

Review Article

Simulated Learning Experiences in Global Speech-Language Pathology Programs: A Scoping Review

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ABSTRACT

Purpose: Simulated learning experiences (SLEs) are increasingly utilized in health care education and to train speech-language pathology students. The increasing popularity of simulations, particularly during the COVID-19 pandemic, has generated interest in their potential for achieving teaching and learning outcomes and a need to map the evidence in the field. This review explores the application of SLEs in speech-language pathology training. It examines the types of simulated learning approaches used across clinical contexts in relation to student outcomes and stakeholder perceptions to guide evidence-based curriculum development.

Method: We conducted a scoping review to identify published journal articles and gray literature that described how SLEs were used for clinical training in the profession. Following the abstract and full-text screening, 53 articles were reviewed, and a descriptive synthesis of findings was conducted.

Results: A variety of SLEs are used for training in various areas of practice in the profession. Most studies have been conducted in the Global North and especially post-COVID-19. SLEs offer valuable practice opportunities and can enhance clinical education opportunities for improving students' clinical skills, knowledge, and confidence. Using SLEs can also facilitate the transition from theory to practice. Low-fidelity SLEs appear as effective as higher fidelity options. There are relatively few longitudinal studies and studies that explore how skills learned in SLEs translate into clinical settings. Overall, SLEs were viewed positively for enhancing learning and clinical readiness.

Conclusions: While SLEs have proven useful tools for teaching and learning across various areas of practice in the speech-language pathology field, they require careful planning, scaffolding, and feedback to students. Future research should explore the use of SLEs in the Global South, gather perspectives from clinical educators and standardized patients, and focus on learning processes as well as, where possible, the long-term transfer of skills into real-world practice.

Simulated learning approaches in health care education are tools and techniques used to create a simulated learning experience (SLE) that mimics a real health care event or patient condition (Dudding et al., 2018). SLEs gained traction particularly during the COVID-19 pandemic

when hands-on face-to-face opportunities for students to practice clinical skills with patients were problematic and alternate teaching and practice methods needed to be implemented to ensure continuity of clinical training (Busch & Ma, 2023).

Simulations can be used to teach students a particular skill or activity, evaluate clinical competence, or give students an opportunity for experiential learning (Dudding et al., 2018). Even before COVID-19, these approaches

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were well established as teaching and learning tools, particularly in professions such as medicine and nursing and in contexts of the Global North,¹ which are arguably better resourced (Ajemba et al., 2024; Alonso-Peña & Álvarez-Álvarez, 2023; Coyne et al., 2020; Herrera-Aliaga & Estrada, 2022; Heuer et al., 2022; Saleem & Khan, 2023; Sezgin & Bektas, 2023). There is evidence to suggest that SLEs can be effective approaches to developing speech-language pathology students' knowledge, clinical skills, critical thinking, and other skills such as communication (e.g., Dudding & Nottingham, 2018; Hill et al., 2010; MacBean et al., 2013). SLEs provide a controlled space for students to learn and practice skills without the risk of real-world consequences (Becker et al., 2018).

A range of structured activities that simulate real-world or hypothetical clinical practice scenarios can be used in SLEs. Fidelity refers to the degree to which the SLE resembles a real scenario: High-fidelity SLEs typically offer opportunities for practicing skills in scenarios that mirror real-life clinical settings, while low-fidelity SLEs are typically used to facilitate students' learning of procedural or practical skills (Alinier & Oriot, 2022). In the speech-language pathology profession, simulated learning approaches may include several modalities, as detailed in Table 1.

Some of these approaches may involve role-playing, where students take on specific roles in a scenario designed to mimic real-life situations (Harten, 2012). Role-playing may involve standardized patients (SPs), clinical educators (CEs), avatars, or peers. SLEs often involve cases where a patient-related clinical scenario (and potentially also case-related materials such as patient charts or reports) is used to guide the experience (Dudding & Ginsberg, 2024). The American Speech-Language-Hearing Association (n.d., para 2) indicates that SLEs "should allow students to (a) interpret, integrate, and synthesize core concepts and knowledge; (b) demonstrate appropriate professional and clinical skills; and (c) incorporate critical thinking and decision-making skills while engaged in identification, evaluation, diagnosis, planning, implementation, and/or intervention."

Several recent reviews are available on simulated learning approaches in the health sciences in general (e.g., Alonso-Peña & Álvarez-Álvarez, 2023; Coyne et al., 2020; Heuer et al., 2022; Saleem & Khan, 2023; Sezgin & Bektas, 2023) and for specific professions such as occupational therapy (Grant et al., 2021) and audiology (Alanazi & Nicholson, 2023). These studies conclude that SLEs allow

students to engage in complex clinical scenarios without putting vulnerable clinical populations at risk, and they can foster skill acquisition, confidence, and preparedness. Key benefits include developing competencies essential for patient care such as teamwork, communication, and trust, especially within multidisciplinary teams. However, to maximize learning outcomes, institutions must address challenges related to managing the simulation environment and provide effective debriefing sessions following an SLE (which may take the form of face-to-face discussions, self-reflections, and/or written self-evaluations with feedback; American Speech-Language-Hearing Association, n.d.).

Pogson et al. (2023) highlight the need to focus more specifically on the quality of simulated learning approaches in health care education. While extensive literature is available on the use of SLEs in the speech-language pathology profession and there are several guidelines on how to implement simulated learning approaches (e.g., Dudding et al., 2018; Dudding & Ginsberg, 2024), no existing reviews appear to have consolidated the available evidence, especially considering a teaching and learning focus. This makes it difficult to understand which simulated learning approaches may be most effective for training student abilities in terms of clinical skills and across areas of practice. Despite the strength of the SLE literature, G. W. Wolford et al. (2024) highlight how knowledge gaps exist in the speech-language pathology field, partly because of methodological decisions and the outcomes focused on in this literature.

Because SLE use is evolving in the field (Dudding et al., 2024), it is important to understand how these approaches are integrated into speech-language pathology curricula. A review of how SLEs are being used with curriculum development and learning outcomes is therefore needed; otherwise, CEs may continue to implement SLEs without a thorough evidence-based understanding of how they can be used effectively for teaching and learning purposes.

The primary aim of this scoping review was to examine the existing literature on SLEs used for speech-language pathology clinical training. We focused on the types of simulated learning approaches used, their application in various clinical areas, the measurement of key outcomes for students, and perceptions and experiences of SLEs.

Method

Structure and Reporting

We used Arksey and O'Malley's (2005) scoping review guidelines and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for

¹The wealthiest, most developed nations, which are primarily located in the northern regions of the world, are referred to as the "Global North," while lower income nations, which are primarily located in the southern regions, are referred to as the "Global South" (Chitadze, 2023). However, we recognize that these terms are frequently used in a loose, oversimplistic manner.

Table 1. Simulation modalities in clinical education for speech-language pathology.

Simulation modality	Description	References
Standardized patients	An actor who is coached to simulate a patient or caregiver in a realistic and repeatable way	Busch & Ma, 2023; Dudding et al., 2018; Dudding & Nottingham, 2018
Manikins	A life-sized model of a human, which can mimic human functions to varying degrees	Busch & Ma, 2023; Dudding et al., 2018; Dudding & Nottingham, 2018
Computer-based simulation	May involve a simulation on a computer screen (e.g., an avatar or virtual patient), case-based software, or gaming technology	Busch & Ma, 2023; Dudding et al., 2018; Dudding & Nottingham, 2018
Task trainers	An object or piece of equipment designed to help students practice specific clinical skills or procedures	Busch & Ma, 2023; Dudding et al., 2018; Dudding & Nottingham, 2018
Immersive virtual reality	A three-dimensional computer-generated space that replicates real-world or imagined scenarios for immersive learning; may include virtual patients	Busch & Ma, 2023; Dudding et al., 2018; Dudding & Nottingham, 2018

Scoping Reviews Checklist (Tricco et al., 2018). We did not register a review protocol, and ethical approval was not required for this scoping review. We did not include Arksey and O'Malley's optional Step 6—consulting with stakeholders to inform or validate the findings. However, our knowledge and experience in clinical education and simulated learning approaches in this field contributed to shaping this review.

Identifying Relevant Studies

We systematically searched titles, abstracts and key words without time limitations across six databases, including CINAHL, ERIC, Google Scholar, Medline, Scopus, and Web of Science Core Collection. The Google Scholar search was limited via Publish or Perish software to the first 200 entries downloaded (this search engine is not as selective as the other databases and tends to find many more articles, which are not necessarily related to the topic; also, the algorithm presents the most relevant articles first). Our selection of databases was informed by Bramer et al.'s (2017) recommendations for optimizing database selection for reviews. We did not limit searches by date. Searching took place during October 2023.

We chose relevant search phrases and key words to cover a range of simulated learning approaches. Following some preliminary searches via Medline, Scopus, and Web of Science, we refined our search string as follows: ("speech-language pathology" OR "speech therapy" OR "communication science") AND student AND (simulation OR simulated OR "standardized patient" OR "role play" OR manikin OR "virtual reality" OR "computer-based" OR "video-based" OR "case-based"). We used the same search string for all databases but modified it using appropriate Boolean operators (AND, OR) to combine these terms effectively according to the requirements for each database.

We also hand-searched several major journals in the speech-language pathology field, which had already yielded studies on the topic of interest (*American Journal of Speech-Language Pathology*, *Dysphagia*, *International Journal of Language and Communication Disorders*, *International Journal of Speech-Language Pathology*, *Journal of Communication Disorders*, *Teaching and Learning in Communication Sciences and Disorders*). Reference lists and citations were also searched. This search resulted in 35 additional papers, which were further screened for eligibility. This process is illustrated in Figure 1.

Study Selection

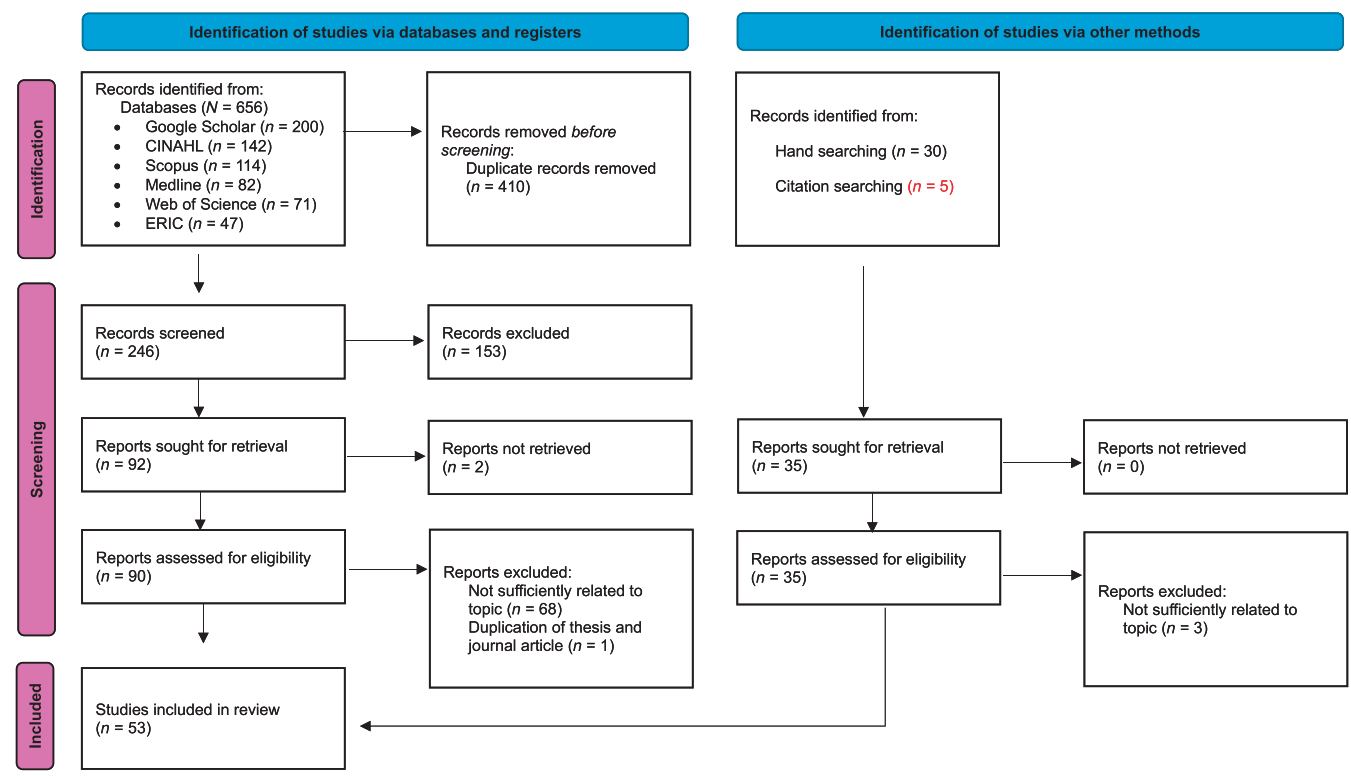
We included English-language peer-reviewed journal articles and gray literature (theses or dissertations) involving empirical research related to simulated learning approaches used for speech-language pathology student teaching and learning. We paid specific attention to whether the source included sufficient focus on SLEs and speech-language pathology students.

We did not limit the type of research design. Studies were excluded if they were not relevant to the research question, were not an empirical study, were duplicates (including where a published article repeated the contents of an unpublished thesis), and/or included scoping or systematic reviews. We did not limit the year of publication or the context.

We conducted an initial screening of titles and abstracts independently to identify potentially relevant articles using rayyan.ai,² which was set to blinded review.

²Rayyan.ai is a web-based software that facilitates the process of conducting a systematic review. It allows for a team of collaborators to review articles, and it records agreement rate. It also stores the full articles for later analysis. We did not use the paid version, which offers automatic synthesis functionality.

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews flow diagram.



We then discussed and resolved any conflicting decisions. Conflicts related to whether the studies sufficiently met our inclusion criteria. Resolution involved each author reading the full article followed by a discussion in relation to the aims of the review and our inclusion criteria. Thereafter, full-text sources were assessed for eligibility based on our inclusion and exclusion criteria. We independently assessed the full-text sources and again discussed and resolved any conflicting decisions. Given that agreement was achieved through discussion and consensus rather than via strict independent ratings, formal interrater agreement metrics were not calculated.

Data Charting

We extracted variables from the selected studies using a predefined data extraction form that we developed based on our goals for the review and taking into account population, concept, and context. Two authors completed a pilot data extraction exercise together. Thereafter, all authors completed data extraction for a third of the set of studies and then checked approximately 25% of each other's charting and discussed and refined our charting process. Information was collected from each article about author(s) and publication year, country of origin, study aim, study design, methodology, population, sample size,

simulation type, field of speech-language pathology (population/area of practice), outcomes assessed in the study, and key findings. Given the scoping nature of this review, a formal quality assessment of individual studies was not conducted.

Data Synthesis

We analyzed the included studies to provide a descriptive synthesis of findings and map key concepts, themes, and gaps. We collaboratively identified common trends across the literature, summarized the data, and organized it into categories and themes, which we then interpreted, reflecting on the implications of simulated learning approaches for teaching and training in this field.

Results

Overview of the Included Studies

Publication Details

Fifty-three studies were deemed eligible for inclusion in this review. Figure 1 provides an overview of the identification and screening process. Table 2 provides an overview of the studies reviewed.

Table 2. Overview of research studies on simulation for speech-language pathology education.

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
1.	Bartlett et al. (2021)	U.S.	Efficacy of an SLE to teach clinical swallow evaluation	Adult dysphagia	Nonrandomized controlled trial using a posttest mixed-methods design (quizzes and written feedback)	Knowledge, critical thinking skills, perceptions (of anxiety, preparedness)	50 graduate speech-language pathology students, 2 facilitators	Manikins, role play	The SLE improved long-term knowledge and reportedly increased student engagement and critical thinking skills more than traditional teaching methods. Anxiety and preparedness were not impacted.
2.	Benadom & Potter (2011)	U.S.	Comparison of real patients vs. manikins for teaching transnasal endoscopy skills	Adult dysphagia (transnasal endoscopy)	Randomized controlled trial with quantitative measures (speed of transnasal endoscopy skills)	Clinical skills, perceptions (of confidence)	18 graduate speech-language pathology students	Manikins, SPs (healthy volunteers)	No difference in pass times for both groups. Both groups were faster and more confident after multiple real-life practice. SLEs may be useful for improving confidence.
3.	Berkowitz (2017)	U.S.	Efficacy of an SLE to teach transnasal endoscopy skills	Adult voice, resonance, dysphagia	Pretest/posttest mixed-methods design (outcome exam and surveys)	Clinical skills, interest in field, perceptions (of confidence)	13 graduate speech-language pathology students	Cadavers, peer role play, task trainers	The SLE improved technical skills, interest in the field, and confidence.
4.	Bressmann & Eriks-Brophy (2012)	Canada	Student perceptions of an SLE for learning how to manage difficult patient behaviors	Communication skills	Posttest mixed-methods design (evaluation form with qualitative feedback)	Perceptions (of SLE)	95 graduate speech-language pathology students	SPs	The SLE improved reported experiences of managing difficult patient behaviors, but students felt underprepared for the SLE.
5.	Broadfoot & Estis (2020)	U.S.	Efficacy of an SLE for assessing oral feeding skills in preterm infants	Pediatric dysphagia (infant feeding)	Pretest/posttest within-subject and between-subjects quantitative design (documentation of distress signals)	Clinical skills	20 graduate speech-language pathology students, 20 UG nursing students, 20 non-health care UG students ($N = 60$)	Video-based, manikins	Speech-language pathology students showed a superior ability post-SLE to identify key factors for distress, assess preterm infants, and make clinical recommendations.
6.	Bryan (2022)	U.S.	Efficacy of an SLE for dysphagia training	Adult dysphagia	Posttest quantitative design (with repeated analysis of videofluoroscopy)	Clinical skills, knowledge, perceptions (of confidence)	27 graduate speech-language pathology students	Computer-based, SPs	The SLE improved confidence and clinical competence in several but not all clinical knowledge areas.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
7.	Busch et al. (2022)	U.S.	Efficacy of an SLE for IPE socialization and competency	Adult dysphagia, AAC, expressive and receptive language, hearing loss	Posttest mixed-methods design (quantitative surveys with students, informal qualitative input from SPs)	Communication skills, IPE teamwork, perceptions (of confidence)	7 graduate speech-language pathology students, 7 UG nursing students ($N = 14$); unknown number of SPs	SPs	The SLE produced high ratings of confidence, understanding of team member roles, and collaborative communication and problem-solving skills.
8.	Busch & Ma (2023)	U.S.	Student perceptions of SLEs during COVID-19	Not specified	Posttest mixed-methods design (survey)	Perceptions (of communication skills, confidence, SLE)	327 graduate speech-language pathology students across universities	VR, computer-based, task trainers, SPs, manikins	SLEs improved reported confidence in clinical decision making and interpersonal (communication) skills. The number of hours spent on an SLE did not correlate with perceptions. Virtual patient SLEs were associated with more positive interpersonal skills.
9.	Byrd et al. (2022)	U.S.	Efficacy of an SLE for training active listening skills	Pediatric fluency (parent counseling)	Pretest/posttest quantitative experimental design (self- and external ratings of listening behaviors; survey)	Communication skills (empathy), perceptions (of SLE)	15 UG and leveling speech-language pathology students	SPs	The SLE improved active listening skills and was deemed highly acceptable.
10.	Carter (2019)	U.S.	Comparison of traditional teaching and a computer-based SLE for pediatric language disorders	Developmental language disorders	Pretest/posttest quantitative experimental design (surveys)	Clinical skills, critical thinking skills, knowledge	103 graduate speech-language pathology students	Computer-based (Simucase)	The group that attended the SLE outperformed the group that received traditional instruction. SLEs may have a positive impact on students' critical thinking skills.
11.	Clinard (2022)	U.S.	Comparison of manikin and case-based SLEs for improving confidence in assessing and managing oral feeding readiness	Pediatric dysphagia (feeding of medically complex infants)	Pretest/posttest sequential, embedded mixed-methods design (surveys)	Knowledge, perceptions (of confidence)	52 second-year graduate speech-language pathology students	Manikins, case-based	Both SLE types led to improved knowledge. Greater gains in confidence with manikins. SLEs reportedly increased confidence.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
12.	Clinard & Dudding (2019)	U.S.	Student perceptions of an SLE	General diagnosis of speech-language disorders	Posttest mixed-methods design (survey and FGDs)	Perceptions (of SLE)	29 speech-language pathology first-year graduate students	Computer-based (Simucase)	Students noted benefits and were satisfied with the SLE, although they did not receive the experience they deemed important. Debriefing is key.
13.	Davidson et al. (2023)	Australia	Role and perceptions of CEs in an SLE for adult rehabilitation	Adult acute rehabilitation (neurogenic disorders and dysphagia)	Posttest qualitative design (interviews)	Perceptions (of role, SLE)	10 CEs	SPs (CEs acted in this role)	There are similarities and differences between CE roles in an SLE and traditional learning approach. An SLE can bridge the gap between theory and practice.
14.	Bressmann & Eriks-Brophy (2012)	U.S.	Student perceptions of an SLE for child language intervention	Child language	Posttest qualitative design (interviews)	Perceptions (of SLE)	10 speech-language pathology first-year graduate students	Computer-based (Simucase)	Students noted generally positive perceptions of the SLE but preparation and debriefing are essential.
15.	Estis et al. (2015)	U.S.	Efficacy of an SLE for enhancing knowledge of IPE roles and patient care	Adult tracheostomy care	Pretest/posttest mixed-methods design (survey)	Knowledge, perceptions (of SLE)	17 graduate speech-language pathology students, 69 senior-level UG nursing students, 24 junior-level UG respiratory students (N = 110)	Manikins, SPs	The SLE improved all students' knowledge of professional roles and tracheostomy care. Students found the SLE challenging but valuable.
16.	Ewing (2015)	U.S.	Comparison of manikin and video-based SLEs for teaching dysphagia care	Pediatric dysphagia (infant feeding)	Pretest/posttest quantitative comparative design (documentation of distress signals)	Clinical skills, knowledge	52 graduate speech-language pathology students	Manikins, video-based	Both methods increased knowledge and clinical judgment skills. Students who completed video-based training documented more distress signs.
17.	Ferguson & Estis (2018)	U.S.	Comparison of didactic teaching with and without an SLE for improving students' evaluation of feeding skills	Pediatric dysphagia (infant feeding)	Pretest/posttest quantitative comparative design (survey)	Clinical skills, knowledge	42 graduate speech-language pathology students, 52 UG nursing students (N = 94)	Video-based	Knowledge improved in both groups. Video-based training improved the accuracy of distress signal identification, interpretation of feeding behaviors and clinical reasoning.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
18.	Harten (2012)	U.S.	Student perceptions of an SLE for aphasia intervention	Aphasia	Pretest/posttest quantitative design (surveys)	Knowledge, perceptions (of clinical skills, competence, SLE)	15 graduate speech-language pathology students	Peer role play	The SLE reportedly assisted with solidifying conceptual knowledge and promoted the transfer of knowledge and skills into real-life scenarios.
19.	Hemmerich & Hoepner (2022)	U.S.	Comparison of role play with and without a video-based SLE for clinical skills in telepractice	Cleft palate	Posttest quantitative comparative design (reviewed common errors in student assignments)	Clinical skills	20 graduate speech-language pathology students	Role play with CE as patient, video-based	The video-based SLE improved intermediate and advanced skills. Using multiple SLEs provided more opportunities for feedback with fewer errors in interpretation and parent education. Role play facilitated more feedback.
20.	Hill et al. (2021)	Australia	Comparison of an SLE vs. traditional training for adult intervention	Adult neurogenic communication, adult dysphagia	Noninferiority randomized controlled trial with quantitative measures (skills assessed via COMPASS Scale)	Clinical skills	325 UG speech-language pathology students from 6 universities in "middle third" of training	Case-based, SPs	An SLE can partially replace traditional placement time without loss of competency.
21.	Irani & Richmond (2012)	U.S.	Listener reactions to students' pseudo stuttering	Fluency	Posttest mixed-method design (survey)	Perceptions (listener reactions)	43 graduate students majoring in CSD	Pseudo stuttering by students	Most listeners were patient. The most common stuttering behavior used by students was repetition.
22.	Kelly et al. (2023)	Australia	Student perceptions of an SLE to learn clinical skills	Oral motor evaluation	Posttest qualitative design (survey)	Perceptions (of SLE)	55 second-year UG speech-language pathology students	VR	Students found the SLE valuable and reported a positive learning experience.
23.	Meyers et al. (1989)	U.S.	Efficacy of an SLE for students' ability to use effective verbal techniques in intervention	Pediatric fluency	Posttest controlled experimental quantitative design (analysis via computer software and in therapy)	Clinical skills	20 graduate speech-language pathology students	Computer-based simulation of dysfluent speech	Students who attended the SLE used more effective therapy techniques with real stuttering patients thereafter.
24.	Miles et al. (2015)	New Zealand	Experiences of an SLE for training hospital readiness	Adult and pediatric dysphagia	Posttest mixed-methods design (survey and FGDs)	Knowledge, perceptions (of confidence, preparedness, SLE)	19 first-year graduate speech-language pathology students	Manikins, SPs	Students attributed increased confidence and clinical competency to the SLE. These findings

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
									were present on the day and three months later, indicating potential long-lasting benefits.
25.	Miles et al. (2016)	New Zealand	Efficacy of an SLE for training hospital readiness and IPE clinical reasoning	Adult and pediatric dysphagia	Pretest/posttest quantitative design (surveys and clinical vignettes)	Perceptions (of confidence, IPE teamwork, knowledge, preparedness)	20 first-year graduate speech-language pathology students, 11 first-year graduate dietetic students in (N = 31)	Case-based, manikins, SPs	The SLE increased students' confidence and knowledge and was helpful for preparing students for interdisciplinary work.
26.	Miles et al. (2020)	New Zealand	Efficacy of an SLE for training tracheostomy management	Tracheostomy care (pediatric and adult)	Pretest/posttest quantitative design (quizzes and rating of skills)	Clinical skills, knowledge, perceptions (of confidence)	35 graduate speech-language pathology students	Video-based	The SLE increased knowledge, confidence and skill performance.
27.	Moineau et al. (2018)	U.S.	Efficacy of an SLE for training language screening skills	Aphasia	Posttest mixed-method design (quantitative surveys for students and SPs; qualitative surveys for students 3 months post-SLE)	Perceptions (of clinical skills, confidence, SLE)	36 graduate speech-language pathology students; unknown number of SPs	Video-based, manikins, SPs	The SLE improved competency, with positive perceptions of the SLE. Certain skills may be slower to emerge, requiring more experience and feedback (e.g., problem-solving moments). Students felt more comfortable and confident with assessments 3 months post-SLE.
28.	Muñoz-Montes et al. (2021)	Chile	Student perceptions of learning via an SLE	Communication across the life span	Posttest mixed-method design (surveys)	Perceptions (of SLE)	277 third- and fourth-year UG speech-language pathology students	SPs	Students had positive perceptions of the SLE.
29.	Noureddine et al. (2016)	U.S.	Efficacy of an IPE SLE for student learning	Adult dysphagia	Posttest mixed-method design (survey and analysis of debrief session)	Perceptions (of confidence, SLE)	16 second-year graduate speech-language pathology students, 29 UG nursing students	Case-based, SPs	The IPE SLE was valued by students across disciplines. Students were satisfied with the SLE design, felt supported, and indicated confidence in the learning process.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
30.	Ormerod & Mitchell (2024)	U.K.	Student perceptions of an SLE	Adult dysphagia and stroke, pediatric school-age language	Posttest qualitative design (FGDs and interviews)	Perceptions (of SLE)	11 second-year UG speech-language pathology students	SPs, video-based	Students had positive experiences of the SLE. They valued the safe space and learning support. Barriers related to prior knowledge, facilitator skills, group size and learning landscape of the program.
31.	Penman et al. (2020)	Australia	Student perceptions of an SLE	Adult neurogenic communication, adult dysphagia	Pretest/posttest mixed-methods design (surveys and FGD)	Perceptions (of anxiety, confidence, preparedness)	6 final-year speech-language pathology students (4 UG, 2 graduate)	SPs	Students found the SLE valuable and reported increased levels of confidence and preparedness for clinical placements.
32.	Penman et al. (2021a)	Australia	Evaluation of students' clinical skills after an SLE	Adult fluency	Posttest quantitative design (evaluation via a developed tool)	Clinical skills	114 third- or fourth-year UG speech-language pathology students	SPs, peer role play, case-based, video-based	The SLE significantly improved students' clinical skills.
33.	Penman et al. (2021b)	Australia	Efficacy of an SLE for improving students' comfort, anxiety, knowledge and confidence in stuttering management	Adult fluency	Pretest/posttest mixed-method design (surveys)	Perceptions (of anxiety, comfort, confidence, knowledge)	105 UG and graduate speech-language pathology students	SPs, case-based, video-based	Students valued the SLE. Attending the SLE produced a significant difference in students' perceived knowledge levels, with increased comfort and decreased anxiety.
34.	Quail et al. (2016)	Australia	Comparison of students' self-reported communication skills, knowledge, confidence and empathy in an SLE vs. a traditional learning environment	Communication with the elderly	Pretest/posttest mixed-method design (surveys)	Perceptions (of communication skills, confidence, knowledge)	69 UG speech-language pathology students	SPs, VR	The SLE led to higher self-reported communication skills, knowledge and confidence, but not empathy. Students found conversing with a virtual patient more challenging than with a real patient or SP.
35.	Rami et al. (2003)	U.S.	Effect of a pseudostuttering SLE on student self-perceptions	Fluency	Pretest/posttest quantitative design (surveys)	Perceptions (listener reactions)	29 graduate speech-language pathology students	Pseudostuttering by students	The SLE impacted student self-perceptions of having a stutter. Students experienced negative socioemotional

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
									aspects associated with stuttering.
36.	Robinson et al. (2020)	Australia	Efficacy of an SLE for teaching communication skills	Dementia	Posttest quantitative design (survey and CE ratings of interactions)	Communication skills, perceptions (of communication skills, confidence, knowledge)	82 second-year UG speech-language pathology students	VR	CEs' ratings of students' performance were higher following a second SLE. Students' self-ratings were higher after the SLE.
37.	Smith et al. (2021)	U.S.	Efficacy of an SLE for improving student confidence with aphasia management across health care settings	Aphasia	Pretest/posttest mixed-methods design (surveys)	Clinical skills, perceptions (of confidence)	77 first-year graduate speech-language pathology students	Video-based	The SLE improved confidence for each clinical skill and health care setting, but it did not affect students' ability to identify factors such as patient motivation and comorbidities.
38.	Smyers (2019)	U.S.	Student perceptions of an SLE and its impact on knowledge for articulation disorders	Articulation	Pretest/posttest mixed-methods design (surveys)	Clinical skills, perceptions (of confidence, knowledge)	5 senior UG CSD students	Computer-based (Simucase)	The SLE improved confidence when providing treatment, but confidence decreased in taking data and making clinical decisions. The SLE led to increased time spent interacting with cases and increased competency scores.
39.	Stead et al. (2020)	U.S.	Student perceptions of four SLEs	Adult dysphagia (transnasal endoscopy), TBI	Posttest mixed-methods design (survey)	Clinical skills, knowledge, perceptions (of confidence, SLE)	18 first-year graduate speech-language pathology students	Task trainers, manikins, video-based, role play, SPs	Using both SPs and manikin training increased students' perceptions of knowledge and confidence in their clinical skills.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
40.	Stead et al. (2022)	U.S.	Exploration of variables that predict student success when engaging with SLEs	Aphasia	Posttest quantitative design (analysis of decision points)	Clinical skills	149 graduate students in CSD programs	Computer-based (Simucase)	Individual factors were more responsible for predicting student outcomes after SLEs. Students who navigated initial assessment steps more carefully were more likely to reach the correct recommendation.
41.	Stead, Tinsley, et al. (2023)	U.S.	Efficacy of an SLE for improving communication skills in tracheostomy care	Adult tracheostomy care	Posttest quantitative design (survey)	Communication skills, perceptions (of SLE)	20 graduate speech-language pathology students	SPs	The SLE improved communication skills, was helpful to student learning and provided a safe environment to practice clinical skills.
42.	Stead, Vinson, et al. (2023)	U.S.	Efficacy of an SLE for training communication skills in end-of-life care	End-of-life care	Posttest quantitative design (student surveys and CE evaluation of student performance)	Communication skills, perceptions (of SLE)	33 graduate speech-language pathology students	SPs	Most students showed effective communication skills, but struggled with terminology use, summary and validation skills. Students felt the SLE advanced their learning, helped them reflect, and gave exposure to fragile medical patients.
43.	Strang & Meyers (1987)	U.S.	Efficacy of an SLE for evaluating and training intervention techniques in fluency intervention	Pediatric fluency	Pretest/posttest quantitative design (comparison of intervention strategies used)	Clinical skills	8 experienced SLPs, 8 "entry-level" speech-language pathology students ($N = 16$)	Computer-based simulation of dysfluent speech	More experienced SLPs performed better than students in the SLE.
44.	Syder (1996)	U.K.	Efficacy of an SLE for training clinical skills	Generic skills: case history taking, basic assessment and some intervention skills	Posttest qualitative design (survey)	Perceptions (of SLE)	33 graduate speech-language pathology students	SPs	The SLE was well received. It seemed to work better when introduced at first-year level.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
45.	Taylor et al. (2018)	U.S.	Efficacy of an SLE for training communication skills	Pediatric TBI (communication with parent, teacher, doctor)	Pretest/posttest quantitative design (interactions scored using the SBAR-C tool)	Communication skills	3 graduate speech-language pathology students	VR, case-based	The SLE improved communication skills. Students performed best when interacting with the teacher and worst with the doctor.
46.	Thomas et al. (2023)	Australia	Comparison of SP and video-based SLEs on student self-reported confidence, preparedness and anxiety	Pediatric (communication skills with caregivers)	Pretest/posttest randomized cross-over quantitative design (surveys)	Perceptions (of anxiety, confidence, preparedness)	127 first-year graduate speech-language pathology students	SPs, video-based	Both SLEs increased confidence and preparedness scores, but only the SP activity decreased student anxiety.
47.	Wagner (2016)	U.S.	Comparison of manikin and video-based SLEs on students' ability to identify markers of distress in infant feeding	Pediatric dysphagia (infant feeding)	Pretest/posttest quasi-experimental quantitative design (documentation of distress signals)	Clinical skills, knowledge, perceptions (of anxiety)	16 graduate speech-language pathology and 5 UG CSD students ($N = 22$)	Manikins, video-based	Students trained via the video-based SLE had higher clinical judgment scores and lower anxiety levels than those trained on manikins. Knowledge and technical skills improved via both approaches.
48.	Ward et al. (2015)	Australia	Perceptions of an SLE for developing clinical skills in pediatric dysphagia	Pediatric dysphagia	Pretest/posttest quantitative design (surveys)	Perceptions (of anxiety, clinical skills, confidence, knowledge)	29 graduate speech-language pathology students	Manikins	The SLE significantly improved students' perceptions of knowledge, skills and confidence, and reduced anxiety about working clinically.
49.	Weir-Mayta et al. (2020)	U.S.	Effects of an IPE SLE on student knowledge and preparedness for hospital placements	Adult dysphagia, aphasia	Pretest/posttest quasi-experimental quantitative design (surveys)	Perceptions (of clinical skills, IPE teamwork, knowledge, preparedness)	18 second- and third-year graduate speech-language pathology students, 7 fourth-year UG nursing students ($N = 25$)	Peer role play, manikins	Following the SLE, speech-language pathology students felt more knowledgeable about the roles and responsibilities of team members and more prepared in their skills for working in hospital contexts.

(table continues)

Table 2. (Continued).

No.	Authors	Country	Aim/focus of study	Speech-language pathology field (population/ condition)	Study design	Evaluated outcomes	Participants	Simulation type	Key findings related to simulation (note that these statements are simplified summaries)
50..	Wilson et al. (2016)	New Zealand	Efficacy of an IPE SLE for language-literacy instruction	Literacy	Pretest/posttest quasi-experimental quantitative design (surveys and analysis of lesson plans)	Clinical skills, IPE teamwork, knowledge	27 third-year UG speech-language pathology students, 18 UG student teachers	Case-based	Speech-language pathology students who worked together on the SLE with student teachers showed increased knowledge, while those who worked individually did not. Students' case-based instructional planning skills did not improve via the SLE.
51.	L. L. Wolford & Wolford (2020)	U.S.	Comparison of practice on human volunteers, task trainers and manikins for teaching transnasal endoscopy skills	Adult dysphagia (transnasal endoscopy)	Posttest quantitative comparative design (speed of endoscopy, surveys for students and SPs)	Clinical skills, perceptions (of confidence, SP comfort)	21 second-year graduate speech-language pathology students, 6 SPs	Simulated patients, manikins, task trainers	No significant differences between the simulation types. All simulation types increased student confidence after practice. Confidence predicted the time taken to complete the task.
52.	L. L. Wolford et al. (2023)	U.S.	Comparison of an SLE with and without peer-to-peer practice to train transnasal endoscopy skills	Adult dysphagia (transnasal endoscopy)	Quasi randomized controlled trial with quantitative measures (surveys, request for additional experience, and speed of transnasal endoscopy skills)	Clinical skills, perceptions (of confidence)	36 graduate speech-language pathology students	Task trainers	No significant differences between groups, with low effect sizes. Peer-to-peer practice did not add significant benefits after simulation had already occurred.
53.	Zraick et al. (2003)	U.S.	Comparison of an SLE vs. didactic lectures to train interpersonal communication skills	Aphasia	Posttest quantitative comparative design with repeated measures (CE ratings of student performance)	Communication skills	18 graduate speech-language pathology students	SPs, case-based	Both groups initially showed weak skills. Clinical skills improved following additional lectures.

Note. US = United States; SLE = simulated learning experience; pretest = before the SLE; posttest = after the SLE; SP = standardized patient; UG = undergraduate; AAC = augmentative and alternative communication; IPE = interprofessional education; leveling = students completing necessary undergraduate prerequisite courses to enter a graduate program; FGD = focus group discussion; COMPASS = Competency Assessment in Speech Pathology; UK = United Kingdom; VR = virtual reality; CE = clinical educator; CSD = communication science and disorders; TBI = traumatic brain injury; SLP = speech-language pathologist; SBAR-C = Situation, Background, Assessment, Recommendation, and Communication.

All papers involved empirical studies that investigated SLEs used for teaching and learning purposes with speech-language pathology students. Most papers ($n = 43$) were published during or after 2015, with dates ranging from 1987 to 2023. More than half the papers ($n = 28$) were published since 2020 and the advent of the COVID-19 pandemic. All but one study was conducted in the Global North, with a breakdown of countries of origin as follows: United States ($n = 35$), Australia ($n = 10$), New Zealand ($n = 4$), United Kingdom ($n = 2$), and Canada ($n = 1$). The Global South outlier was a study conducted in Chile ($n = 1$). Figure 2 provides an illustration of the breakdown of the countries in which the reviewed literature was conducted.

The data set included five unpublished theses/dissertations. Papers were published in a range of journals in the speech-language pathology field, most often in *Teaching and Learning in Communication Sciences & Disorders* ($n = 12$), the *American Journal of Speech-Language Pathology* ($n = 7$), and the *International Journal of Language and Communication Disorders* ($n = 5$). Penman et al. (2021a, 2021b) used the same cohort of students across their two papers. Wagner (2016) and Ewing (2015) used the same SLE scenarios in their studies.

Participants

Most studies targeted speech-language pathology students ($n = 52$), including both undergraduate ($n = 12$) and graduate ($n = 42$) students, depending on how speech-language pathology programs are taught in each context (see Table 3 for details of qualification requirements across the countries included in the review; see Figure 3

for an illustration of the participants included across the studies). For the purpose of this review article, it should be noted that an undergraduate degree does not allow for licensed or certified speech-language pathology practice in the United States. However, different countries allow for or have historically allowed for undergraduate students to be qualified to practice.

One study involved speech-language pathology CEs as participants (Davidson et al., 2023), three sought input from SPs (Busch et al., 2022; Moineau et al., 2018; L. L. Wolford & Wolford, 2020), and another involved SLE facilitators (Bartlett et al., 2021). Other students included alongside speech-language pathology students in interprofessional education (IPE) studies were nursing students ($n = 6$), dietetic students ($n = 1$), respiratory therapy students ($n = 1$), non-health care students ($n = 1$), and student teachers ($n = 1$).

Study Designs

The studies utilized diverse study designs, encompassed a wide range of outcomes, and incorporated several simulated learning approaches. Table 4 provides a breakdown of the outcomes, simulated learning approaches, and the total sample size per area of practice. Most studies utilized quantitative ($n = 28$) or mixed-methods ($n = 19$) designs, with only six exclusively qualitative studies included. Pretest/posttest designs were frequently used ($n = 24$), typically focusing on comparing students' knowledge, skills, or perceptions before and after an SLE via Likert scales, evaluation rubrics, rating scales, and surveys. Many studies used a posttest-only approach ($n = 26$), typically involving quantitative or mixed methods to gather data on the impact of the SLE on aspects such as students'

Figure 2. Breakdown of countries included in the reviewed studies.

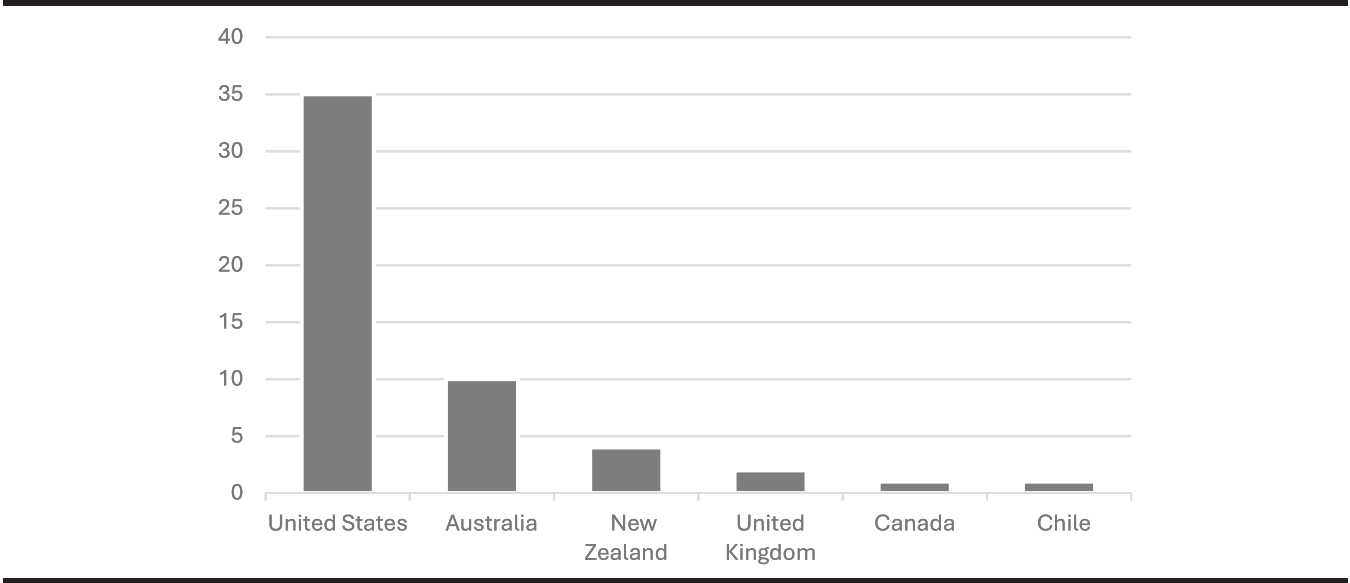


Table 3. Speech-language pathologist qualification requirements across the countries included in the review.

Country	Undergraduate requirement	Graduate requirement
Australia	Bachelor's degree in speech-language pathology	OR master's degree in speech-language pathology (if a bachelor's degree was completed in a related field)
Canada	Bachelor's degree in communication sciences and disorders or a related field	Master's degree in speech-language pathology
Chile	Bachelor's degree in speech-language pathology (can work on general cases or with assistance)	Master's in speech-language pathology (to work independently)
New Zealand	Bachelor's degree in speech-language pathology	OR master's degree in speech-language pathology (if a bachelor's degree was completed in a related field)
United Kingdom	Bachelor's degree in speech-language pathology	OR master's degree in speech-language pathology (if a bachelor's degree was completed in a related field)
United States	Bachelor's degree in communication sciences and disorders or an undergraduate degree with prerequisite courses (although it should be noted that an undergraduate degree does not allow for licensed or certified speech-language pathology practice in the United States)	Master's degree in speech-language pathology

Note. Although we have used the term “graduate” throughout Tables 1 and 2 in order to achieve some homogeneity of description, the term “postgraduate” is used in some contexts to refer to master’s-level studies.

confidence, knowledge, clinical skills, perceptions, and experiences usually via a survey. Qualitative studies were less commonly used and typically involved interviews and focus group discussions to explore experiences and perceptions of SLEs. Thirteen studies involved comparisons, including student performance across real versus simulated patients ($n = 1$; Benadom & Potter, 2011), traditional teaching or training approaches versus SLEs ($n = 5$), or a comparison of different simulation types ($n = 7$).

Areas of Practice

The most common area of practice included across the studies was dysphagia, including adult dysphagia ($n =$

14) and pediatric dysphagia ($n = 6$), and two studies targeted both adult and pediatric dysphagia (Miles et al., 2015, 2016). Specific procedures such as transnasal endoscopy, also known as fiberoptic endoscopic evaluation of swallowing ($n = 4$) and tracheostomy care ($n = 3$ adult, $n = 1$ pediatric) were investigated. Traditionally vulnerable, fragile, or hard-to-access populations in a student training facility were also included, with studies focusing on aphasia or adult neurogenic disorders ($n = 15$), voice ($n = 1$), dementia ($n = 1$), and end-of-life care ($n = 1$). Fluency was relatively well represented ($n = 7$), with three of these studies focusing on pediatric fluency. Other pediatric areas targeted were literacy ($n = 1$), child language ($n = 1$), school-age language ($n = 1$), articulation ($n = 1$),

Figure 3. Participants included across the studies.

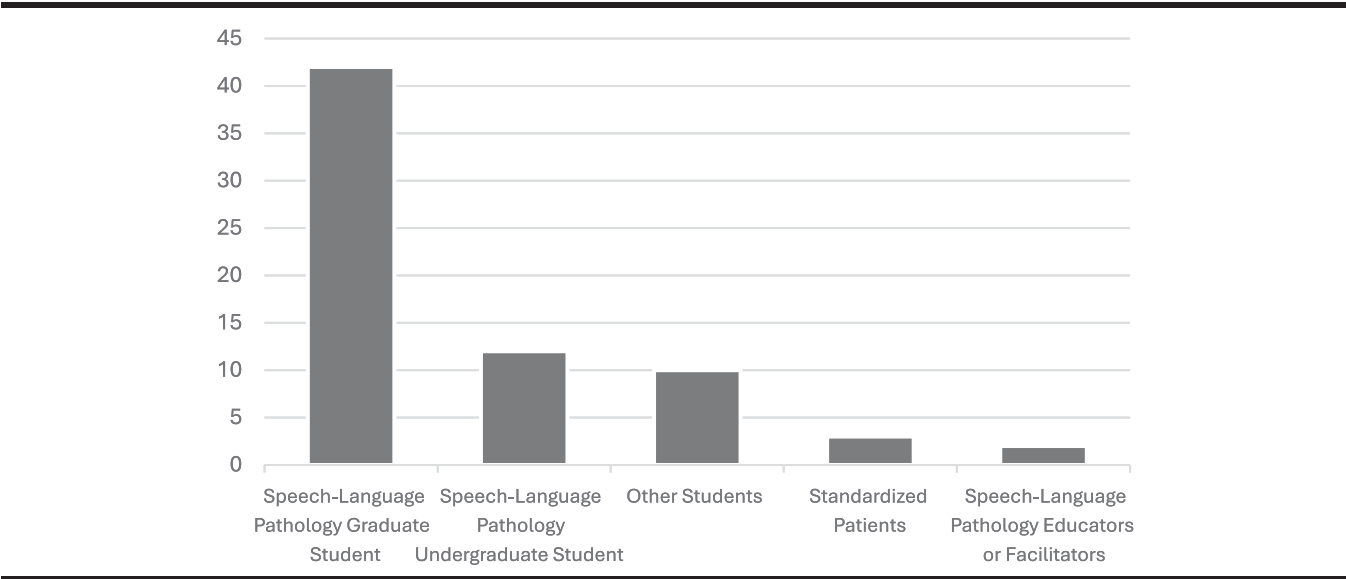


Table 4. Breakdown of outcomes, simulated learning approaches, and total sample size per area of practice.

Area of practice	No. of studies	Citations	Evaluated outcomes	Simulated learning approaches (types)	Total no. of speech-language pathology students	Study designs
AAC	1	Busch et al., 2022	Communication skills, IPE teamwork, perceptions (of confidence)	SPs	7	Posttest mixed-methods design (quantitative surveys with students, informal qualitative input from SPs)
Adult neurogenic communication disorders (including aphasia, dementia, communication with the elderly, and end-of-life care)	14	Davidson et al., 2023; Harten, 2012; Hill et al., 2021; Moineau et al., 2018; Ormerod & Mitchell, 2024; Penman et al., 2020; Quail et al., 2016; Robinson et al., 2020; Smith et al., 2021; Stead et al., 2020; Stead et al., 2022; Stead, Vinson, et al., 2023; Weir-Mayta et al., 2020; Zraick et al., 2003	Clinical skills, communication skills, knowledge, perceptions (of anxiety, clinical skills, comfort, communication skills, competence, confidence, IPE teamwork, knowledge, preparedness, role, SLE)	Case-based Computer-based (Simucase) Manikins Peer role play Role play SPs Video-based VR	857 (plus 10 CEs)	• Pretest/posttest quantitative design (surveys) • Pretest/posttest mixed-method design (surveys) • Posttest qualitative design (interviews; FGDs; descriptive surveys) • Posttest quantitative design (survey and CE ratings of interactions, analysis of decision points, student surveys and CE evaluation of student performance) • Posttest mixed-methods design (survey) • Noninferiority randomized controlled trial with quantitative measures
Cleft palate	1	Hemmerich & Hoepner, 2022	Clinical skills	Role play Video-based	20	Posttest quantitative comparative design (reviewed common errors in student assignments)
Communication across the life span	1	Muñoz-Montes et al., 2021	Perceptions of SLE	SPs	277	Posttest mixed-method design (surveys)

(table continues)

Table 4. (Continued).

Area of practice	No. of studies	Citations	Evaluated outcomes	Simulated learning approaches (types)	Total no. of speech-language pathology students	Study designs
Child speech and language (including articulation, developmental language disorders, literacy, school age language)	6	Busch et al., 2022; Carter, 2019; Elliott & Brumbaugh, 2021; Ormerod & Mitchell, 2024; Smyers, 2019; Wilson et al., 2016	Clinical skills, communication skills, critical thinking skills, IPE teamwork, knowledge, perceptions (of confidence, knowledge, SLE)	Case-based Computer-based (Simucase) SPs Video-based	163	• Pretest/posttest quantitative experimental design (surveys; analysis of lesson plans) • Pretest/posttest mixed-methods design (surveys) • Posttest qualitative design (interviews; FGDs) • Posttest mixed-methods design (quantitative surveys with students, informal qualitative input from SPs)
Dysphagia (adult and pediatric; FEES)	21	Bartlett et al., 2021; Benadom & Potter, 2011; Berkowitz, 2017; Broadfoot & Estis, 2020; Bryan, 2022; Busch et al., 2022; Clinard, 2022; Davidson et al., 2023; Ewing, 2015; Ferguson & Estis, 2018; Miles et al., 2015, 2016; Nouredine et al., 2016; Ormerod & Mitchell, 2024; Penman et al., 2020; Stead et al., 2020; Wagner, 2016; Ward et al., 2015; Weir-Mayta et al., 2020; L. L. Wolford & Wolford, 2020; L. L. Wolford et al., 2023	Clinical skills, communication skills, critical thinking skills, Interest in field, IPE teamwork, knowledge, perceptions (of anxiety, clinical skills, confidence, IPE teamwork, knowledge, preparedness, role, SLE, SP comfort)	Cadavers Case-based Computer-based (including Simucase) Manikins Peer role play Role play SPs Task trainers Video-based	555	• (Quasi)randomized controlled trial with quantitative measures (speed of transnasal endoscopy skills, surveys, request for additional experience) • Pretest/posttest mixed-methods designs (FGDs, outcome exam, survey) • Pretest/posttest quantitative designs (clinical vignettes, documentation of distress signals, repeated analysis of videofluoroscopy, surveys) • Posttest mixed-methods designs (surveys, FGDs, informal qualitative input, analysis of debrief session)

(table continues)

Table 4. (Continued).

Area of practice	No. of studies	Citations	Evaluated outcomes	Simulated learning approaches (types)	Total no. of speech-language pathology students	Study designs
						• Posttest qualitative design (FGDs, interviews) • Posttest quantitative comparative design (speed of endoscopy, survey) • Nonrandomized controlled trial using a posttest mixed-methods design (quizzes and written feedback)
Fluency (adult, pediatric)	7	Byrd et al., 2022; Irani & Richmond, 2012; Meyers et al., 1989; Penman et al., 2021a, 2021b; Rami et al., 2003; Strang & Meyers, 1987	Clinical skills, communication skills (empathy), perceptions (of anxiety, comfort, confidence, knowledge, listener reactions, SLE)	Computer-based (Simucase) Case-based Peer role play Pseudo stuttering SPs Video-based	334	• Pretest/posttest quantitative design (surveys; comparison of intervention strategies used; self- and external ratings of listening behaviors) • Pretest/posttest mixed-method design (surveys) • Posttest quantitative design (evaluation via a developed tool, analysis via computer software and in therapy) • Posttest mixed-method design (survey)
General diagnosis of speech-language disorders	1	Clinard & Dudding, 2019	Perceptions of SLE	Computer-based (Simucase)	29	Posttest mixed-methods design (survey and FGDs)
Hearing loss	1	Busch et al., 2022	Communication skills, IPE teamwork, perceptions (of confidence)	SPs	7	Posttest mixed-methods design (quantitative surveys with students, informal qualitative input from SPs)
Pediatric TBI	1	Taylor et al., 2018	Communication skills	Case-based VR	3	Pretest/posttest quantitative design (interactions scored)

(table continues)

Table 4. (Continued).

Area of practice	No. of studies	Citations	Evaluated outcomes	Simulated learning approaches (types)	Total no. of speech-language pathology students	Study designs
Tracheostomy care	3	Estis et al., 2015; Miles et al., 2020; Stead, Tinsley, et al., 2023	Clinical skills, communication skills, knowledge, perceptions (of confidence, SLE)	Manikins SPs Video-based	72	• Pretest/posttest quantitative design (quizzes and rating of skills) • Pretest/posttest mixed-methods designs (outcome exam and surveys)
Voice	1	Berkowitz, 2017	Clinical skills, interest in field, perceptions (of confidence)	Cadavers Task trainers	13	Pretest/posttest mixed-methods design (outcome exam and surveys)

Note. AAC = augmentative and alternative communication; IPE = interprofessional education; SP = standardized patient; SLE = simulated learning experience; pretest = before the SLE; posttest = after the SLE; FGD = focus group discussion; CE = clinical educator; VR = virtual reality; FEES = fiberoptic endoscopic evaluation of swallowing; TBI = traumatic brain injury.

oral motor evaluation ($n = 1$), augmentative and alternative communication ($n = 1$), and cleft palate ($n = 1$). Several papers targeted more than one area of practice in the SLE they described.

Table 4 provides a breakdown of the number of studies and students across areas of practice. Adult neurogenic communication disorders involved the greatest number of students ($n = 857$ across 14 studies), followed by dysphagia ($n = 555$ across 21 studies) and fluency ($n = 334$ across seven studies). All three of these strongly focused-on areas of practice utilized diverse study designs, encompassed a wide range of evaluated outcomes, and incorporated several simulated learning approaches.

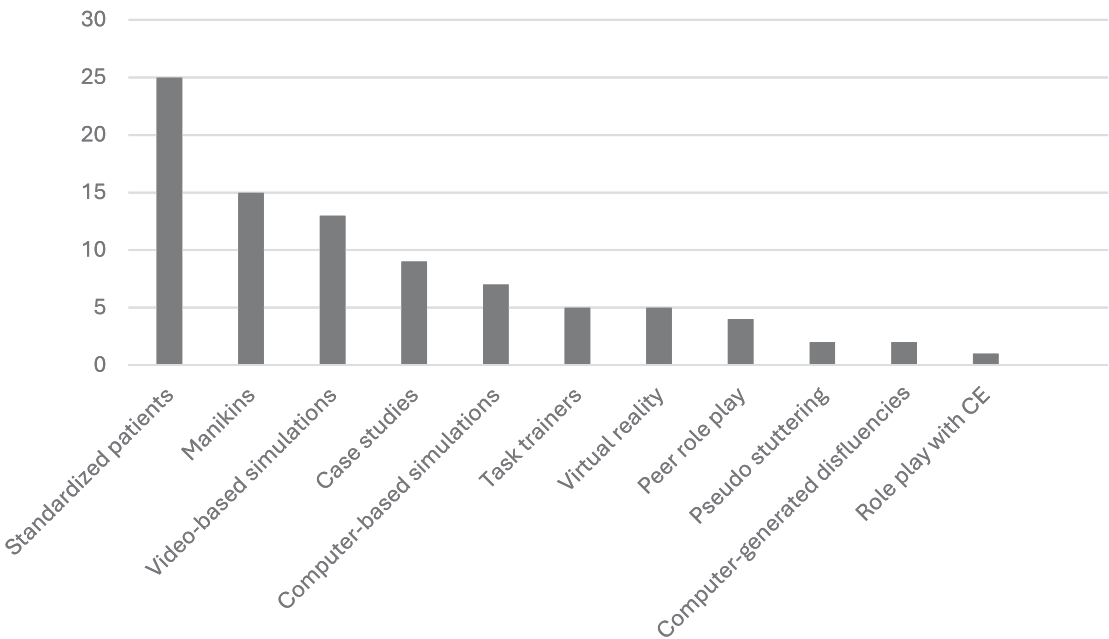
Types of Simulated Learning Approaches Described

In this study, the word *type* describes the modality or simulated learning approach used in the SLE (refer to the definitions provided in the introduction). The types of simulated learning approaches used in SLEs varied across the studies. Sometimes multiple types were used in the same SLE ($n = 26$; e.g., manikins and SPs). Because speech-language pathology practice is different from other health sciences such as medicine and nursing, where there is arguably a greater focus on competence in specific clinical skills rather than a more holistic, process-based approach to interacting with patients (Burns et al., 2012), the combination of several types of simulated learning

approaches within an SLE is used to achieve greater realism and mirror real-world speech-language pathology scenarios. Therefore, our review focused on exploring the key outcomes noted in each study rather than on attempting to separate out findings according to simulation type.

Figure 4 provides a breakdown of the types of simulated learning approaches across the studies reviewed. SPs ($n = 25$) were most frequently mentioned, followed by manikins ($n = 15$); video-based simulations ($n = 13$); computer-based simulations ($n = 7$), which was most commonly via Simucase software; and virtual reality (VR; $n = 5$), which included 3D immersive experiences with virtual patient avatars. The SLEs were sometimes explicitly described as including case studies ($n = 9$), although many of the other types of SLEs mentioned in the included studies would by nature involve cases too, including activities with SPs, manikins, and VR. Other studies explicitly mentioned the use of role play via peer role play ($n = 4$) and role play with the CE in the role of a pediatric patient ($n = 1$; Hemmerich & Hoepner, 2022). Task trainers were also used ($n = 5$), most commonly for training dysphagia-related procedures (e.g., pool noodles; a transnasal endoscopy trainer used with a manikin; plastic pipe fittings, a box and pieces of plastic drinking straws). Please see Table 2 for details. Perhaps unique to the speech-language pathology profession, two studies focused on the use of pseudo stuttering (Irani & Richmond, 2012; Rami et al., 2003), and two included computer-generated simulations of dysfluent speech (Meyers et al., 1989; Strang & Meyers, 1987).

Figure 4. Types of simulated learning approaches across the studies reviewed. CE = clinical educator.



Importantly, six studies point to improvements in students' skills with low-fidelity, cheaper simulated learning approaches. These included task trainers (Benadom & Potter, 2011; Berkowitz, 2017; L. L. Wolford & Wolford, 2020) and video-based options (Ewing, 2015; Ferguson & Estis, 2018; Wagner, 2016), depending on the area of clinical practice.

Outcomes of SLEs

Outcomes primarily focused on whether SLEs empirically demonstrated or self-reported improvement in students' clinical skills ($n = 25$), confidence ($n = 21$), knowledge ($n = 20$), communication skills ($n = 7$), IPE teamwork ($n = 4$), and critical thinking skills ($n = 2$). A second frequent focus was on participant perceptions ($n = 28$) of aspects such as anxiety, clinical skills, competence, confidence, knowledge, listener reactions, preparedness, and the SLE itself. Figure 5 provides an illustration of the outcomes focused on in the studies reviewed. Several studies explored student anxiety ($n = 6$), preparedness ($n = 4$), and comfort ($n = 1$) and how SLEs mediated these factors. Twenty-six studies evaluated more than one of these outcomes. The SLEs were used primarily as a teaching and learning tool rather than for assessment purposes.

Three studies included a quasi-longitudinal analysis of students' learning via SLEs, albeit with only one follow-up point. Bartlett et al. (2021) explored students' retention of knowledge several months post-SLE, Miles

et al. (2015) measured students' perceptions of confidence and knowledge 3 months post-SLE, and Moineau et al. (2018) obtained qualitative data on students' perceptions of confidence three months post-SLE. Meyers et al. (1989) looked at how students translated clinical skills learned via SLEs into real-world clinical settings.

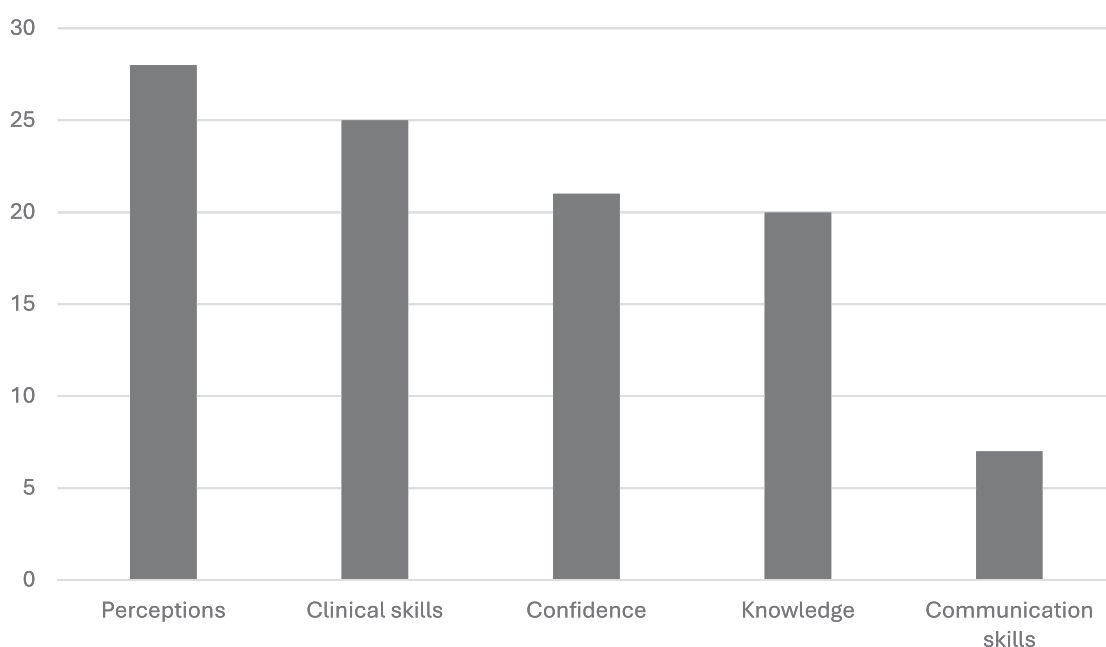
The SLEs were generally viewed positively by speech-language pathology students across 17 studies that analyzed perceptions of SLEs, with perceived benefits to knowledge, skills, and confidence. SLEs largely improved student knowledge and clinical judgment skills compared to traditional didactic or practical clinical teaching methods. Two studies mentioned that SLEs offered an opportunity for students to practice skills without compromising vulnerable populations and receive feedback in a nonthreatening manner.

Clinical Skills

Twenty-one studies measured clinical skills objectively via observed methods. In 17 studies, SLEs were found to enhance students' clinical skills, while four studies did not observe such improvements. One study (Hill et al., 2021) found that SLEs can partially replace traditional training approaches without loss of competency.

SLEs may enhance students' technical, critical thinking, problem-solving, and clinical decision-making skills, particularly for complex cases. In four studies of SLEs used for teaching infant feeding skills (Broadfoot & Estis, 2020; Ewing, 2015; Ferguson & Estis, 2018; Wagner,

Figure 5. Outcomes of the simulated learning experiences in the studies reviewed.



2016), students showed an enhanced ability to identify infant distress signals and make clinical decisions and recommendations.

The literature does point to some caveats when using SLEs for training clinical skills, however. Two studies (Bryan, 2022; Smith et al., 2021) found that while students showed improved clinical skills in some areas after practice via SLEs, this was not the case for all clinical areas targeted via SLEs. Improvements in clinical skills may also depend on the type of simulated learning approach used. Three studies showed that video-based approaches led to noticeable improvements in clinical skills over and above other simulated learning approaches such as manikins (Ewing, 2015; Wagner, 2016) or role play (Hemmerich & Hoepner, 2022), although these approaches also led to some improvements in clinical skills.

The study by Meyers et al. (1989) seems to be the only one that attempted to explore the impact of an SLE on real-life therapy skills. Meyers et al. noted that students who practiced skills in SLEs performed better in a 10-min therapy session with a real preschool-age child who stuttered, compared to students who had only watched videos about working with this population. Data from Moineau et al. (2018) concurred that some skills may be slower to emerge, requiring greater experience and feedback.

Four studies explored student perceptions of the impact of an SLE on their clinical skills: Ward et al. (2015) and Weir-Mayta et al. (2020) found that SLEs empowered students to feel more prepared for clinical work. One study (Harten, 2012) found that students felt SLEs promoted the transfer of clinical skills into real-life scenarios.

Individual and Interprofessional Communication Skills

Specific interpersonal skills that were targeted included general communication skills with patients or caregivers ($n = 7$), IPE teamwork ($n = 3$), and listener reactions ($n = 2$). Six studies showed that SLEs hold promise for improving individual communication skills. Five studies found that SLEs seem to hold advantages for IPE training, including the development of communicative and collaborative skills within health care teams and an improvement in students' understanding of team member roles and responsibilities.

One study (Zraick et al., 2003) showed no improvement initially in individual communication skills, although these skills improved following additional class lectures. Stead, Vinson, et al. (2023) caution that although students showed effective communication skills after an SLE, many struggled with terminology use, summarizing information,

and validating patient concerns. These struggles highlight the need for more intensive input and opportunities for practicing these complex skills.

Simulation exercises via SPs and VR seemed most useful for training communication skills, rather than case-based approaches (Zraick et al., 2003). Taylor et al. (2018) note, however, that students performed differently, depending on whether the communicative partner in a VR exercise was a CE or a doctor.

Knowledge

Some studies ($n = 13$) reported improvements in measures of students' knowledge, while others showed improved perceptions of knowledge after SLEs ($n = 7$). The SLEs may improve long-term knowledge retention because they offer experiential learning opportunities, which favor active learning rather than passive receipt of knowledge via a lecture format (Bartlett et al., 2021). One study (Wilson et al., 2016) found that student knowledge improved particularly on SLEs where students had to work together, highlighting the additional power of teamwork as part of the learning process. The use of SLEs can help solidify conceptual knowledge and promote the transfer of knowledge gleaned during clinical training into real-life scenarios (Harten, 2012). Improvements in knowledge seem to occur when SLEs are introduced following lectures (Clinard, 2022). One study (Bryan, 2022) showed that not all knowledge areas improved following an SLE.

Confidence, Preparedness, and Anxiety

Twenty-two studies included a focus on students' self-reported confidence, with all studies showing an increase in confidence following SLEs, albeit to varying degrees. Students reported increased confidence in their abilities post-SLE and a greater sense of preparedness for clinical placements. The use of SLEs may increase students' confidence in learning processes (Noureddine et al., 2016) and clinical decision making (Busch & Ma, 2023). Busch and Ma (2023) noted that the number of hours of simulated clinical experience did not seem to have an impact on confidence, meaning that even a short SLE can have a positive impact in this regard.

There are some cautions regarding the use of SLEs in relation to students' confidence in applying clinical skills. For example, Smyers' (2019) study showed that while students' confidence increased when providing treatment following an SLE, their confidence decreased in making clinical decisions. In addition, SLEs may lead to increases in confidence across some types of clinical skills but not others (Bryan, 2022). Stead et al. (2020) showed that students' confidence increased with the use of certain types of simulated learning approaches, such as SPs and manikins, but not with other types like task trainers, role

play, and video-based approaches. Clinard (2022) showed similar differences in students' confidence, depending on the type of simulated learning approach used.

Six studies focused on self-reported anxiety and five on students' sense of preparedness for clinical work following an SLE. Four studies showed that SLEs reduced student anxiety, while one study (Bartlett et al., 2021) found that the SLE had no impact on students' ratings of anxiety. Another study (Thomas et al., 2023) found that anxiety decreased only for an SP activity and not a video-based SLE.

Six studies focused on students' self-reported preparedness for clinical placements following an SLE. Five studies led to students feeling more prepared, while Bartlett et al. (2021) showed that preparedness was not impacted by an SLE.

Student Perceptions of SLEs

Seventeen studies included an analysis of students' perceptions of SLEs, one study included SP perceptions of the SLE (Moineau et al., 2018), and one study involved CE perspectives on the SLE (Davidson et al., 2023). Perceptions were measured via mixed methods ($n = 7$); qualitative methods such as interviews, focus group discussions or qualitative surveys ($n = 6$); and quantitative methods including ratings and Likert scales ($n = 5$).

Of these, all studies indicated that the SLEs were generally viewed positively by the participants. Students valued the experiences afforded by SLEs, particularly the experience of working with (a) medically fragile patients (Stead, Vinson, et al., 2023) and (b) patients displaying difficult interpersonal behavior (Bressmann & Eriks-Brophy, 2012), as well as being able to experience (c) what it is like to live with a condition such as disfluency (Rami et al., 2003). Students welcomed the opportunity to practice skills in a safe space with learning support (Ormerod & Mitchell, 2024) and felt that SLEs advanced their learning and helped them to reflect more effectively (Stead, Vinson, et al., 2023).

Challenges Noted in the Studies

Importantly, some studies noted caveats related to experiences and perceptions of SLEs. Students may feel underprepared for SLEs (Bressmann & Eriks-Brophy, 2012) and may not receive the experience that they deem important (Clinard & Dudding, 2019). Clinard and Dudding (2019) highlight the importance of setting clear expectations upfront and integrating student perceptions into the development of SLEs. Large group sizes during an SLE may not be optimal for learning. Students' learning potential may not be maximized if facilitators do not hold the necessary skills (Ormerod & Mitchell, 2024) or are

not comfortable with leading SLEs (Clinard & Dudding, 2019). Students in Estis et al.'s (2015) study, which involved learning complex technical skills, indicated that they found the SLE challenging.

Discussion

Our review of 53 studies highlights how simulated learning approaches in speech-language pathology clinical education can improve students' clinical skills, knowledge, and confidence. SLEs can be used successfully across areas of practice and offer opportunities for practice without compromising vulnerable populations. Students who have engaged in SLEs indicated high satisfaction levels and a generally positive experience. The SLEs appear to facilitate the transition from theory to practice, particularly with skills that are not dependent on patient responses. In this section, we explore trends in the literature and consider the effectiveness of SLEs for promoting clinical skills and knowledge, with suggestions for further development of the field.

Trends in Research on SLEs

Most included studies were published after 2015 ($n = 43$), with a notable surge post-2020 ($n = 28$), likely driven by the increased reliance on virtual and simulated training methods during the COVID-19 pandemic. Most studies on SLEs in the speech-language pathology field have been conducted in the Global North ($n = 52$), particularly in the United States ($n = 35$). There are significant gaps in research on this topic from the Global South, where resources may be different, educational programs may not be well established, and other complexities exist (Watermeyer & Kanji, 2024). This finding highlights the need for greater exploration of SLEs in diverse socioeconomic and cultural contexts to ensure broader applicability in speech-language pathology education.

Some areas of practice are well represented in the simulation literature, particularly adult neurogenic communication disorders ($n = 14$), dysphagia ($n = 21$), and fluency ($n = 7$). However, other vulnerable populations or hard-to-access conditions such as voice ($n = 1$), cleft palate ($n = 1$), dementia ($n = 1$), and end-of-life care ($n = 1$) showed less support, indicating gaps in the literature.

SPs were most frequently used across almost half of the studies reviewed ($n = 25$), and almost all the areas of practice were included in this set of studies. This finding makes sense given the more integrated patient-centered approach to care in the field, rather than a heavy focus on students' mastery of specific clinical skills. Manikins ($n =$

15) were used for areas of practice such as adult neurology, dysphagia, and tracheostomy care, which is in alignment with the types of skills that the SLEs were targeting.

Video-based SLEs, though not classified as clinical simulation by the American Speech-Language-Hearing Association (n.d.), were used to train clinical skills in a quarter of the studies reviewed ($n = 13$). Several studies ($n = 3$) showed that this type of simulated learning approach led to greater improvements in clinical skills than other types (Ewing, 2015; Ferguson & Estis, 2018; Wagner, 2016). A review of the types of clinical simulation for speech-language pathology as described by the American Speech-Language-Hearing Association (n.d.), may thus be warranted, especially since other guidelines (Dudding et al., 2018) do refer to the use of video as part of simulated learning approaches. Other approaches such as pseudostuttering (Irani & Richmond, 2012; Rami et al., 2003) seem unique to the field and may need to be included in definitions of simulated learning approaches for speech-language pathology education going forward.

Effectiveness of SLEs in Skill Development

The studies reviewed consistently demonstrated improvements in students' clinical judgment (Broadfoot & Estis, 2020; Ewing, 2015; Wagner, 2016), technical skills (Berkowitz, 2017; Bryan, 2022; Ewing, 2015; Ferguson & Estis, 2018; Hemmerich & Hoepner, 2022; Meyers et al., 1989; Miles et al., 2020; Penman et al., 2021a; Robinson et al., 2020; Stead, Tinsley, et al., 2023; Taylor et al., 2018; Wagner, 2016), and decision-making abilities (Bartlett et al., 2021; Carter, 2019). However, variability in outcomes suggests that the effectiveness of SLEs is influenced by the level of fidelity and the type of simulated learning approach used in an SLE, as well as the specific skills being targeted. This finding is confirmed in the broader health professions literature (Graham & Sealey, 2024; Tonapa et al., 2023). For example, video-based simulations and SPs appeared to outperform other approaches in fostering clinical skills, particularly for pediatric dysphagia (Ewing, 2015; Ferguson & Estis, 2018; Wagner, 2016).

Encouragingly, this review highlights how simple low-fidelity SLEs such as task trainers or video-based options seem to be as effective as higher fidelity options for teaching specific clinical skills (Benadom & Potter, 2011; Berkowitz, 2017; Ewing, 2015; Ferguson & Estis, 2018; Wagner, 2016; L. L. Wolford & Wolford, 2020). This is a helpful finding for contexts where there may be limited access to funding for expensive high-fidelity simulation devices and simulation laboratories.

SLEs proved effective for targeting individual and interprofessional communication skills, a critical component

of speech-language pathology practice (Bressmann & Eriks-Brophy, 2012; Busch et al., 2022; Byrd et al., 2022; Robinson et al., 2020; Stead, Tinsley, et al., 2023; Stead, Vinson, et al., 2023; Taylor et al., 2018). SLEs that involved SPs or VR offered opportunities for immersive learning of these skills, although challenges were noted in mastering complex communicative tasks such as summarizing information or validating patient concerns (Stead, Vinson, et al., 2023). The integration of IPE within SLEs further demonstrated value in terms of fostering collaboration and encouraging role clarity among students from various disciplines (Busch et al., 2022).

Knowledge Retention Following SLEs

SLEs appeared to enhance knowledge retention by facilitating active, experiential learning. The positive impact on knowledge seemed most evident when SLEs were paired with traditional didactic methods (Ferguson & Estis, 2018). Studies like Penman et al.'s (2021b) caution, however, that simulated learning is only effective when coupled with good academic content in the form of lectures. Similarly, Zraick et al.'s (2003) preliminary study suggests that lectures may be what ultimately help students gain skills and confidence in their clinical skills and that inserting an SLE into a course without a clear link to foundational theoretical input may not produce the desired outcomes.

Confidence in Relation to Competence

Confidence in clinical abilities was perceived to increase post-SLE across studies ($n = 22$), highlighting the role of these experiences in preparing students for clinical placements. However, some discrepancies were noted. For example, while students' confidence in specific skills improved, their confidence in areas such as clinical decision making sometimes lagged (Smyers, 2019), suggesting the need for repeated practice to solidify these competencies and simultaneously increase confidence.

Confidence and competence are interconnected concepts in health care education (Gottlieb et al., 2022). Confidence requires competence and knowledge, while competence is dynamic and dependent on the situation (Kim et al., 2020). This is especially true in training situations where students' confidence is associated with competence posttraining (Clanton et al., 2014). However, it is important to remember that although students' confidence may improve following an SLE, this improvement does not necessarily translate into actual competence and performance in real-world clinical settings. Some studies, like Smith et al. (2021), found that SLEs improved student confidence in performing clinical skills, but their ability to

identify factors such as patient motivation and comorbidities did not improve. Additionally, O'Donoghue et al. (2018) suggest that simulated clinical practice without appropriate feedback can result in high confidence levels but a lack of competency. Therefore, competence and confidence should be carefully considered and realistically aligned in relation to the outcomes of any SLE.

Student Perceptions of SLEs

Students largely valued the learning opportunities provided by SLEs ($n = 17$). Perceived benefits included enhanced clinical competence, confidence, and reflection skills. However, the importance of well-designed SLEs was emphasized, with studies cautioning against inadequate preparation (Elliott & Brumbaugh, 2021), insufficient facilitator expertise (Ormerod & Mitchell, 2024), and overly large group sizes (Ormerod & Mitchell, 2024), which could detract from the learning experience. Clear expectations and preparatory exercises should be integrated into SLEs to optimize student engagement and minimize anxiety. Some of the reviewed studies highlighted how students particularly value debriefing opportunities (Clinard & Dudding, 2019; Elliott & Brumbaugh, 2021).

The successful use of SLEs in clinical training requires thorough preparation to achieve the desired learning outcomes and ensure students have a positive learning experience. The SLEs must be organized in a way that facilitates students' transition from theory to practice.

G. W. Wolford et al. (2024), for example, suggest that additional time is necessary to learn dynamic skills, which are contingent on a patient's response. Roussin and Weinstock's (2017) concept of SimZones may be useful here, as it offers a systematic approach to developing a longitudinal learning program where SLEs are introduced hierarchically to provide scaffolded support for students' learning processes.

Implications for Future Research

An aspect not reported in our results but worth mentioning is the relationship between the SLEs described in the reviewed studies and the broader curriculum. While this was an initial goal of our review, we found that such information was either absent or difficult to make sense of across many of the articles reviewed. We encourage researchers to include more information about these aspects in future papers, given the importance of carefully embedding SLEs within the broader curriculum (Labuschagne et al., 2023; Le, 2023) and ensuring constructive alignment in the curriculum through carefully defined learning outcomes (Biggs, 2014).

Given the findings of this review in relation to high-versus low-cost SLE options, it is important to explore how SLEs might be implemented in less resourced contexts and how less sophisticated options might have relevance across contexts. It is also important to conduct more research on the use of SLEs with undergraduate students in countries that offer speech-language pathology education at this level, since there are acknowledged differences between undergraduate and graduate students in terms of developmental, cognitive, and professional needs (Wilkinson et al., 2004).

We noted a limited focus on CE, SLE facilitator, and SP perspectives on SLEs. To understand students' learning processes as well as the pedagogical preparation needed for successful engagement in SLEs, it is essential to seek the input of these stakeholders in the SLE teaching and learning process, over and above their role in evaluating students. Because effective SLEs depend on skilled CEs, facilitators, and SPs (where these are included in SLEs), greater investment in training and research with these stakeholders is warranted to maximize learning outcomes and opportunities.

Very few studies attempted to measure the transfer of skills (Meyers et al., 1989) or knowledge (Harten, 2012) learned in an SLE into performance with real patients in real clinical scenarios, both in the short and long term. Although we acknowledge that this type of study is challenging to execute, it is important to explore whether the skills learned via SLEs are transferable to the real world. Future longitudinal studies are needed to strengthen the evidence regarding the impact of SLEs on real-life clinical performance and to understand the process of how SLEs may assist students in navigating the transition between theory and academic content, and clinical practice.

Most studies utilized quantitative ($n = 28$) or mixed-methods ($n = 19$) designs, with a strong focus on measuring outcomes and perceptions. Over half of the reviewed studies focused on students' perceptions of SLEs ($n = 28$). However, we noted a lack of focus on understanding students' learning processes and how students acquire skills via SLEs. Future research should emphasize the scholarship of teaching and learning (i.e., studying students during an SLE to understand their learning and improve teaching via simulated learning approaches), incorporating input from CEs and facilitators who are essential to the teaching and learning process.

It is important to note that in the studies included in this review, SLEs were primarily used for teaching rather than for assessment purposes. The use of SLEs for the assessment of student knowledge and skills could be explored further.

There is a need for more research comparing different types of simulated learning approaches to one another, as well as research comparing SLEs to traditional teaching methods and comparing student performance across real patients versus SPs. While some studies included in the review did explore these comparisons, the heterogeneity in their designs and areas of practice made it challenging to draw definitive conclusions.

Limitations of the Review

Our search was limited to English-language publications, which may have introduced a bias toward research and perspectives from the Global North, potentially overlooking important contributions from other contexts such as the Global South. Although the variety of SLEs included in our search string was extensive, there is a chance we may have missed some studies because of variations in the nomenclature used in the field of simulated learning approaches in clinical education.

Because they provide an overview of the body of research on a particular topic and emphasize breadth over depth, scoping reviews are by nature limited. Having said that, we believe this review provides some important directions for CEs who work with speech-language pathology students using SLEs, as well as some considerations that should be made to advance research in this field.

Conclusions

SLEs are a powerful pedagogical tool for speech-language pathology education, offering engaging and supportive environments for targeting essential clinical skills and enhancing knowledge. While their efficacy is well supported, careful design, contextual adaptation, and ongoing refinement are crucial for optimizing their impact. Addressing gaps in research and practice will further enhance the potential of SLEs as teaching and learning tools.

Data Availability Statement

All data generated or analyzed during this study are included in this published article.

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