria: Speech Pathology Australia).

Speech Pathology Australia (SPA), (2018) *Clinical Education in Australia: Building a Profession for the Future*. (Melbourne, Victoria: Speech Pathology Australia).

St Louis, K.O. & Lass, N.J., (1981) A survey of communicative disorders students' attitudes toward stuttering. *Journal of Fluency Disorders*, 6, pp. 41–79.

Tellis, G.M., Bressler, L. & Emerick, K., (2008) An exploration of clinicians views about assessment and treatment of stuttering. *Perspectives on Fluency and Fluency Disorders*, 18(1), 16–23. https://doi.org/10.1044/ffd18.1.16.

Vermeulen, C., (2010) *Undergraduate speech–language therapy students' perceived competence to treat persons who stutter following an additional training component using a simulated patient* (Master's thesis, University of Stellenbosch). Retrieved from https://www.semanticscholar.org/paper/Undergraduate-speech-language-therapy-students%E2%80%99-toVermeulen/97a0b83335916f5eccb0ed4136eaf00770b596f9

Ward, E.C., Baker, S.C., Wall, L.R., Duggan, B.L.J., Hancock, K.L., Bassett, L.V., et al. (2014) Can human mannequin-based simulation provide a feasible and clinically acceptable method for training tracheostomy management skills for speech–language pathologists? *American Journal of Speech–Language Pathology*, 23, 421–436. https://doi.org/10.1044/2014_AJSLP-13-0050

Yaruss, J.S. & Quesal, R.W., (2002) Academic and clinical education in fluency disorders: An update. *Journal of Fluency Disorders*, 27, 43–63.

Zraick, R.I., Allen, R.M. & Johnson, S.B., (2003) The use of standardized patients to teach and test interpersonal and communication skills with students in speech–language pathology. *Advances in Health Sciences Education*, 8, 237–248.

Zraick, R.L., (2020) Standardized patients in communication sciences and disorders: Past, present and future directions. *Teaching and Learning in Communication Sciences & Disorders*, 4(3), Article 4.

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