Critical Review:
Do simulated learning experiences benefit students in Speech-Language Pathology?

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This critical review examines the evidence for the benefit of simulated learning experiences on students in Speech-Language Pathology (S-LP). Two non-randomized trials, one randomized controlled trial and one study with a single group, repeated measures design were critically appraised. Overall, most of the studies reported that students perceived a gain in attitudes, skills and knowledge after participating in a simulated learning opportunity. One study that used an objective measure of skill improvement did not show any benefits of simulated learning experiences. However, the evidence gathered from this review is only suggestive. Recommendations for future research before the implementation of simulated learning experiences into the S-LP curriculum are provided.

Introduction

There are different types of simulated learning experiences. Simulated/standardized patients (SPs) are trained to act like a real patient with a specific case history and physical/emotional characteristics (Barrows, 1971). SPs have been shown to be effective in fields such as medicine (Monahan et al., 1988) and nursing (Festa, Baliko, Mangiafico, & Jarosinski, 2000). They can help students develop clinical skills in a structured setting before entering a clinical placement, where patient presentation is more difficult to predict (Hill, Davidson & Theodoros, 2010). The situation also allows students to practise with less supervision and without impeding on another patient's time (Nestel & Kneebone, 2010). Students can develop their skills without fearing that their insufficient skills may have harmed patients (Kneebone and Nestel, 2005). Another type of simulated learning experience is a Human Patient Simulation (HPS). Specialized equipments and mannequins can simulate real patients and provide an opportunity to repetitively practice skills without negatively affecting real patients (Benadom & Potter, 2011).

Due to the advantages stated above, it is useful to study the benefit of simulated learning environments in Speech-Language Pathology (S-LP), the results of which can be extended to Canadian programs where only one study has been conducted to date by Bressmann and Eriks-Brophy in 2012.

Objectives

The objective of the paper is to critically review the research literature on the benefits of using simulated learning experiences with students in S-LP.

Methods

Search Strategy
The online database Scopus was used to search for journal articles. The keywords "speech language pathology" AND "student education" were used. The search was then limited to "Article". Next, the key word "simulation" was used to search within the remaining results. Hand searching of the articles selected was also used.

Selection Criteria
Study sample should only include graduate S-LP students to help apply the results to Canadian programs. Research should involve S-LP skills/knowledge relevant to Canadian S-LP curriculum.

Data Collection
This critical review includes two non-randomized trials, one randomized control trial and one study with a single subject, repeated measures design.

Results

Outcome Measure: Student Self-Reports
The following studies appropriately used student self-reports in order to explore perceptions of S-LP students on their experience with simulated learning opportunities. The studies were either not successful in obtaining questionnaire responses from all participants (50-69% participants responded) or did not report on the percentage of responses received, which affected the representativeness of questionnaire results.

Syder (1996) studied the use of Standardized Patients (SPs) to teach general clinical skills to S-LP students in the United Kingdom. Syder provided a series of rationales to evaluate new methods of clinical teaching (specifically SP use), but there are only a few citations provided to support her rationale. This was a non-

randomized experimental study of different cohorts undergoing a training program with tutors and SPs.

The 3 student cohorts involved were: Group A (Year 1 students in 1994), Group B (Year 2 students in 1994), and Group C (Year 2 students in 1995 who were followed in their Year 1 as part of Group A). Critical elements of the participant description were missing, such as the selection method, the number of participants per group, the average age, gender breakdown and the University attended. This affected the extent to which the cohorts were similar at baseline. The cohorts were further divided into two sub-groups, where one group interacted with SPs individually, and the other group interacted with SPs in a group session. However, the author did not report the sub-group allocation method. This produced problems for the method. It was not certain whether all 3 cohorts experienced the same type of SP experience, affecting the ability to compare cohorts. There was also no indication of whether the results of the sub-groups were compared. Descriptions of the method around the SP sessions were inconsistent and often vague. For example, the duration of the SP sessions (10 weekly sessions, 2.5 hours/session) was given for only one cohort

An open-ended questionnaire was used to evaluate student thoughts on the SP technique and the timing of the SP sessions in the school year; however, the authors do not reveal when the SP technique was administered for all groups. Importantly, the use of a questionnaire did not objectively measure the change in clinical skills (a limitation acknowledged by the author). Only two questions from the entire questionnaire were reported and analyzed and the method of data analysis was not reported. They appeared to count up similar responses and analyze the most common responses. They evaluated all of the students' results to obtain an overview and compared the results between each of the groups.

Overall, students reported that they had gained specific skills, knowledge, and self-awareness. The extent of gain in each area differed between first and second year students, but this may be an invalid conclusion. If a student gave fewer responses for an author-identified theme (skills, knowledge or self-awareness), then the author assumed that the student did not find it to be important. This is an incorrect assumption because fewer responses could be due to students not being motivated to answer. It could also indicate that the author did not develop accurate themes, which is difficult to determine because the method of analysis was not given. Moreover, it is concluded that the training program will work best if conducted as group sessions in first year, and individual sessions in second year. However, Syder's definition of a second year student does not indicate if it refers to all second year students or just the ones who had already experienced SP training in Year 1.

Due to the poor reporting of method, results and analysis, the study provides equivocal Level 2 support for the use of SPs as beneficial to students, and that SPs are a valid teaching method. However, the topic addressed is suggestive in terms of clinical applicability, since it has inspired more research in this field.

Bressmann and Eriks-Brophy (2012) conducted the first Canadian study with Standardized Patients (SPs). It involved S-LP students learning how to manage difficult patient behaviour with SP training. The authors provided a well-researched rationale to support their study. They referred to previous research and stated that teaching counselling skills with an SP can provide a less stressful experience for students and clinicians.

Two cohorts of 40 students in 2006 (39 female, 1 male) and 45 students in 2010 (42 female and 3 males) attended a 1-day workshop. The authors reported that the skewed gender distribution is representative of students in S-LP, making the results of the study more ecologically valid. They attempted to reduce the differences between the two cohorts, by only taking first year students and conducting the workshop at the same point in the curriculum. The class gender composition was similar, but the age composition was not reported. Experienced, university-trained SPs were recruited, which increases the strength of the study method in providing a valid SP experience.

The description of the workshop and the SP training method were given in enough detail to help with replicability. The workshops were very similar in every aspect, the only difference being that SPs were used in 2006 and not in 2010. Generally, the students learned about well-established models of the types of difficult patient behaviour and resolution strategies. The authors provided clear reasons (time, cost, goal of creating a stress-free environment) for not being able to give extensive, individualized feedback to the students. One limitation of the study is that they did not report if the authors of the study were also the instructors of the workshop, which can contribute to an experimenter bias.

Both cohorts filled out the same workshop questionnaire. It involved both quantitative data (providing a percentage grade of the overall experience) and 3 open-ended questions to qualitatively evaluate their experience. The students in 2006 received an extra questionnaire probing their experience with SPs, which

included rating scales and boxes to elaborate on their ratings. This method greatly helps interpret the results of the rating scale.

The quantitative results of the two cohorts were appropriately compared using an independent-test, with significance level of p=0.05. Relevant statistical values, point measures (average) and variability measures (standard deviation) were reported for all quantitative data. The student ratings were not significantly different between the two workshops. Hence, the workshop with SPs was not better than the other workshop. To further strengthen this result, the authors found consistencies between the qualitative and quantitative data. In the qualitative results, the answers to all of the questions were analyzed for common topics and recurrent themes. Both groups enjoyed different aspects of each of the workshops. The SP trained group in 2006 enjoyed the SP component and the non-SP trained group in 2010 enjoyed the role-playing and group presentations. The results of the SP-experience specific questionnaire showed that most students who received the SP experience appreciated the opportunity and felt it had prepared them for clinical practicum. However, some felt that they were unprepared to work with the SPs. It was concluded that practicing difficult behaviour management with SPs did not result in a "better" workshop, but can be used as a different and beneficial approach to learning.

Bressmann and Eriks-Brophy (2012) provide a suggestive, Level 2 evidence for the validity of using SPs as a different learning approach. Although the study was well-designed, objective results are more favourable to support the use of SPs in S-LP education. However, the clinical implications are compelling. As a student, it would be beneficial to learn counselling skills in a less threatening environment that would complement lecture-based approaches.

Ward et al. (2015) used a single group, repeated measures design to investigate the utility of human patient simulation (HPS) to develop skills in paediatric dysphagia management. They provided a thorough rationale for their study, stating that such simulations can relieve the pressure off of both supervising-clinicians and students when learning to give care to medically complex individuals. Also, it is more feasible to use human patient simulation instead of standardized patients to practise on such a client population. All 29 students in the first year of their two year Australian SLP degree (26 females, 3 males, mean age of 26.4) participated in a dysphagia course (lectures, case studies), followed by HPS tutorials involving feeding/swallowing examination of simulated infant/child mannequins with complex medical conditions.

The exact content of the lectures and tutorials was reported in detail. The authors ensured clinical relevancy in different ways. They mapped the objectives of the course/tutorials to the competency standards for new graduates in Australia. Moreover, students practised both clinical skills (feeding/swallowing assessment) along with non-clinical skills (communicating with other S-LPs acting as other professionals/caregivers).

Surveys explored students' perceptions on their anxiety, confidence, knowledge and skills related to paediatric dysphagia. The authors used previous research to create the survey, but they did not explain how the previous research informed their surveys. They administered the survey at 3 points of the study: (1) pre-course, (2) post-course but pre-tutorials, (3) post-tutorial. All of the surveys were the same, except for additional questions on Survey 1 probing the students' previous experience with children/pediatric swallowing and on Survey 3 probing students' general views of the course. On all of the surveys, students rated their answers on a scale of 1-5 (1=strongly disagree, 5=strongly agree).

Participants volunteered to be part of the study by taking the surveys sent on Survey monkey to all students. Informed consent was given and anonymity was protected with the use of a numerical code (which tracked the responses over the 3 surveys from each participant). A separate survey with different questions was sent to all of the students eight months after the course and was analyzed separately.

When analyzing the results, the authors should have used a more valid statistical analysis instead of a "visual inspection" of data to determine that the survey responses were similar, regardless of the students' previous experiences with children/children with dysphagia. Friedman tests were employed to measure a change in the student's responses over time. Wilcoxon sign tests were used as a post-hoc analysis to compare the students' survey responses between (1) pre-course and post-course and (2) pre-tutorial and post-tutorial. These tests were appropriate because the authors did not assume that the survey rankings were normally distributed. However, they do not report the reason behind conducting the post-hoc analysis. When reporting the results, the authors reported the p-value, means and standard deviations of the rating scale results, but not the t-statistics. Themes of the qualitative data were reported, but no explanations were given about how the thematic analysis was conducted.

The participants reported a large and significant increase in their knowledge after the course component and in their confidence and skills after the tutorials. Post-tutorials, students reported a decrease in anxiety related to dealing with the population. The students

who completed the final survey reported that clinical placements were the most important contributors to these areas of development, but did credit the course and tutorials for some development. They felt that the HPS experience had prepared them well for their clinical placement.

The evidence is compelling with regards to clinical applicability, specifically to the use of HPS in teaching procedures with medically complex individuals. Conducting more research in HPS can be potentially beneficial for decreasing anxiety and increasing confidence/skills before students enter placements. However, more rigorous trials with objective measures should be conducted to see if the perceived increase in knowledge/skills matches the actual increase in knowledge/skill (which is acknowledged by the authors). Hence, this study of Level 3 evidence is suggestive in terms of validity.

Outcome Measure: Objective Measure of Skill Development

Zraick, Allen & Johnson (2003) used a randomized controlled design to evaluate the use of Standardized Patients (SPs) in teaching and testing interpersonal/communication skills to S-LP students. Specifically, the authors provided a well-researched rationale to use Objective Standardized Clinical Examinations (OSCEs) to test skills. It is objective, provides an authentic measurement of clinical skills and is used in other allied healthcare fields to measure competency.

18 (17 females, 1 male) graduate students in their first semester of the S-LP program at a university in Arkansas were recruited. Along with participating in this study, the students were enrolled in a graduate course on aphasia taught by an author of the study. They had neither taken a previous course nor had clinical experience in the area of aphasia, which ensured that all of the students were similar at baseline. However, details of the recruitment criteria and participant age were not given. The participants were randomly and evenly split into two groups. The control group only received didactic lecture instruction on aphasia whereas the experimental group received didactic lectures and a one-time, individual session with a SP presenting as a client with Broca's aphasia to learn interpersonal skills. The first author of the study coached the students during the session. A randomized control trial was appropriate to measure the difference in the performance of the two groups.

There were 3 phases in the study: (1) teaching of interpersonal skills with SPs to the experimental group, (2) mid-term evaluation using a single-case OSCE for all students, (3) final evaluation using a multi-case OSCE for all students. During both of the OSCEs, faculty judges used a checklist to score students' skills when interacting with a SP presenting a type of aphasia. After the first OSCE, all students were specifically taught interpersonal skills in lectures. In the final multi-case OSCE, the presentation of cases was randomized to avoid order effects. Two-weeks after the end of the study, all of the students rated items evaluating the SP/OSCE method on a 5 point Likert scale (1=strongly agree, 5=strongly disagree). The authors did not provide a copy of the evaluation in the appendix.

The training of SPs and the OSCE organization was well specified and could be easily replicated. The use of an OSCE to measure interpersonal/communication skills is a valid measure because it is used in other professions to measure clinical competency. Also, the author of the study who provided the course instruction did not judge the students during the OSCE, reducing experimenter bias. However, there were important details missing in the method. The SP-student learning sessions were not described. Also, it was unclear about how the final OSCE outcomes could be used to answer the study question, because there was no further experimental manipulation after the mid-term OSCE.

A t-test was used to compare all of the following results, but the reporting of descriptive statistics, p-values and critical values was inconsistent. In the midterm OSCE, the experimental and control groups did not significantly differ in their average scores on the interpersonal/communication skills checklist. The average interpersonal/communication skills score of all students was significantly higher in the final OSCE, compared to that of the midterm OSCE, showing the value of specifically teaching inter-personal skills. The authors' scores on a set number of OSCE videos was correlated with the judges' scores and a high inter-rater agreement was seen. The test statistic used to complete the inter-rater agreement was not reported. In the evaluation of the SP/OSCE method, 100% of students felt that it was appropriate for Speech-Language Pathology, 89% felt that it should be included in future courses and 83% felt that the course prepared them for the SP/OSCE experience.

Although the study was well-designed and used an objective measure of skill development instead of self-report, this Level 1 study uses a very small sample size. Hence, it provides suggestive evidence for SPs not benefitting students. However, the study is compelling in terms of clinical applicability. Students in the study found it beneficial and ways to standardize clinical skill testing/learning is worth exploring in S-LP since its use is well documented in other allied health care fields.

Discussion

All of the studies were completed in countries with which Speech-Language & Audiology Canada has a Mutual Recognition Agreement. The agreement recognizes that all of the countries involved require similar credentials to register with each country's regulatory body (Speech-Language & Audiology Canada, n.d.). It can be assumed that standards between the countries are similar and study results from these countries are applicable to Canadian students

In all of the studies that measured student perceptions, students reported benefitting from simulated learning experiences. Syder (1996) reported that students perceived gains in skills, knowledge and self-awareness. The type and extent of development in each area differed depending on the student's year of study. Bressmann and Eriks-Brophy (2012) showed that students rated workshops with and without SPs as equally favourable, but appreciated the opportunity to work with SPs and felt more prepared for clinical practica with SP training. Ward et al. (2015) discovered that first year S-LP students reported a significant increase in their skills, confidence and decrease in anxiety around working with children with swallowing difficulties after tutorials with Human Patient Simulations. They also felt more prepared for clinical practica. Only one study by Zraick et al. (2003) used a randomized controlled trial with an objective way to measure the change in interpersonal skills following the use of standardized patients. They could not find a significant effect of SPs on the improvement of student skills in OSCEs.

Three of the four studies provided a Level 2 or a higher level of evidence regarding the use of simulated learning experiences. However, poor reporting of methods/data analysis, a lack of objective measures of student gains, and small sample sizes reduced the strength of the studies and the ability to apply the findings to a S-LP training program.

There were common points of discussion between the articles. Both Syder (1996) and Bressmann and Eriks-Brophy (2012) acknowledge that simulated learning experiences are not a substitute for clinical practicum, but provide a different way of learning. Authors noted that lectures are also important in learning. Students who attended lectures before attending simulated learning experiences showed a higher growth in knowledge (Ward et al., 2015) and felt more prepared for simulated learning experiences (Zraick et al., 2003).

Clinical Implications

Most of the research in this critical review explored student perceptions of the benefits of simulated learning environments. Most showed benefits in areas such as knowledge, skills, and attitude. Students also felt more prepared for clinical practica. One study did not show an objective increase in skills with the use of training with Standardized Patients. Overall, the studies provide weak evidence for the use of simulated learning experiences, but demonstrate compelling applicability due to the student's perceived benefits of the experiences.

The following avenues of further research are recommended before simulated learning experiences are integrated into S-LP student curriculum:

- Develop a sensitive and objective measure of skill development to assess the effectiveness of simulated learning experiences (Zraick et al., 2003 & Ward et al., 2015).
- Determine the best way to use simulated learning experiences to benefit students, in terms of frequency of experiences, type of disorders represented and reducing the associated cost with training SPs and creating HPS.
- Conduct studies with a more rigorous designs to compare the effect of lectures, simulated learning experiences and clinical practicum in developing student knowledge, skills and attitudes.

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