



University of Kentucky
UKnowledge

Theatre and Dance Faculty Publications

Theatre and Dance

4-18-2021

Improvisation as a Teaching Tool for Improving Oral Communication Skills in Premedical and Pre-Biomedical Graduate Students


Marianne Phelps
University of Kentucky

Catrina White
University of Kentucky

Lin Xiang
University of Kentucky, lin.xiang@uky.edu

Hollie I. Swanson
University of Kentucky, hswan@uky.edu

Follow this and additional works at: https://uknowledge.uky.edu/theatre_facpub

 Part of the [Acting Commons](#), [Higher Education and Teaching Commons](#), [Medical Education Commons](#), and the [Scholarship of Teaching and Learning Commons](#)

Right click to open a feedback form in a new tab to let us know how this document benefits you.

Repository Citation

Phelps, Marianne; White, Katrina; Xiang, Lin; and Swanson, Hollie I., "Improvisation as a Teaching Tool for Improving Oral Communication Skills in Premedical and Pre-Biomedical Graduate Students" (2021). *Theatre and Dance Faculty Publications*. 1.
https://uknowledge.uky.edu/theatre_facpub/1

This Article is brought to you for free and open access by the Theatre and Dance at UKnowledge. It has been accepted for inclusion in Theatre and Dance Faculty Publications by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Improvisation as a Teaching Tool for Improving Oral Communication Skills in Premedical and Pre-Biomedical Graduate Students

Digital Object Identifier (DOI)

<https://doi.org/10.1177/23821205211006411>

Notes/Citation Information

Published in *Journal of Medical Education and Curricular Development*, v. 8.

© The Author(s) 2021

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Improvisation as a Teaching Tool for Improving Oral Communication Skills in Premedical and Pre-Biomedical Graduate Students

Marianne Phelps¹, Catrina White², Lin Xiang³ and Hollie I Swanson² 

¹Department of Theatre & Dance, University of Kentucky, Lexington, KY, USA. ²Department of Pharmacology and Nutritional Sciences, University of Kentucky, Lexington, KY, USA.

³Department of STEM Education, University of Kentucky, Lexington, KY, USA.

Journal of Medical Education and Curricular Development
Volume 8: 1–7
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/23821205211006411



ABSTRACT

OBJECTIVE: To evaluate the relationship between training in theatre improvisation and empathy, communication, and other professional skills.

METHODS: Undergraduate and graduate students who were participants of a 10-week summer undergraduate research program engaged in theatre improvisation techniques during a 3-hour workshop. In Study #1, a de-identified, self-report questionnaire (known as the Empathy Quotient) was administered prior to and following the workshop. Paired sample 2-tailed *t*-tests were performed to evaluate pre- and post-test scores. To identify additional benefits of engaging in theatre improvisation techniques, Study #2 was performed. Here, a survey was administered to the participants following their completion of the workshop to assess the impact on their personal growth and professional skills. An additional survey was administered at the end of the 10-week program to evaluate all program activities.

RESULTS: Study #1. Paired *t*-test analyses indicated that pre-test versus post-test Empathy Quotient scores were not significantly different, implying that participation in the theatre improvisation workshop did not impact empathy. Study #2. Survey results indicate that participation in the theatre improvisation workshop encouraged feelings of support by peers and creative thinking as well as increasing communication skills.

CONCLUSION: Incorporating a theatre improvisation workshop into educational programs for pre-medical and pre-biomedical students is of value for enhancing self-confidence, oral communication skills and ability to think creatively.

KEYWORDS: Empathy, communication, premedical students, professional education

RECEIVED: February 9, 2021. **ACCEPTED:** March 11, 2021.

TYPE: Original Research

FUNDING: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by NIEHS/NIH R25 ES 027684, NIEHS/NIH P30 ES026529, NIEHS/NIH grant P42ES007380 and by a grant from the American Society of Pharmacology and Experimental Therapeutics. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Hollie I Swanson, Department of Pharmacology and Nutritional Sciences, University of Kentucky, Lexington, MS 305, UKMC, 800 Rose Street, KY 40515, USA. Email: hollie.swanson@uky.edu

Introduction

The ongoing challenges facing today's society clearly illustrate the imperative for strong communication skills amongst our scientific and healthcare professionals. Strong oral communication skills closely align with success in all professional careers, in particular for those engaged in healthcare and the life sciences. Here, it is essential for building trust, explaining complex concepts, and modifying the behaviors of patients and the general public. Key components of effective communication include empathy, active listening, assessing both verbal and nonverbal cues, collaboration, engagement, and a willingness to appreciate other viewpoints. All of these attributes of communication can be gained using techniques employed during theatre improvisation.¹

An increased appreciation of the value of theatre improvisation for enhancing communication skills has led to its incorporation into a variety of academic programs focused on preparing students for careers in life sciences, healthcare and business. Its

successful integration into existing programs requires a good understanding of its basic tenets, which are described as follows:² (1) "Don't deny". In adhering to this concept, the improviser signals a willingness to participate in a spirit of collaboration. (2) "Whenever possible, make a strong choice." Improvisers are often required to quickly respond to suggestions from others; a process requiring a mental generation of a list of possible actions followed by a selection of the best action to be pursued. This process encourages creativity and quick thinking. (3) "You are You." Here, the improviser must shed inhibitions, which allows them to become more authentic and gain self-efficacy. Similar to scientific research, the goal of improvisation is to "solve a problem."³ When incorporated into the classroom as a component of student-centered, collaborative learning experiences, it can be used to promote deep learning.⁴ Thus, it is apparent that theatre improvisation harbors broad applicability that can be adapted to benefit a wide range of learners and learning experiences.



Theatre improvisation is currently being incorporated into training offered to undergraduate, graduate, and professional students in various disciplines. For example, business schools utilize theatre improvisation to build community and encourage risk-taking⁵ as well as enhance self-efficacy and group collaboration.² Graduate schools use improvisation to improve the ability of PhD students to communicate their research to those outside of their scientific disciplines.⁶ A number of healthcare professional programs have also embraced theatre improvisation.⁷ The most commonly used improvisation techniques selected for use by healthcare-related programs are those that encourage empathy and active listening in the absence of judgement. Best practices for incorporating theatre improvisation include co-facilitation by both health and theatre professionals, creating a “safe” classroom environment, and debriefing sessions that occur prior to and following the exercise.⁷

One of the first described elective courses that introduced healthcare professionals to theatre improvisation techniques was developed in a joint effort by the Stony Brook University School of Medicine and School of Journalism and led by instructors from the Alda Center.⁸ The primary learning objective of this elective course, which included students enrolled in medical, nursing, and dental programs, was to enhance the students’ ability to communicate with empathy and clarity. Theatre improvisation has also been successfully incorporated into a pediatric residency training program with the goal of improving the ability of pediatricians to advocate for children’s health issues.⁹ Additional examples of how theatre improvisation has been incorporated into medical school curricula include building more focused “medical improvisation” or “applied improvisation theater” into either traditional coursework or offering independent workshops to both instructors and students. Here, the objectives were to improve skills required for successfully navigating uncertainties encountered in the clinical setting.^{10,11} Theatre improvisation requires active participation without prior knowledge and can be incorporated into traditional programs to contribute to engaging learning environments.

Despite the above-mentioned use of theatre improvisation in the classroom setting, assessment of its effectiveness is limited. Assessment instruments that have been developed include an “Improvisation Evaluation Scale”⁴ to measure its effectiveness as a general teaching tool and an Empathy and Clarity Rating Scale (ECRS) to evaluate empathetic communication skills in medical students.¹² Using the ECRS as a measure, students who had participated in 9 hours of improvisation activities were found to score significantly higher than those who had no improvisation training. Other assessments include a study of undergraduates who had participated in a 10-week improvisation course as compared to those enrolled in a 10-week consumer behavior course.² Here, students with improvisation training were found to score higher in tasks requiring divergent thinking and reported improved perceptions about group collaboration. Similarly, graduate-level

nutrition and dietetic students who experienced medical improvisation via its incorporation into traditional coursework reported an increase in their self-reported skills in collaboration and flexibility as well as increases in their self-confidence.⁶ Finally, teacher trainees exposed to improvisation techniques were found to exhibit reduced stress as indicated by lower heart rates and decreased serum cortisol levels.¹³ Here, the decrease in stress response was attributed to enhanced interpersonal confidence. Taken together, these reports support the idea that use of theatre improvisation contributes to an increase in a learner’s creativity, collaboration, empathy, oral communication, and self-efficacy.

The goal of the current study was to evaluate the effectiveness of incorporating theatre improvisation into a summer undergraduate research program to aid in the development of the participants’ professional skills. Toward this end, 2 hypotheses were tested: The first was that training in theatre improvisation would enhance participants’ empathy. The second hypothesis was that theatre improvisation would enhance participants’ professional skills that pertained to oral communication.

Methods

Participants

The participants of the study were undergraduate and graduate students engaged in the Summer Training in Environmental and Pharmacological Health Sciences (STEPS) program at the University of Kentucky. The STEPS program is a 10-week undergraduate research experience that recruits rising juniors and seniors from a variety of undergraduate institutions.¹⁴ Participants in this program engage in faculty-mentored, independent research projects, and attend bi-weekly activities focused on career development. The 2018 cohort of this program participated in Study #1. The workshop attendees included both the undergraduate participants and their near-peer mentors (graduate students). All 15 workshop attendees responded to the survey. The 2019 cohort participated in Study #2. A total of 26 undergraduate participants and their near-peer mentors attended the workshop with 9 or 10 of these attendees responding to the survey. An improvisation instructor with graduate training in acting (M.P.) facilitated the workshops.

Improvisation workshop

The 3-hour workshop consisted of a series of improvisation exercises that were adapted from those previously described^{1,3} and as outlined in Table 1. The workshop began with a synchronization exercise wherein the group sat on the floor, formed a circle, and simultaneously tapped the floor. The participants were instructed to be “mindful” and fully present in the moment. Subsequent exercises included “Yes, And,” passing imaginary substances, maintaining eye contact with a partner for 2 minutes, participating in a “group machine,” mirroring, and participating in conversations using only questions. For the

Table 1. Summary of training skills and objectives associated with theatre improvisation techniques.

ACTIVITY	SKILL	TRAINING OBJECTIVE
Group tapping	Cooperation	Engage in synchronous behavior to unify the group
“Yes, And”	Collaboration	Reflect back on other’s ideas and build on the ideas of others
Passing imaginary substances	Non-verbal communication	Observe the actions of others and identify appropriate response
Two-minute eye contact	Empathy	Build connection by holding another person’s gaze for an extended period of time
Group machine	Group problem-solving	Observe the actions of others and identify how to contribute
Mirroring	Non-verbal communication	Observe and respond to the motions of others to achieve synchronicity
Answering questions with questions	Active listening	Formulate a relevant response as a query
Describing family portraits from a blank sheet of paper	Storytelling	Build emotional connection by sharing core values

final exercise, each student received a blank sheet of paper and presented this sheet of paper to the group as if it were a portrait of their family. At the conclusion of the workshop conducted with the 2019 cohort, the students reflected on their experience by first writing down their thoughts and then sharing them with the group. An electronic survey was administered to all participants of the STEPS program to evaluate all program activities (including the improvisation workshop) at the end of the 10-week period.

Study #1 2018 cohort: Impact of the improvisation workshop on empathy

Immediately prior to and following the workshop, a paper-based instrument was administered to the participants that consisted of a de-identified, self-reported questionnaire (the Empathy Quotient). The Empathy Quotient consists of a 60-item questionnaire and uses a 4-point scale that ranges from “strongly agree” to “strongly disagree” with a total possible score of 80.¹⁵ Within the questionnaire are 3 subsets of questions that address cognitive empathy, emotional reactivity, and social skills. The pre- and post-test scores were evaluated using paired sample 2-tailed *t*-tests.

Study #2 2019 Cohort: (A) Impact of the improvisation workshop on emotional status, personal growth, and professional skills. (B) Understanding of empathy. We developed a 33-item questionnaire to develop a further understanding of how participating in theatre improvisation may provide benefit. The survey was distributed anonymously and immediately following completion of the workshop via email using an online survey tool (Qualtrics). Within this survey questionnaire were 3 subsets of questions that asked participants to assess their emotions during the workshop and whether participating in the workshop impacted their personal growth or professional skills. A fourth subset of questions probed

participants’ views and understanding of empathy. Each subset consisted of multiple choice questions that asked respondents to assess their perceptions using a 5-point Likert scale (“Strongly Agree,” “Agree,” “Neither Agree Nor Disagree,” “Disagree,” “Strongly Disagree”). A free response question was included at the end of each subset to collect the student’s explanations of their responses.

Results

Impact of theatre improvisation workshop on empathy (Study #1)

The results from the pre- and post-tests of the students who participated in the 2018 workshop are shown in Figure 1. Total empathy (Empathy Quotient, EQ) of the participants ranged from 19 to 59 prior to their participation in the improvisation workshop. Comparison of pre-test versus post-test values indicated that participation in the improvisation workshop did not appear to significantly alter students’ total empathy, emotional reactivity, cognitive empathy, or social skills. In response to additional, solicited feedback, participants suggested that the workshop would be improved if a short period at the end of the session would be incorporated to allow for reflection and sharing of experiences. Benefits of the workshop were indicated in the STEPS program assessment survey administered at the end of the 10-week program wherein the majority of respondents (85.8%) agreed that the improvisation workshop enhanced their self-confidence and communication.

Impact of theatre improvisation workshop on emotional status, personal growth, and professional skills outcomes (Study #2)

The results from the questionnaire administered to the students who participated in the 2019 workshop are shown in Figures 2 and 3. With respect to empathy, the majority (88%, or

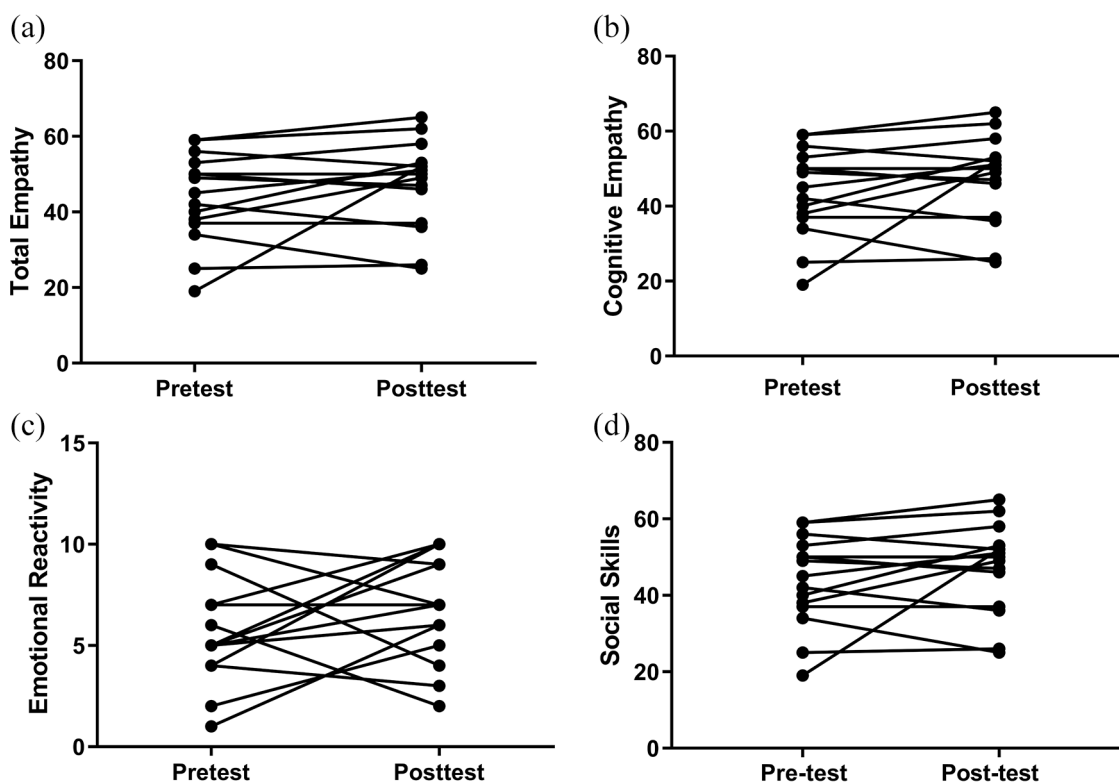


Figure 1. Pre- and post-test empathy scores of theatre improvisation workshop participants: (a) prior to (pre-test) and following (post-test) the improvisation workshop, participants completed a self-report questionnaire (the Empathy Quotient) designed to evaluate total empathy, (b) the subscales of emotional reactivity, (c) cognitive empathy, (d) and social skills. Paired *t*-test analyses indicated that pre-test versus post-test scores were not significantly different ($n=15$, $P=.20$).

8/9) said they were confident in their ability to recognize the emotions of others, but fewer participants (67%, or 6/9) believed they had responded appropriately to these emotions (Figure 2a). Despite acknowledging that they had no prior training in empathy, participants had a strong grasp on its definition as indicated by their responses to the question “How do you define empathy?” The majority of the definitions provided by the participants suggested that there are 2 parts to being empathetic and most definitions included a response or reaction. Examples of student responses to this open response question is shown in Figure 2b. In describing their previous experience with empathy training, only 1 participant responded positively and indicated that it had occurred during resident assistant training.

Upon reflecting on the workshop (Figure 3a), 90% (9/10) of respondents indicated that they were comfortable taking risks in this environment, even though most were nervous about the workshop. All respondents agreed that they felt supported by their peers and they felt free to try new things. In addition, 60% (6/10) of respondents indicated that they felt spontaneous utilizing improvisations and free to fail during the workshop. Finally, 50% (5/10) of respondents reported a strong sense of belonging during the workshop.

Figure 3b depicts survey responses pertaining to the impact of the theatre improvisation experience on their communication

skills. Here, 78% (7/9) of respondents indicated that they had strong communication skills and that participating in the workshop increased their communication skills and helped them become more observant and better listeners. The majority (67%, or 6/9) indicated that the experience enhanced their oral presentation skills and helped decrease their presentation anxiety, and 56% (5/9) of respondents agreed that it improved their ability to deal with stressful situations. All of the respondents agreed that improvisation helped them think creatively, and 89% (8/9) agreed that it helped them respond in the moment. Finally, the majority of respondents (67%, or 6/9) agreed that studying improvisation could help them explain science to those who are not in their field.

The impact of participating in the theatre improvisation workshop on additional professional skills is shown in Figure 3c. While 67% (6/9) agreed that studying improvisation could make them a better professional, 89% (8/9) agreed that the experience allowed them to have a stronger relationship with their peers and mentors and that the workshop increased their confidence in themselves and comfort in ambiguous situations. With respect to solving problems in the laboratory setting, 67% (6/9) of respondents indicated that the experience could be helpful. Finally, the majority (89%, or 8/9) of respondents agreed that something had been gained from the theatre improvisation experience.

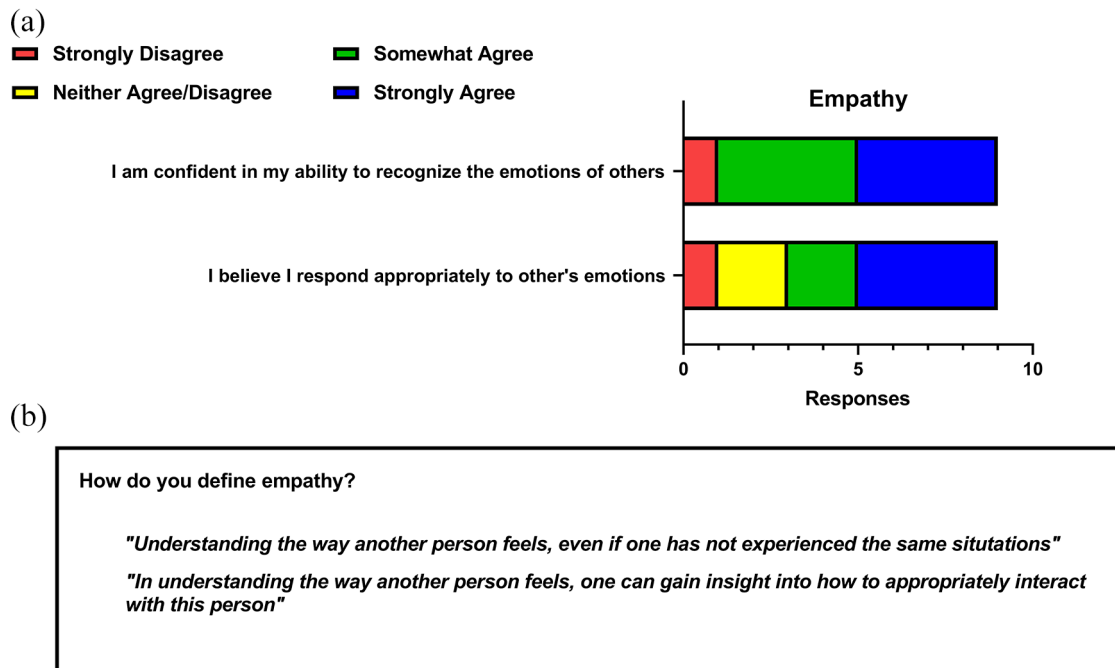


Figure 2. Responses from participants regarding impact of theatre improvisation workshop on empathy. An on-line survey was administered to all participants following their completion of the workshop: (a) responses to indicated survey questions and (b) select responses to the question "How do you define empathy?" (n=9).

When asked which skills could be developed using improvisation, 1 noted that their self-confidence was improved, which could in turn enhance their public speaking skills. Two respondents emphasized that they became more observant of others during this workshop. Another respondent said that improvisation allowed them to slow down in order to better get their point across. This individual also mentioned that relating to other's feelings could be another one of these skills.

When asked about what was learned from the workshop, students provided a variety of responses that included learning how to show empathy, becoming more comfortable and aware of their own presence, and gaining confidence while being among strangers. One student said they realized that improvisation was not just for the theater but that practicing improvisation skills could also be beneficial in both their daily and professional lives. Another student noted that learning how to mirror others could be helpful in professional situations, and that when utilizing improvisation, they became more receptive to other's ideas, but they were still able to retain their own. Respondents to the open response question ("How would you improve this workshop?") included suggestions to shorten the workshop and to add more warm-up activities to help those feeling especially anxious.

Discussion

Concerns regarding a decline in empathy amongst professionals entering the workforce—in particular, those engaged in providing healthcare—have driven interest in the development of educational approaches that can enhance learners' awareness and practice of empathy. Empathy is defined as the ability to

sense, feel and understand another's emotions and encompasses emotional reactivity, cognitive empathy and social skills.^{15,16} A variety of training approaches have been used to improve empathy, including those involving didactic lectures, small group discussions, role playing, standardized patients¹⁷ and theatre improvisation.^{8,12} The most effective approaches are those that focus on communication skills with durations of at least 3 hours and involve active learner participation.¹⁸

Since theatre improvisation is purported to enhance emphatic communication,⁷ we incorporated a theatre improvisation workshop into our 10-week summer undergraduate research program and examined its impact on participants' empathy. The key finding of our initial study was that participation in theatre improvisation activities did not significantly enhance self-reported measures of empathy (Figure 1). Interestingly, students indicated a good understanding of empathy, despite lack of previous training. It should be noted that in this group of students, total empathy, as measured by the Empathy Quotient, varied substantially and ranged from a low of 19 to a high of 59 with a mean of 43.7 ± 11.8 . For comparison, a recent study of undergraduate medical students reported an overall total empathy score of 36.76 ± 9.18 .¹⁹ The cut-off score is defined as equal to or less than 30 points whereas the "super-emphatic" range is equal to or less than 62 points.¹⁵ In the current study, 13.3% scored less than the cut-off score and none scored within the "super-emphatic" range. Individuals who score lower on the Empathy Quotient typically have difficulty in assessing other's behaviors or emotions. For example, patients diagnosed with Asperger Syndrome/High-Functioning Autism reportedly score approximately 20

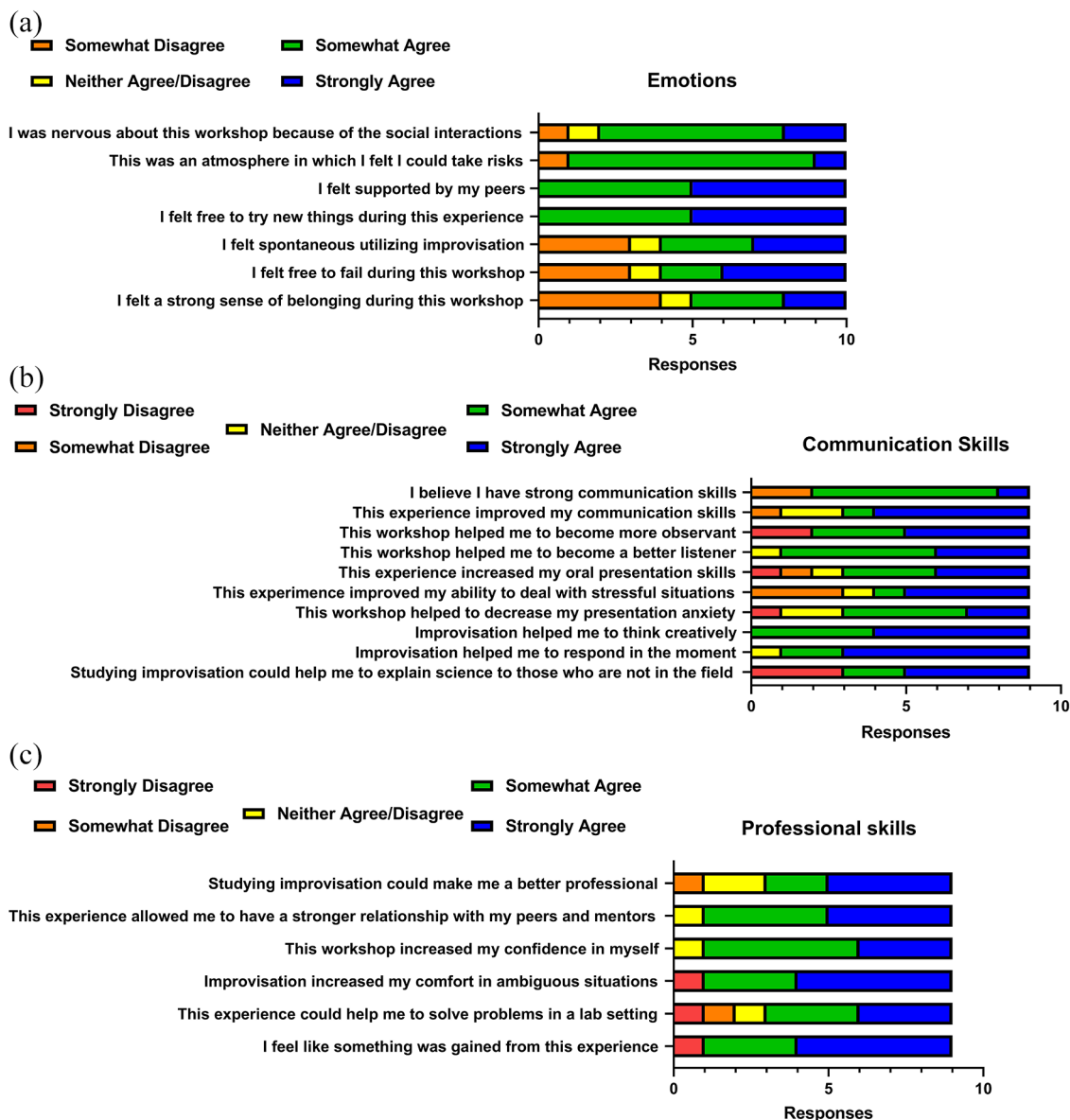


Figure 3. Responses from participants regarding impact of theatre improvisation workshop on professional skills: (a) emotional status, (b) communication skills, and (c) other professional skills. (n=9).

as compared to scores of approximately 42 within a control group.¹⁵ Thus, it is possible that this wide range in variability coupled with our relatively small sample size contributed to lack of statistical significance. An additional limitation of this study was that exposure to theatre improvisation was limited to a single intervention of a short (3-hour) duration. Repeated exposures to theatre improvisation techniques may be required to reinforce skills pertaining to empathy during the learning experience. Finally, the exercises used during the workshop encompassed a range of techniques, only a few of which were focused on improving empathy (Table 1). Focusing the training sessions on only techniques pertaining to empathy may enhance learners' appreciation of key behavioral aspects.

Findings from our second study reinforced previous observations that participating in theatre improvisation enhances learners' self-confidence and oral communication skills⁶ as well

as their ability to think creatively.² An important aspect of the second study was the incorporation of a debriefing session, which allowed participants to reflect upon and share their experiences. Here, participants observed that they enjoyed contributing to a group, experienced an increased comfort level in ambiguous situations, felt more present in the moment and expressed interest in sharing their experience with others. Thus, not only can improvisation be useful for enhancing professional skills of individual participants, but it may also prove to be of benefit for building community within a cohort.

Future efforts will focus on modifying the exercises used to incorporate controversial medical and scientific topics to further enhance learners' communication skills. This would include using the "Yes, And" approach to aid in effective communications regarding the use of vaccines. Similar to the "medical improvisation,"¹¹ a "biomedical sciences improvisation"

training module could be developed and incorporated into a wide variety of educational offerings. Because these approaches do not require a specific prior knowledge, diverse groups of participants may be involved that represent a variety of scientific and non-scientific disciplines, academic and non-academic community members and those representing a range of ages. Given the myriad of benefits provided by incorporating theatre improvisation techniques into our summer undergraduate research program, we suggest that improvisation techniques may similarly be incorporated into other academic STEM programs to better equip emerging professionals within the scientific and healthcare workforce with more effective communication skills.

Author Contributions

HS conceptualized, reviewed literature, wrote, and edited this paper. MP designed and implemented the workshop and Study #1. CW designed and implemented Study #2. LX designed and implemented the program assessment survey and edited this paper.

Ethical Approval

This study was submitted to the University's Institutional Review Board and was determined to be exempt from review.

ORCID iD

Hollie I. Swanson  <https://orcid.org/0000-0002-3725-5504>

REFERENCES

1. Alda A. *If I Understood You, Would I Have This Look on My Face?* Random House; 2017.
2. Mourey JA. Improv comedy and modern marketing education: exploring consequences for divergent thinking, self-efficacy and collaboration. *J Mark Educ.* 2020;42:134-148.
3. Spolin V. *Improvisation for the Theatre: A Handbook of Teaching and Directing Techniques.* Northwestern University Press; 1999.
4. Berk RA, Trieber RH. Whose classroom is it anyway? Improvisation as a teaching tool. *J Excell Coll Teach.* 2009;20:29-60.
5. Huffaker JS, West E. Enhancing learning in the business classroom: an adventure with improv theater techniques. *J Manag Educ.* 2005;29:852-869.
6. Ponzio NM, Alder J, Nucci M, et al. Learning science communication skills using improvisation, video recordings, and practice, practice, practice. *J Microbiol Biol Educ.* 2018;19:19.1.15.
7. Gao L, Peranson J, Nyhof-Young J, et al. The role of "improv" in health professional learning: a scoping review. *Med Teach.* 2019;41:561-568.
8. Kaplan-Liss E, Lantz-Gefroh V, Bass E, et al. Teaching medical students to communicate with empathy and clarity using improvisation. *Acad Med.* 2018;93:440-443.
9. Hoffman-Longtin K, Organ JM, Helphinstine JV, et al. Teaching advocacy communication to pediatric residents: the efficacy of applied improvisation theater (AIT) as an instructional tool. *Commun Educ.* 2018;67:438-459.
10. Hoffman-Longtin K, Rossing JP, Weinstein E. Twelve tips for using applied improvisation in medical school. *Med Teach.* 2017;40:351-356.
11. Mehta A, Fu B, Chou E, et al. Improv: transforming physicians and medicine. *Med Sci Educ.* 2021;31:263-266.
12. Terregino CA, Copeland HL, Sarfaty SC, et al. Development of an empathy and clarify rating scale to measure the effect of medical improv on end-of-first-year OCSE performance: a pilot study. *Med Educ Online.* 2019;24:1666537.
13. Seppanen S, Toivanen T, Makkonen T, et al. Effects of improvisation training on student teachers' behavioral, neuroendocrin, and psychophysiological responses during the trier social stress test. *Adapt Hum Behav Physiol.* 2020;6:356-380.
14. Swanson HI. Summer training in environmental and pharmacological sciences. *Res Outreach.* 2019;105:72-75.
15. Baron-Cohen S, Wheelwright S. The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *J Autism Dev Disord.* 2004;34:163-175.
16. Singer T, Klimecki OM. Empathy and compassion. *Curr Biol.* 2014;24:R875-R878.
17. Patel S, Pelletier-Bui A, Smith S, et al. Curricula for empathy and compassion training in medical education: a systematic review. *PLoS One.* 2019;14:e0221412.
18. Winter R, Issa E, Roberts N, et al. Assessing the effect of empathy-enhancing interventions in health education and training: a systematic review of randomised controlled trials. *BMJ Open.* 2020;10:e036471.
19. Haque M, Sa B, Majumder MaA, et al. Empathy among undergraduate medical students: a cross-sectional study in one Malaysian public medical school. *Ann Afr Med.* 2018;17:183-188.