Aesculapius Journal (Health Sciences & Medicine)

Volume 3 Article 1

September 2022

Training standardized patients to provide effective feedback: development, implementation, and its effect on the efficacy of medical students' education.

Gavin Nelson
University of South Dakota, Gavin.P.Nelson@usd.edu

Julie Swenson
University of South Dakota, julie.swenson@usd.edu

Valeriy Kozmenko
University of South Dakota, valeriy.kozmenko@usd.edu

Paul Thompson
University of South Dakota, paul.thompson@usd.edu

Training standardized patients to provide effective feedback: development, implementation, and its effect on the efficacy of medical students' education.

Cover Page Footnote

Acknowledgments We would like to thank the Parry Center for Clinical Skills & Simulation for allowing access to the Standardized Patient database to perform this research. We would also like to thank the University of South Dakota Scholarship Pathways Program Coordinators for their oversight and guidance of this project.

Training standardized patients to provide effective feedback: development, implementation, and its effect on the efficacy of medical students' education.

Gavin Nelson, MD; University of South Dakota Sanford School of Medicine, Sioux Falls, SD, USA

Julie Swenson, BA, NRP; University of South Dakota Sanford School of Medicine, Parry Center for Clinical Skills & Simulation, Sioux Falls, SD, USA

Valeriy Kozmenko, MD; University of South Dakota Sanford School of Medicine, Parry Center for Clinical Skills & Simulation, Sioux Falls, SD, USA

Paul Thompson, PhD; University of South Dakota Sanford School of Medicine, Sioux Falls, SD, USA

Corresponding author:
Gavin Nelson
Email: gavin.p.nelson@coyotes.usd.edu
Mobile: 402-990-1644

Statements and Declarations
The authors have no competing interests to declare that are relevant to the content of this article.

Introduction

Repetition is a necessity in skill acquisition. However, blind repetition, that is without assessment and feedback, is less effective than deliberate practice[1]. Deliberate practice is a specific type of practice that is purposeful and systematic, with a goal of achieving mastery in a certain skill or competency. The concept of deliberate practice has been studied extensively in various professions and has become a pinnacle of healthcare education and training [1]–[3]. Arguably one of the most important requirements of deliberate practice is feedback[4]. Without positive and constructive feedback learners would lack guidance for improving, thus, deliberate practice would not be possible. Feedback must be descriptive, timely, and relevant, allowing the recipient to easily modify behaviors and achieve proficiency. In the medical setting this is particularly important because feedback often extends beyond self-improvement and ultimately affects patient care.

In recent years, healthcare has shifted to the interprofessional team-based approach to patient care, and patients are considered team members[5]. Healthcare education in the United States spends much time and effort to ensure its graduates are competent in communicating with patients and performing the necessary physical exam in a respectful manner. These skills are tested extensively throughout pre-clinical and clinical years of education, culminating in the institutional high-stakes Objective Structured Clinical Examinations (OSCE). According to the deliberate practice principle, it is essential to provide medical students with quality feedback, so they can attain skills necessary to progress in their careers.

Most medical schools in the United States have Standardized Patient (SP) programs. A SP, also known as a simulated patient, sample patient, or patient instructor, is an individual trained by script to act as a real patient portraying a medical diagnosis. Healthcare students practice taking medical history and performing physical exam skills by interacting with SPs. SPs are considered co-educators with clinical faculty, and the quality of the feedback provided by SPs affects the quality of students' learning. SP feedback has previously been associated with increased student scores on physical exam skill evaluations[6]. To assure quality and standardized method of delivering feedback as the Standardized Patient's title suggests, standardized training on how to give feedback must be provided.

The current study hypothesizes that improving SPs quality of feedback through standardized training will, in turn, enhance medical students' communication and physical exam skills. To help determine this, two aims were established: (1) evaluate SPs attitudes, knowledge, and performance regarding giving feedback and (2) investigate for confounding factors that affect the quality of SP performance in providing feedback.

Methods

Study Design and Participants

An invitation to participate in the training was sent to all SPs in a database provided by a university in the Midwestern United States. 51 SPs expressed interest and were enrolled in the training workshop. Each training session was conducted in-person while observing social distancing and using personal protective equipment (PPE) to comply with COVID19 precautions. All SPs were screened for COVID19 symptoms, prior to and on the day of training, via a web-based questionnaire. Only symptom-free SPs were allowed to attend the training. From July 2020 to December 2020, ten two-hour SP training sessions were conducted. Each training group consisted of the SP educator and 2-10 participants. Prior to the activity, each SP completed a multiple-choice questionnaire (MCQ) that tested SP's expectations from the workshop along with attitudes and knowledge regarding how to give feedback. The workshop was conducted as a media-enhanced interactive guided discussion. During each activity, the material was presented by the same SP educator and on several occasions by a medical student. The training provided clear definitions of the main principles of giving feedback while following a specific feedback model (Figure I) [7].

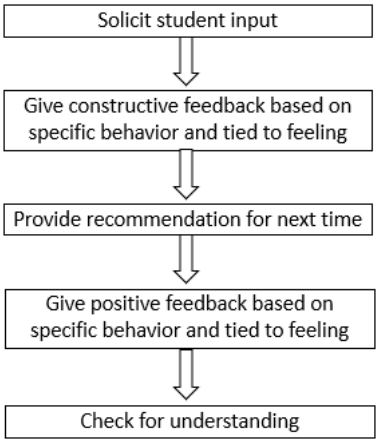

Fig. I Feedback model used in training workshops for SPs. SP begins at 'solicit student input' and completes each consecutive action ending at 'check for understanding'. 'Solicit student input' and 'check for understanding' are not applicable to written feedback

Participants of the workshop had an adequate number of opportunities to practice giving feedback and obtain feedback on their performances. The workshop covered written and oral feedback. Immediately after the activity, participants completed post-activity attitude/knowledge MCQ and satisfaction surveys. After completing the training, SPs participated in a series of simulation activities that required written feedback to the learners. Each encounter completed by the SP was graded with a specifically designed 10-item rubric.

Assessments

Current literature has limited studies and validated models regarding assessment of feedback for SPs. For this study, surveys were developed to determine the efficacy of training and translated performance in SPs, specific to the feedback training workshop provided.

A survey was administered prior to training and one after training, each evaluating 2 main domains. One being SPs self-confidence and attitude toward giving feedback. This had 12 items graded on a 5pt Likert-type scale. The second assessed knowledge about types of feedback using 8 multiple choice questions.

After the standardized patients had the opportunity to use the feedback model in an encounter, they were evaluated with a performance checklist. This checklist had 10 items they either met or did not meet during the encounter based on the training session. A total of 29 patients were assessed with the performance survey with a combined 315 encounters. Data continues to be collected on SPs that have completed prior training.

Statistical Analysis

Associations between participant characteristics and pre- and post-training survey data were analyzed using ANOVA. Patient characteristics were recategorized so that each characteristic was stratified into two groups. This allowed comparison between group variables. Each characteristic has two groups for two different time points (pre- and post-surveys). Groups were analyzed using the following questions:

- Group difference: what is the overall significance of the difference between the groups?
- Time difference: what is the overall significance of the difference between pre- and post-training?
- Interaction: are there differences in pre-post difference in the two groups?

Four more specific questions are then asked.

- T1-GD: Do the groups differ at Time 1 (pre-training survey)?
- T2-GD: Do the groups differ at Time 2 (post-training survey)?
- G1-TD: Is there a time difference for Group 1?

- G2-TD: Is there a time difference for Group 2?

Scores between pre-training survey and post-training survey data were analyzed using paired t-tests. Mean completion of performance items were reported for SP Performance data. P-value of $p \leq 0.05$ was used for statistical significance. SAS, Version 9.4, was used for all statistical analysis.

Results

Participant characteristics

51 participants were included in the study population. A majority were female at 31(60.8). 21(41.2) were above 60 years old. 31(60.8) had previous healthcare experience and 28(54.9) had no prior feedback training. Most had been a SP less than 1 year and participate in encounters every 1-2 months. 13(25.5) had never participated in an encounter. 21(41.2) had participated in the high stakes OSCE. 38(74.5) had participated in both script-based and physical exam encounters (Table I).

Table I Number of SPs for each demographic and characteristics pertaining to prior feedback experience

	n
Gender	
M	20
F	31
Age	
>60	21
41-60	12
26-40	13
<25	5
Formal healthcare training	
Y	31
N	20
Prior formal feedback training	
Y	23
N	28
SP duration	
<1yr	23
1-3yr	16
3-5yr	5
>5yr	7
SP participation interval	
N/A	13
every 1-2 months	17
every 3 months	14
every 6 months	4
once a year or less	3
High stakes OSCE participation	
Unsure	18
Y	21
N	12
Type of encounter	
Physical exam only	0

Script-based	10
Both	38

Y= yes, N= no

Characteristic Stratification

SP characteristics were recategorized into two groups for each characteristic. Statistically significant questions for each characteristic on pre- and post-surveys are shown in Table II.

Table IIa Attitude and knowledge items showing statistical significance stratified by SP characteristic. GD = group difference, TD = time difference, Int = interaction, T1 = timepoint 1, T2 = timepoint 2

		Overall			Contrasts			
Characteristic	**Question**	**GD**	**TD**	**Int**	**GD-T1**	**GD-T2**	**TD-G1**	**TD-G2**
Gender G1 = Female G2 = Male	Ability to read and interpret nonverbal messages	0.20	0.0231	0.77	0.48	0.26	0.0400	0.20
	# # correct out of 8 questions out of 8 questions	0.92	<.0001	0.41	0.51	0.61	<.0001	<.0001
Age G1= ≤40yo G2= >40yo	Comfortable giving written feedback	0.23	0.0496	0.56	0.21	0.66	0.11	0.24
	Strong knowledge base giving feedback	0.80	0.0003	0.11	0.19	0.33	0.0012	0.06
	Ability to identify areas of improvement for learners	0.45	0.0007	0.29	0.83	0.20	0.0052	0.0358
	Ability to read and interpret nonverbal messages	0.53	0.0165	0.64	0.91	0.44	0.07	0.10
	# correct out of 8 questions	0.31	<.0001	0.92	0.43	0.51	0.0006	<.0001
SP duration G1= ≤1 year G2= >1 year	Strong knowledge base giving feedback	0.45	0.0010	0.87	0.67	0.52	0.0283	0.0087
	Ability to identify areas of improvement for learners	0.55	0.0011	0.74	0.51	0.86	0.0133	0.0240
	Ability to read and interpret nonverbal messages	0.98	0.0163	0.61	0.73	0.71	0.0483	0.15
	# correct out of 8 questions	0.94	<.0001	0.59	0.74	0.67	<.0001	<.0001
SP participation G1= Every 1-2mo G2= Other	Strong knowledge base giving feedback	0.72	0.0008	0.48	0.45	0.80	0.0114	0.0166
	Believe feedback is important	1.00	0.20	0.20	0.36	0.36	1.00	0.0276
	Ability to identify areas of improvement for learners	0.27	0.0054	0.27	0.12	1.00	0.28	0.0010
	Ability to read and interpret nonverbal messages	0.92	0.0318	0.77	0.89	0.79	0.24	0.0354
	# correct out of 8 questions	0.45	<.0001	0.51	0.94	0.32	0.0032	<.0001
Type of encounter G1= Both G2= Other	Strong knowledge base giving feedback	0.79	0.0010	0.41	0.44	0.69	0.0111	0.0155
	Ability to identify areas of improvement for learners	0.86	0.0035	0.89	0.82	0.98	0.0055	0.07
	Ability to read and interpret nonverbal messages	0.62	0.0463	0.86	0.82	0.63	0.0321	0.29
	# correct out of 8 questions	0.27	<.0001	0.19	0.89	0.09	<.0001	<.0001
High stakes OSCE participation G1= Yes G2= Other	Strong knowledge base giving feedback	0.0357	0.0008	0.90	0.16	0.11	0.0195	0.0097
	Practical experience giving feedback	0.0439	0.26	0.78	0.10	0.21	0.57	0.27
	Ability to identify areas of improvement for learners	0.05	0.0016	0.51	0.06	0.35	0.09	0.0029
	Ability to identify strong performance	0.11	0.33	0.08	0.0203	0.91	0.61	0.0363
	Ability to read and interpret nonverbal messages	0.42	0.0182	0.87	0.65	0.49	0.10	0.08
	# correct out of 8 questions	0.71	<.0001	0.68	0.98	0.58	<.0001	<.0001
Formal healthcare training G1= No	Comfortable giving written feedback	0.15	0.10	0.38	0.10	0.70	0.61	0.0440
	Strong knowledge base giving feedback	0.63	0.0018	0.44	0.38	0.84	0.11	0.0021
	Practical experience giving feedback	0.0448	0.33	0.33	0.45	0.0368	1.00	0.13

G2= Yes	Ability to identify areas of improvement for learners	0.30	0.0023	0.40	0.19	0.89	0.14	0.0021
	Ability to read and interpret nonverbal messages	0.08	0.0330	0.25	0.0409	0.64	0.51	0.0102
	# correct out of 8 questions	0.07	<.0001	0.32	0.0463	0.54	<.0001	<.0001
Formal feedback training G1= No G2= Yes	Comfortable giving feedback on communication skills	0.0082	0.51	0.70	0.10	0.0313	0.83	0.48
	Comfortable giving feedback on patient comfort	0.0043	0.74	0.97	0.0416	0.0374	0.82	0.80
	Comfortable giving written feedback	0.0178	0.06	0.64	0.0444	0.17	0.08	0.33
	Comfortable giving verbal feedback	0.0443	0.39	0.93	0.17	0.13	0.56	0.52
	Strong knowledge base giving feedback	0.0003	0.0006	0.13	0.0004	0.11	0.0003	0.16
	Practical experience giving feedback	<.0001	0.25	0.15	<.0001	0.0251	0.05	0.84
	Believe feedback is important	0.0364	0.07	0.66	0.07	0.23	0.10	0.35
	Ability to identify areas of improvement for learners	0.06	0.0011	0.77	0.12	0.25	0.0073	0.0374
	Ability to identify strong performance	0.0150	0.21	0.59	0.0356	0.17	0.19	0.62
	Ability to read and interpret nonverbal messages	0.0272	0.0203	0.25	0.0187	0.43	0.0108	0.41
	# correct out of 8 questions	0.82	<.0001	0.39	0.44	0.65	<.0001	0.0008

Table IIb Mean values and standard deviation (SD) for statistically significant values found in Table IIa

		Group 1 (G1)				**Group 2 (G2)**			
		Pre		**Post**		**Pre**		**Post**	
Characteristic	**Question**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Gender G1 = Female G2 = Male	Ability to read and interpret nonverbal messages	4.10	0.83	4.48	0.63	3.95	0.76	4.25	0.64
	# correct out of 8 questions	4.29	1.35	5.71	1.24	4.05	1.05	5.90	1.41
Age G1= ≤40yo G2= >40yo	Comfortable giving written feedback	4.22	0.65	4.56	0.51	4.45	0.71	4.64	0.55
	Strong knowledge base giving feedback	3.33	0.97	4.22	0.73	3.64	0.70	4.00	0.75
	Ability to identify areas of improvement for learners	3.78	0.73	4.39	0.61	3.82	0.68	4.15	0.51
	Ability to read and interpret nonverbal messages	4.06	0.80	4.50	0.62	4.03	0.81	4.33	0.65
	# correct out of 8 questions	4.39	1.33	5.94	1.21	4.09	1.18	5.70	1.36
SP duration G1= ≤1 year G2= >1 year	Strong knowledge base giving feedback	3.48	0.85	4.00	0.80	3.57	0.79	4.14	0.71
	Ability to identify areas of improvement for learners	3.74	0.75	4.22	0.52	3.86	0.65	4.25	0.59
	Ability to read and interpret nonverbal messages	4.00	0.85	4.43	0.66	4.07	0.77	4.36	0.62
	# correct out of 8 questions	4.13	1.25	5.87	1.10	4.25	1.24	5.71	1.46
SP participation G1= Every 1-2mo G2= Other	Strong knowledge base giving feedback	3.41	0.71	4.12	0.78	3.59	0.86	4.06	0.74
	Believe feedback is important	4.88	0.33	4.88	0.33	4.79	0.41	4.97	0.17
	Ability to identify areas of improvement for learners	4.00	0.71	4.24	0.56	3.71	0.68	4.24	0.55
	Ability to read and interpret nonverbal messages	4.06	0.83	4.35	0.61	4.03	0.80	4.41	0.66

	# correct out of 8 questions	4.18	1.33	5.53	1.33	4.21	1.20	5.91	1.29
Type of encounter G1= Both G2= Other	Strong knowledge base giving feedback	3.58	0.76	4.05	0.80	3.38	0.96	4.15	0.55
	Ability to identify areas of improvement for learners	3.82	0.69	4.24	0.59	3.77	0.73	4.23	0.44
	Ability to read and interpret nonverbal messages	4.05	0.77	4.42	0.64	4.00	0.91	4.31	0.63
	# correct out of 8 questions	4.21	1.32	5.61	1.26	4.15	0.99	6.31	1.32
High stakes OSCE participation G1= Yes G2= Other	Strong knowledge base giving feedback	3.71	0.72	4.29	0.56	3.40	0.86	3.93	0.83
	Practical experience giving feedback	4.29	0.64	4.43	0.51	3.90	0.99	4.13	0.90
	Ability to identify areas of improvement for learners	4.00	0.55	4.33	0.48	3.67	0.76	4.17	0.59
	Ability to identify strong performance	4.48	0.51	4.38	0.50	4.07	0.69	4.40	0.62
	Ability to read and interpret nonverbal messages	4.10	0.70	4.48	0.51	4.00	0.87	4.33	0.71
	# correct out of 8 questions	4.19	1.21	5.90	1.34	4.20	1.27	5.70	1.29
Formal healthcare training G1= No G2= Yes	Comfortable giving written feedback	4.55	0.60	4.65	0.49	4.26	0.73	4.58	0.56
	Strong knowledge base giving feedback	3.65	0.93	4.05	0.69	3.45	0.72	4.10	0.79
	Practical experience giving feedback	3.95	1.15	3.95	0.94	4.13	0.67	4.45	0.57
	Ability to read and interpret nonverbal messages	4.30	0.80	4.45	0.60	3.87	0.76	4.35	0.66
	# correct out of 8 questions	3.75	1.07	5.65	1.14	4.48	1.26	5.87	1.41
Formal feedback training G1= No G2= Yes	Comfortable giving feedback on communication skills	4.36	0.68	4.39	0.74	4.65	0.57	4.78	0.42
	Comfortable giving feedback on patient comfort	4.39	0.74	4.43	0.63	4.74	0.45	4.78	0.42
	Comfortable giving written feedback	4.21	0.69	4.50	0.58	4.57	0.66	4.74	0.45
	Comfortable giving verbal feedback	4.25	0.70	4.36	0.73	4.52	0.73	4.65	0.57
	Strong knowledge base giving feedback	3.18	0.72	3.93	0.86	3.96	0.71	4.26	0.54
	Practical experience giving feedback	3.64	0.91	4.04	0.84	4.57	0.51	4.52	0.59
	Believe feedback is important	4.75	0.44	4.89	0.31	4.91	0.29	5.00	0.00
	Ability to identify areas of improvement for learners	3.68	0.82	4.14	0.52	3.96	0.47	4.35	0.57
	Ability to identify strong performance	4.07	0.72	4.29	0.60	4.43	0.51	4.52	0.51
	Ability to read and interpret nonverbal messages	3.82	0.82	4.32	0.67	4.30	0.70	4.48	0.59
	# correct out of 8 questions	4.07	1.36	5.86	1.38	4.35	1.07	5.70	1.22

Attitudes and Knowledge

Attitudes and knowledge between pre-training and post-training surveys were compared using paired t-tests (Table III). Regarding attitude and self-confidence in giving feedback, three items had statistical significance between pre- and post-surveys. These items were as follows:

1. I have strong knowledge base regarding giving feedback. (p=0.0006)
2. I can easily identify learners' areas that need improvement. (p=0.0007)
3. I am comfortable reading and interpreting learners' nonverbal messages (i.e., body language). (p=0.0152)

Knowledge was evaluated using 8 multiple choice questions. The mean number correct was 4.20 for surveys taken before training and 5.78 for surveys taken after training. This showed statistical significance with a p-value of <0.0001.

Table III Comparison of pre- and post-training survey attitude and knowledge questions. Bottom row, '# correct out of 8 questions', indicates results for MCQ knowledge survey. p-value <0.05 indicates significance. SD=standard deviation

	Pretest		Posttest		
Question	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Comfortable giving feedback on communication skills	4.49	0.64	4.57	0.64	0.5389
Comfortable giving feedback on patient comfort	4.55	0.64	4.59	0.57	0.7454
Comfortable giving feedback on ethical issues	4.14	0.85	4.31	0.71	0.2567
Comfortable giving written feedback	4.37	0.69	4.61	0.53	0.0570
Comfortable giving verbal feedback	4.37	0.72	4.49	0.67	0.3965
Strong knowledge base giving feedback	3.53	0.81	4.08	0.74	0.0006
Practical experience giving feedback	4.06	0.88	4.25	0.77	0.2344
Believe feedback is important	4.82	0.39	4.94	0.24	0.0663
Ability to identify areas of improvement for learners	3.80	0.69	4.24	0.55	0.0007
Ability to identify strong performance	4.24	0.65	4.39	0.57	0.1978
Ability to read and interpret nonverbal messages	4.04	0.80	4.39	0.63	0.0152
Confidence in providing nonbiased feedback	4.49	0.58	4.59	0.54	0.4000
# correct out of 8 questions	4.20	1.23	5.78	1.30	<.0001

Performance

SP performance was evaluated using a 10-item checklist showing over 90% completion for 6 out of 10 items assessed (Table IV). The lowest mean completion was for the following items:

1. Gave at least one constructive comment – 70.19%
2. Tied constructive comment to feeling – 57.17%
3. Gave recommendation for next time regarding constructive comment – 55.99%

Table IV Performance evaluation of SPs indicating average completion of intended task. Left column shows items evaluated in performance survey, right column is the mean completion of all participants for associated performance item

ITEM EVALUATED	AVERAGE COMPLETION (%)
Commented on any points not given	93.54
Gave at least one constructive comment	70.19
Tied constructive comment to feeling	57.17
Gave recommendation for next time regarding constructive comment	55.99
Gave at least one positive comment	90.13
Tied positive comment to feeling	82.09
Feedback was specific	95.18
Feedback referenced changeable behavior	95.63
Feedback referenced interpersonal communications	95.04

Feedback was kind	96.07

Discussion

This study assessed the efficacy of a SP training workshop in providing quality feedback and subsequent SP performance during encounters with students. Analysis of pre- and post-training surveys suggests the training implemented had the desired effect of making SPs more comfortable in giving feedback and improving knowledge. Specifically, SPs were more comfortable reading and interpreting learners' nonverbal messages, identifying learners' areas for improvement, and having a stronger knowledge base in giving feedback after receiving training. We believe the other items in the Attitude portion of the survey were not statistically significant since mean scores on the pre-training surveys were high, suggesting SPs were already comfortable or overconfident in their abilities. The ceiling effect recognized has been established in other studies using a Likert-scale, which is known to naturally restrict improvement due to the limits of the instrument[8], [9].

Performance data also suggests standardized patients are acquiring the skills set forth in the training sessions. The cohort of SPs in this study have above 90% completion for 6 of the 10 required feedback tasks measured during student encounters. The most difficult tasks to complete are centered around giving constructive criticism. Constructive criticism is inherently difficult to give and expected completion of this task was lower. A previous study found one of the contributing factors affecting willingness to give constructive feedback is being labeled as intimidating or harassing[10].The desire to avoid defensiveness from students or give offense to the students is one explanation for the lack of constructive criticism in our study. SPs and students alike need to understand that there will be a certain level of unease throughout the feedback process. It is important that SPs do not withhold feedback in an effort to make students more comfortable. A second barrier cited was the time it takes to thoughtfully word a comment of criticism[10]. This brings up an important point of the type of feedback and the setting in which feedback was developed. This study looked strictly at written feedback which naturally requires more time than verbal feedback. SPs interact with student learners for approximately 15 minutes for each encounter. This is followed by a brief 5-10 minute "break" in which SPs electronically document their feedback. After 5-10 minutes the next student encounter begins. Depending on the proficiency in typing and thought organization, this can be difficult for some individuals to finish their feedback in the time allotted. This may contribute to SPs not performing as well on performance evaluations if time is limited. In future studies it will be imperative to include verbal feedback and compare the two. Additionally, analyzing written versus oral feedback would be valuable in determining if one is more prone to the stereotypical or non-constructive statements.

Warm-up and fatigue effects related to skill acquisition are well known phenomena in psychology. The warm-up effect is defined as: "a phenomenon observed in learning and motor tasks in which individuals perform inexactly and slowly at the start of a session, even if familiar with the task, but then progress quickly to more proficient performance."[11] In this study an observation noted was SPs tended to score increasingly higher on the performance evaluation with contiguous days, most arriving at the 100% completion rate. This was not seen within a day of multiple student encounters. It is important to mention that each SP was informed of their score on the performance evaluation after each day, allowing them to adjust their feedback the following day. This more than likely accelerated the warm-up effect seen. A fatigue effect was not recognized.

When SP characteristics were recategorized into groups, there were few group differences noted except for 'prior formal feedback training'. This would be consistent with initial thoughts that if a person has formal feedback training, he or she will have more self-confidence and be more comfortable giving feedback. However, this did not translate into higher knowledge scores tested suggesting this is a perceived effect.

This study was conducted at a single institution in the Midwestern United States and may not be representative of SPs in other regions. Additionally, there is inherent bias in self-reported surveys that has potential to skew data. Confounding factors were controlled as best as possible. Project investigators recognized that a control group in this study would help substantiate our claims but given the intervention ultimately affects student education and indirectly patient care, it was decided to adopt this training for the Standardized Patient Program to help standardize education. After establishing the SP training program over several years, future directions will include monitoring the rate at which medical students learn various skills that depend on the quality of the feedback from SPs.

Conclusion

Deliberate practice is an important concept in medical education. It is a concept that involves appropriate and effective feedback. Standardizing feedback is the first step in making feedback more effective for students and familiarizing students to how feedback will be presented. This study demonstrates a training program for SPs is important in providing knowledge, self-confidence, and increasing performance when SPs are required to provide feedback. Guided by the deliberate practice model, the project investigators suspect this translates into more informed and better responses from students when modifying behaviors, although this has yet to be tested.

Compliance with ethical standards

Funding: No funding was received to assist with the preparation of this manuscript.
Conflicts of interest: The authors have no relevant financial or non-financial interests to disclose.
Ethical approval: This study was approved by the University of South Dakota IRB.
Informed consent: Informed consent was obtained from all participants included in the study.

Statements and Declarations

The authors have no competing interests to declare that are relevant to the content of this article.

References

[1] S. A. Mitchell and T. J. Boyer, “Deliberate Practice in Medical Simulation,” *StatPearls*, 2021, Accessed: Nov. 18, 2021. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/32119445/

[2] O. Lappi, “The Racer’s Mind-How Core Perceptual-Cognitive Expertise Is Reflected in Deliberate Practice Procedures in Professional Motorsport.,” *Frontiers in psychology*, vol. 9, no. AUG, p. 1294, Aug. 2018, doi: 10.3389/fpsyg.2018.01294.

[3] K. A. Ericsson, “Deliberate practice and acquisition of expert performance: A general overview,” *Academic Emergency Medicine*, vol. 15, no. 11, pp. 988–994, Nov. 2008, doi: 10.1111/j.1553-2712.2008.00227.x.

[4] T. Sawyer *et al.*, “Learn, see, practice, prove, do, maintain: an evidence-based pedagogical framework for procedural skill training in medicine,” *Academic medicine : journal of the Association of American Medical Colleges*, vol. 90, no. 8, pp. 1025–1033, Aug. 2015, doi: 10.1097/ACM.0000000000000734.

[5] F. D. Golom and J. S. Schreck, “The Journey to Interprofessional Collaborative Practice: Are We There Yet?,” *Pediatric clinics of North America*, vol. 65, no. 1, pp. 1–12, Feb. 2018, doi: 10.1016/J.PCL.2017.08.017.

[6] J. H. Park, J. Y. Son, S. Kim, and W. May, “Effect of feedback from standardized patients on medical students’ performance and perceptions of the neurological examination,” *https://doi.org/10.3109/0142159X.2011.588735*, vol. 33, no. 12, pp. 1005–1010, Dec. 2012, doi: 10.3109/0142159X.2011.588735.

[7] D. LaMarra, “Taking Feedback to the Next Level.” https://www.youtube.com/watch?v=ecpRO0BtrdY (accessed Nov. 28, 2021).

[8] A. Voutilainen, T. Pitkäaho, T. Kvist, and K. Vehviläinen-Julkunen, “How to ask about patient satisfaction? The visual analogue scale is less vulnerable to confounding factors and ceiling effect than a symmetric Likert scale,” *Journal of advanced nursing*, vol. 72, no. 4, pp. 946–957, Apr. 2016, doi: 10.1111/JAN.12875.

[9] C. Masino and T. C. M. Lam, “Choice of rating scale labels: implication for minimizing patient satisfaction response ceiling effect in telemedicine surveys,” *Telemedicine journal and e-health : the official journal of the American Telemedicine Association*, vol. 20, no. 12, pp. 1150–1155, Dec. 2014, doi: 10.1089/TMJ.2013.0350.

[10] S. A. McQueen, B. Petrisor, M. Bhandari, C. Fahim, V. McKinnon, and R. R. Sonnadara, “Examining the barriers to meaningful assessment and feedback in medical training,” *The American Journal of Surgery*, vol. 211, no. 2, pp. 464–475, Feb. 2016, doi: 10.1016/J.AMJSURG.2015.10.002.

[11] “warm-up effect – APA Dictionary of Psychology.” https://dictionary.apa.org/warm-up-effect (accessed Nov. 28, 2021).