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# Using 3D Virtual Standardized Patients to Teach Motivational Interviewing

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## Abstract

The term motivational interviewing focuses on patients' struggles to make changes for which they may not be ready, willing, and able. The foundation of this approach is the transtheoretical model, which posits that behavior change involves several stages and that not everyone is equally ready to change. To address the lack of training and self-confidence, medical schools have implemented motivational interviewing training courses within the curriculum, utilizing a problem-based learning approach. As computers have become more popular in education, motivational training has moved into the e-learning, computer-assisted, learning environment.

A pilot study was designed in an effort to explore the feasibility of using virtual standardized patients to teach motivational interviewing. This study's guiding research questions were: Is it feasible to use virtual standardized patients to enhance motivational interviewing training? Could the Second Life virtual world platform, combined with the traditional face-to face training materials, improve motivational interviewing techniques?

The results of this study present both positive and negative outcomes. The standardized patient and principal investigator assessment data added to our understanding of the feasibility of using virtual worlds to teach motivational interviewing as an alternate to the webpage virtual standardized patient. The standardized patient assessment showed a significant improvement in the students' abilities to determine the patient's readiness to change, using the scaled readiness ruler. What must be explored in future studies is whether this improvement continues to exist when removing the lecture presentation, since the level of learning that might be attributed to the lecture itself is unknown. Others considering future research in this field, should consider the limitations imposed by a limited budget and timeframe to conduct the study. The study was an internally funded department project, and the budget covered only the costs of two virtual standardized patients. Future studies should consider the costs for additional virtual standardized patients and for consulting time to professionally program Second Life.



## 1. Introduction: Background and Statement of the Problem

Lifestyle changes are an important factor in improving an individual's health; however, changing one's lifestyle may be a difficult task when referring to addictive behaviors such as smoking, alcohol drinking and poor eating habits. The Center for Disease Control and Prevention (CDC) National Health Interview Survey from 2009 reported that 21% of adults are current smokers, 52% regular drinkers, 35% are overweight and 27% obese (Center for Disease Control, 2009). Though the process of changing unhealthy behaviors may be long and difficult for many individuals, physicians are encouraged, increasingly, to counsel their patients through the use of motivational interviewing. Physicians are often hesitant to use motivational interviewing techniques with their patients due to a lack of training on what motivational interviewing is and how it is performed (Fiscella, 2008; Stafford, 2000). As an example, medical students from the University of Otago stated that they did not feel sufficiently prepared for their clinical duties as doctors in communicating with patients. The authors of the study quoted one student as saying "We just go in and talk to the patient ourselves...but it's not supervised though" (Egnew and Wilson, 2010).

### 1.1 What is Motivational Interviewing?

The term motivational interviewing focuses on patients' struggles to make changes for which they may not be ready, willing, and able. In general terms, it is a method not of telling the patients what they should do, but rather allowing patients to make the choice on how they can change their behavior. The physician's role is to encourage patients to describe their behavioral lifestyle by asking open-ended questions, providing any information requested by the patient in a non-judgmental manner and asking the patient to reflect on what was discussed (Rollnick et al., pp.105-129). The foundation of this approach is the transtheoretical model, which posits that behavior change involves several stages and that not everyone is equally ready to change (Weinstein et al., 1998).

There are five main stages of change that a patient may experience prior to adopting a new behavior on a long-term basis (Weinstein et al., 1998). They are pre-contemplation, contemplation, action, maintenance, and relapse. William Miller and Stephen Rollnick, who are the founders of this concept, state that motivational interviewing involves collaboration, evocation, and respect of a patient's autonomy. Collaboration builds a relationship between the patient and the physician. Evocation relies on the patient to provide the argument for change, whereas autonomy respects the patients freedom of choice (Miller and Rollnick, pp.33-42; Miller and Rollnick, pp.52-84). The benefit of motivational interviewing is that it allows patients to self-manage their health behaviors according to their confidence and readiness to change. The role of the primary health care physicians is to motivate high-risk patients to adopt positive health behaviors. This is accomplished following specific principles and using specific skills.

The principles of motivational interviewing are: expressing empathy, developing discrepancy, rolling with resistance, and supporting self-efficacy. The expression of understanding provides the patients with a sense of acceptance for who they are. The second principle of motivational interviewing is to develop a discrepancy between their current and desired behavior. It is believed that patients are more willing to change when they become aware of the discrepancy between their current behavior and their goals. A physician may deal with a patient's resistance by acknowledging the patient's perspective and by asking questions that give the patient an opportunity to describe what the patient finds wrong with each suggested solution, and an opportunity to present a solution that he/she finds acceptable. The final important principle of motivational interviewing is the support of self-efficacy, where the patient

needs to believe that he/she is capable of making that change (Miller and Rollnick, pp. 33-42). Self-efficacy plays a central role in self-regulation of motivation through goals, outcomes and expectations (Bandura, 2001). Efficacy allows patients to choose what challenges to undertake and influences the types of activities and environments patients choose to get into (Bandura, 2001). Miller and Rollnick describe several skills for asking open-ended questions, reflective listening, affirmation, and summarization. Open-ended questions that are asked skillfully may not only provide information regarding a patient's health, related to the patient's desire, ability, reason and need for change. According to Miller and Rollnick (2002), reflective listening is the most difficult to learn as the physician is required to guess what the patient means, because it may not be expressed directly. Affirmation, on the other hand, provides an opportunity to positively comment on efforts and intentions to change. Finally, the skill of summarization allows the patient to listen to what he/she has said, and it gives the physician an opportunity to confirm the information. These four skills, which are fundamental to motivational interviewing, are often referred to using the acronym OARS. A skill not part of the OARS, but just as useful, throughout the change process, is knowing how to elicit change talk. Physicians may ask questions to have patients re-evaluate their commitment to change (Miller and Rollnick, pp.52-84).

## **1.2 How Motivational Interviewing Is Taught Traditionally?**

To address the lack of training and self-confidence, medical schools such as Mayo Clinic, the University of California, and Yale University have implemented motivational interviewing training courses within the curriculum, utilizing a problem-based learning approach. Through problem-based learning, students develop problem-solving skills and become effective collaborators (Hmelo-Silver, 2004). These courses are traditionally taught face-to-face, with interactive activities that allow medical students to play the role of physician in an "as-if" or "simulated" scenario designed to represent a real life experience. This technique is used to help the student to develop an understanding of the specific characteristics of a given patient, and to practice decision-making, problem-solving, and communication skills. These interactive activities may take place in the classroom or in a clinical environment with the use of a standardized patient, who is a healthy subject or an actual patient, trained to present consistently a particular case, and to judge the student's performance based on fixed criteria (Beullens et al., 1997). Through these interactive activities, students are able to see how patients react to a specific behavior in a safe learning environment, in which they are provided with feedback on their performance. In addition, these activities are said to increase a student's interest and motivation to interact with other individuals, and to get a sense of self-discovery and self-understanding (Yardlesy-Matwiejczuk, 1997, pp.15-35; Yardlesy-Matwiejczuk, 1997, pp. 36-59).

The Mayo Clinic medical school has implemented motivational interviewing within the curriculum by developing a Health Behavior Change Counseling course consisting of five, two-hour sessions with pre-test and post-test course assessments. Through the pre- and post-test assessments of the course, students reported that they gained confidence in their understanding of motivational interviewing techniques, but they felt less confident in their ability to motivate patients who would have behavioral issues other than smoking, i.e., they felt unable to transfer these skills to apply to other situations, such as obesity (Poirier et al., 2004). The University of California incorporated a similar four-week course into the curriculum, with third-year medical students, with similar results. The difference between the two courses was that the University of California did not concentrate on one specific health behavior and did not include the use of standardized patients due to budget-related issues: these ended up being pedagogical limitations (Bell and Cole, 2008). A final example regarding the implementation of motivational interviewing is that of Yale University, which implemented a single session, two-hour

course for psychology clerkship students with a pre- and post-test knowledge assessment. As with the previous studies, the students gained knowledge and confidence in using the motivational interviewing technique, with specific limitations. The limitations in this example included the inability to record the student-patient encounter, and, therefore, dependence on only the student's self-assessment to determine the results of this study (Martino et al., 2007).

### **1.3 Newer Methods for Teaching Motivational Interviewing**

As computers have become more popular in education, motivational training has moved into the e-learning, computer-assisted, learning environment. Only two studies published to date, conducted by Carpenter and fellow colleagues (Carpenter et al., 2003; Carpenter et al., 2008), have explored computer-based interactive interventions. The first study consisted of two sections in which the authors: 1) conducted a preliminary evaluation of the effectiveness of a two-module training program for teaching motivational interviewing strategies and principles; and 2) determined the ability of the tutorials to teach brief intervention and motivational interviewing related to smoking cessation, for pre-nursing students and health care professionals. In the evaluation of effectiveness of the motivational interviewing role play software, pre-nursing students were given a pre-test assessment with a smoking cessation scenario followed by a tutorial. The results of this first section showed that prior to the tutorial, students concentrated on nicotine replacements (35%), the dangers of smoking (53%), and used scare tactics (71%). After the tutorial, pre-nursing students concentrated in the individual's readiness along with their sense of importance of smoking (65%), asking permission to discuss behavioral change (35%), and established small goals of behavior change (35%). Based on these two assessments, it was concluded that the role play software was effective in teaching nursing students motivational interviewing skills.

The second section determined the ability of the tutorials to teach brief intervention and motivational interviewing related to smoking, and was conducted using health care professionals. Participants were randomly assigned into the interventional or control groups. Next, the interventional group completed four motivational interviewing modules, using the same software used by the pre-nursing students in the first section. The control group, on the other hand, was instructed to read clinical and public health guidelines equivalent to the motivational interviewing tutorial. In this second section, the assessments showed that those participants who completed the motivational interviewing role play software tutorial had significantly higher scores during the post-test, and rated the software as an easy-to-use, attractive, and enjoyable teaching tool. One limitation of this second section was that there was no opportunity to follow up with these health professionals, to determine how they incorporated these skills into their daily practice (Carpenter et al., 2003).

Carpenter and colleagues conducted another motivational interview training session in which participants were allied healthcare professionals from a northwest U.S. university (Carpenter et al., 2008). Unlike the previous example, this study included an initial screening to exclude any participant who had previous training in motivational interviewing of more than one hour. The eligible participants were asked to first complete a pre-test standardized patient video assessment that presented four scenarios, in which patients varied in their readiness to quit smoking. In this study, the interventional group was asked to complete two tutorials. The first was developed to cover issues regarding smoking cessation that included practice exercises with feedback and review of the exercise. As in the previous study by Carpenter (Carpenter et al., 2003), the control group was assigned readings from Miller and Rollnick (Miller and Rollnick, pp.33-42; Miller and Rollnick, pp.52-84) on motivational interviewing and health behavior change. The results of this study conclude that all students scored lower on the pre-

test (tutorial  $M=12.6$ , reading  $M=14.5$ ) than on the post-test; however, the tutorial group ( $M=31.7$ ) scored higher during the post-test than the reading group score ( $M=28.0$ ). These two studies, led by Carpenter, concluded that cognitive problem-based learning with a tutorial is more effective in teaching motivational interviewing than simply reading guidelines, public health materials, and motivational interviewing literature (Carpenter et al., 2008). As with the previous study, Carpenter and colleagues were unable to complete a follow-up to determine who later incorporated the skills into their practice.

#### **1.4 Feasibility for Use of Next Generation Training Tools**

Through these studies, motivational interview training has been found to be effective in both a traditional classroom and online screen-based environment; however, as technology advances to a three dimensional (3D) virtual world environment, the use of internet training advances. Currently, certain fields of medicine have turned to this environment for training specific diagnosis skills (e.g., detection of heart murmurs), as well as surgical skills; however, it is unknown whether motivational interviewing training is feasible in a 3D virtual world environment, although it is currently being used in treatment of various psychological disorders and for support groups (Gorini, 2008). The feasibility of 3D virtual world environments for building motivational interviewing, counseling skills must be explored.

A pilot study was designed and implemented at the University of Illinois at Chicago, College of Medicine, in an effort to explore the feasibility of using virtual standardized patients in Second Life virtual world to teach motivational interviewing. This study's guiding research questions were: Is it feasible to use virtual standardized patients to enhance motivational interviewing training? Could the Second Life virtual world platform, combined with the traditional face-to face training materials, improve motivational interviewing techniques?

## **2. Method**

### **2.1 Participants**

To test the feasibility of using Second Life virtual world, a virtual standardized patient was trained to teach students from the Colleges of Medicine, Education, and Urban Planning & Social Affairs, at the University of Illinois at Chicago (UIC) during September 2010. The students ( $N=556$ ) were recruited through written announcements that were sent electronically by department staff and administrators, using the department email listserv. Of these, only eight students showed interest in participating in the study after multiple announcements and class presentation of the study. On the day of the study, an information sheet about the study was reviewed with the students. As this study received UIC Institutional Review Board (IRB) approval, all participants signed a letter of consent. Lunch was provided and each student was given a flash drive as incentives for completing all required tasks for the study. They were also allowed to keep their avatars as an additional "thank you" for their participation. Other participants included persons who played the roles of the virtual standardized patients and other support staff of the Dr. Allen L. and Mary L. Graham Clinical Performance Center, and the Distance Medical Education Office, which assisted in coordinating tasks throughout the study.

### **2.2 Case Study Design**

This study consisted of six segments: 1) an orientation session; 2) a recorded pre-intervention assessment; 3) a one-hour interventional motivational interviewing workshop; 4) a recorded post-intervention assessment; 5) a recorded focus group discussion session; and 6) Learnability and Usability assessments. Figure 1 presents each of the general case study design.

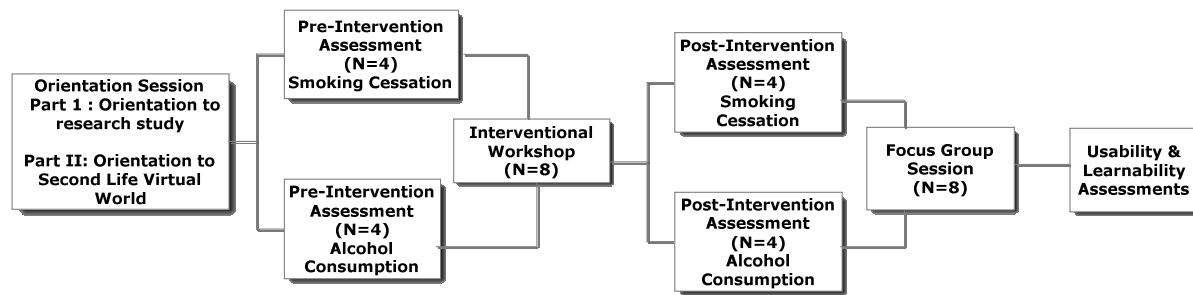


Figure 1: Case Study Design

Two segments comprised the one-hour orientation session. During the first segment of the orientation, students were given an introduction to the purpose of the study along with a brief introduction to the Second Life virtual world program, during which they learned the basics of the program. The second segment promoted familiarity with the Second Life program, including how to customize and control their avatars, how to use the voice chat feature, and how to navigate within the virtual environment.

For the pre-intervention assessment, a student was placed in one of two rooms equipped with a laptop computer and a microphone headset to provide access to Second Life. Standardized patients worked from another similarly equipped location. The assessment utilized a standardized smoking or alcohol consumption counseling scenario, modified for use in Second Life. The avatars of both the student and one of two standardized virtual patients appeared on the computer screen in a simulated clinical environment, and the student interviewed the patient using voice chat and avatar gestures. Prior to beginning the interaction, the students were given a brief description of the patient's history and current condition, and were asked to interview the patient. The real time interaction between each student and the virtual standardized patient was about eight to ten minutes in duration. The sessions were captured in video recordings that preserved voice as well as gestural data. Following the interaction, the standardized patients were given five minutes to evaluate the student's performance by completing a Likert rating scale checklist coded from 1 ("Strongly Disagree") to 4 ("Strongly Agree") (Table 1). Pre- and post-intervention self-evaluations were also completed by the students, using a rating scale and checklist similar to that of the standardized patients (Table 2). In order to triangulate results, the principal investigator watched and evaluated the video recordings of the pre-intervention and post-intervention assessments using the same rating scale and standardized patients' checklist, *prior* to seeing evaluations filled out by students and standardized patients (Table 1).



**Table 1: Standardized and Principle Investigator Checklist**

	1	2	3	4
1. The student expressed empathy (warmth, accurate understanding).				
2. The student acknowledged the difference between my current behavior and my goals.				
3. The student did not make decisions for me.				
4. The student expressed a belief in my ability to change.				
5. The student allowed me to state my opinion.				
6. The student included me in determining some possible lifestyle changes.				
7. The student allowed me to make my own decision on lifestyle changes.				
8. The student asked open-ended questions.				
9. The student listened to me by -repeating/rephrasing what I was saying.				
10. The student listened to me by acknowledging my emotions.				

**Table 2: Student Self-Evaluation Checklist**

	1	2	3	4
1. I did express empathy (warmth, accurate understanding).				
2. I did acknowledge the difference between his/her current behavior and his/her goals.				
3. I did not make decisions for him/her.				
4. I did express a belief in his/her ability to change.				
5. I did allow him/her to state his/her opinion.				
6. I did include him/her in determining some possible lifestyle changes.				
7. I did allow him/her to make my his/her own decision on lifestyle changes.				
8. I did ask open-ended questions.				
9. I did listen to him/her by -repeating/rephrasing what he/she was saying.				
10. I did listen to him/her by acknowledging his/her emotions.				

Following the pre-intervention assessment, students received the intervention in the form of a one-hour workshop moderated by a faculty member from the UIC College of Dentistry. This workshop consisted of two parts: a brief lecture on motivational interviewing with group role play exercise discussion, and a session providing students with an opportunity to practice newly learned skills with an

obese virtual standardized patient, in the Second Life environment. Students took turns controlling the physician avatar and asking questions of the virtual standardized patient, with a goal of understanding and practicing each of the motivational interviewing principles and skills. The video-recorded post-intervention assessment determined the student's performance skills gained from participating in the instructional workshop and activities. The format of the post-intervention assessment was identical to the pre-intervention, except that the student completed a different case from their pre-intervention assessment, in order to minimize practice effects. The standardized patient was given five minutes to evaluate the student's performance by completing a case-specific rating scale and checklist, covering principles and skills of motivational interviewing, which used the same Likert scale as the pre-intervention assessment. The students completed a self-evaluation, this time focusing on their confidence in performing the skills of motivational interviewing. Students also completed an evaluation of the Second Life program using a learning effectiveness and usability checklist. Finally, the students participated in a focus group session to explore further their experiences in using standardized patients in the Second Life virtual world and completed a learnability and usability survey (Table 3, 4), using the same ranking scale as in the pre-intervention and post-intervention assessments, to assess the use of Second Life as a feasible learning tool in medical education.

**Table 3: Table 3. Learnability Checklist**

	1	2	3	4
The workshop helped me understand the principles of Motivational Interviewing.				
The workshop helped me understand the skills required to perform Motivational Interviewing.				
The workshop taught me how to ask the proper questions.				
The workshop taught me how to understand the patient's perspective.				
The workshop taught me how to communicate with a patient who is ambivalent to change.				

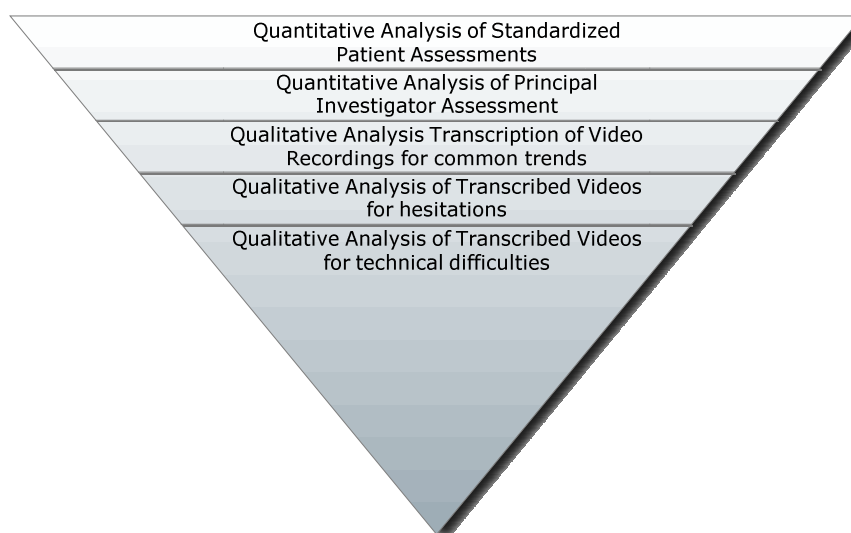
**Table 4: Usability Checklist**

	1	2	3	4
The Second Life virtual world platform was useful in teaching motivational interviewing.				
The Second Life virtual world platform was easy to use.				
The Second Life virtual world platform was a useful teaching tool.				
I enjoyed using the Second Life virtual world platform.				
Overall, I recommend the use of the Second Life virtual world platform in the future.				

The pre-intervention and post-intervention video recordings were transcribed, capturing information on spoken words as well as non-verbal elements like hesitations and gestures, and any technical difficulties that may have occurred.

### 2.3 Data Analysis

The quantitative data analysis was performed using: 1) general demographics and 2) the Student Paired T-test with an  $\alpha=0.05$  and a critical  $t$  value of 1.895 ( $df=7$ ) to compare the pre-intervention and post-intervention scores, for all items individually. This was done by first calculating the difference between the pre-intervention and post-intervention confidence scores, followed by a one sample  $t$ -test using the SAS statistical software. The Likert rating scale was coded from 1 (“Very Unconfident”) to 4 (“Very Confident”). The Student Paired T-test was performed for each pre-intervention assessment, post-intervention assessment, and the student self-evaluation assessment. The data analysis process is presented in Figure 2.



**Figure 2: Data Analysis Process.**

The qualitative analysis was performed manually from the printed transcripts of the video pre-intervention and post-intervention recordings. First, the transcripts were analyzed looking for any common trends of questions, comments, and approach to the interaction. The transcript from the focus group session was used to obtain additional detailed feedback from the students, not available through the use of self-assessment, learnability, and usability surveys. Next, the transcripts were analyzed to determine the average number of hesitations (“um” and “ah”) the students had throughout the interaction, as well as the number of technical difficulties that may have occurred.

## 3. Results

### 3.1 Participant Characteristics

A total of 8 students ( $N=556$ ) completed the pre-intervention assessment. The demographic characteristics were: gender (male = 63%, female= 38%) and class category (second year medical student = 4, fourth year medical student = 2, math education = 1, urban planning = 1).

### 3.2 Pre and Post-Intervention Data Analysis

Pre- and post-intervention assessments were completed by the standardized patients and the principal investigator for all of the eight students who participated in this study. At baseline, the students' overall scores ranged from 44% to 83%. After the intervention, the total scores ranged from 56% to 88%. Though there were too few participants to draw many meaningful conclusions about efficacy of the intervention, the pre- and post-intervention data does give some insights about the general feasibility of the approach.

The results of the Students Paired T-test on the standardized patient assessments showed a significant difference in the student's ability to determine the patient's readiness to change, using a scale referred to as the readiness ruler ( $t=3.860$ ). The principle investigator's assessment uncovered significant improvement, not only in the student's ability to determine the patient's readiness to change ( $t= 4.25$ ), but also improvements in his/her ability to acknowledge the difference between the patient's behavior and goal ( $t=2.20$ ), to listen and acknowledge the patient's emotions ( $t=2.20$ ), and to express his/her belief in the patient's ability to change ( $t=3.21$ ). Table 5 presents the results of the student mean scores, standard deviations, and the statistical t-test value for the two standardized patients and principle investigator's assessments.

**Table 5: Standardized Patient and Principle Investigator Assessment**

	Standardized Patient Mean (SD)		Statistical Test		Primary Investigator Mean (SD)		Statistical Test	
	Pre	Post	t-test	p-value	Pre	Post	t-test	p-value
1. The student expressed empathy (warmth, accurate understanding).	2.000 (0.926)	2.250 (0.886)	0.510	0.626	2.125 (0.991)	2.750 (0.707)	1.26	0.2495
2. The student acknowledged the difference between my current behavior and my goals.	2.750 (0.835)	2.250 (0.463)	1.000	0.351	1.875 (0.835)	2.750 (0.707)	2.20	0.0639
3. The student did not make decisions for me.	2.750 (0.707)	3.125 (0.354)	1.16	0.2849	2.875 (0.835)	3.125 (0.641)	0.80	0.4512
4. The student expressed a belief in my ability to change.	2.000 (0.926)	2.500 (0.535)	1.320	0.228	1.875 (0.835)	3.000 (0.756)	3.21	0.0148
5. The student allowed me to state my opinion.	2.875 (0.641)	3.125 (0.354)	1.00	0.3506	2.875 (0.641)	3.125 (0.354)	1.00	0.3506
6. The student included me in determining some possible lifestyle changes.	2.750 (0.707)	2.750 (0.707)	0.000	1.000	2.750 (0.886)	2.625 (0.518)	-0.42	0.6845
7. The student allowed me to make my own decision on lifestyle changes.	2.875 (0.354)	3.000 (0.535)	1.00	0.3506	2.875 (0.835)	3.000 (0.535)	0.31	0.7627
8. The student asked open-ended questions.	3.125 (0.354)	3.000 (0.000)	-1.000	0.351	3.125 (0.354)	2.500 (0.641)	0.000	1.000
9. The student listened to me by -repeating/rephrasing what I was saying.	2.500 (1.069)	2.625 (0.916)	0.20	0.8436	2.875 (0.835)	2.500 (0.535)	-1.000	0.3506
10. The student listened to me by acknowledging my emotions.	1.75 (0.886)	2.625 (0.916)	1.99	0.0875	1.750 (0.886)	2.625 (0.744)	2.20	0.0639
11. The student used the "readiness rule" (scale from 1-10 asking about my readiness to change).	1.625 (0.744)	2.500 (0.535)	3.860	0.006	1.625 (0.744)	3.000 (0.756)	4.25	0.0038
12. The student did not argue with me.	3.125 (0.835)	3.250 (0.463)	0.420	0.685	3.250 (0.707)	3.375 (0.518)	0.42	0.6845
	N=8	N=8			N=8	N=8		

The students' self-evaluations were analyzed using a Student Paired T-Test to compare the pre-intervention and post-intervention scores for all items. This was done using a similar methodology as the standardized patients' assessment. The Likert rating scale was coded from 1 ("Very Unconfident") to 4



(“Very Confident”). The results presented in Table 6 suggest that the intervention resulted in significant improvement in the students’ confidence in their abilities not to argue with the patient ( $t=1.93$ ). In several areas, however, students rated themselves lower on several of the skills and principles of motivational interviewing in the post-intervention self-assessment than on the pre-intervention assessment. These included their ability to: express empathy ( $t= -1.16$ ), acknowledge the difference between the patient’s behavior and goal ( $t=-1.53$ ), not to make decisions for the patient ( $t= -1.18$ ), express belief in the patient’s ability to change ( $t=-2.20$ ), allow the patient to state his/her own opinion ( $t= -0.42$ ), include the patient in determining possible lifestyle changes ( $t= -0.36$ ), allow the patient to make his/her own decision ( $t= -1.49$ ), repeat what the patient was saying ( $t= -0.26$ ) and acknowledge the patient’s emotions ( $t= -1.93$ ). The students did assess themselves higher on the post-test in their ability to acknowledge the patient’s readiness to change; however, it was not significantly higher than the pre-test assessment.

**Table 6: Student Confidence Assessment**

	Student Evaluation Mean (SD)				Statistical Test	
	Pre	Post	t-test	p-value		
1. I did express empathy (warmth, accurate understanding).	3.00 (0.926)	2.625 (0.518)	-1.16	0.2849		
2. I did acknowledge the difference between his/her current behavior and his/her goals.	3.00 (0.535)	2.500 (0.535)	-1.53	0.1705		
3. I did not make decisions for him/her.	3.125 (0.835)	2.625 (0.744)	-1.18	0.2753		
4. I did express a belief in his/her ability to change.	3.125 (0.835)	2.25 (0.463)	-2.20	0.0639		
5. I did allow him/her to state his/her opinion.	2.875 (0.641)	2.75 (0.707)	-0.42	0.6845		
6. I did include him/her in determining some possible lifestyle changes.	2.875 (0.641)	2.75 (0.707)	-0.36	0.7318		
7. I did allow him/her to make my his/her own decision on lifestyle changes.	3.25 (0.707)	2.625 (0.744)	-1.49	0.1803		
8. I did ask open-ended questions.	2.75 (0.886)	2.75 (1.035)	0.00	1.000		
9. I did listen to him/her by -repeating/rephrasing what he/she was saying.	2.875 (1.126)	2.75 (0.463)	-0.26	0.8018		
10. I did listen to him/her by acknowledging his/her emotions.	2.75 (0.886)	2.125 (0.354)	-1.93	0.0950		
11. I did use the “readiness rule” (scale from 1-10 asking about my readiness to change).	1.75 (1.035)	2.625 (1.302)	1.31	0.2306		
12. I did not argue with him/her.	3.00 (1.069)	3.625 (0.518)	1.93	0.0950		
	N=8	N=8				

### 3.3 Learnability and Usability Evaluation of Second Life

The students were asked to rate (1=Strongly Disagree, 4=Strongly Agree) Second Life as a learning tool for learning communication skills. Seven of the eight students agreed: 1) to better understand the principles ( $M=3.571$ ) and skills ( $M=3.571$ ) of motivational interviewing, 2) to learn to ask the proper questions ( $M=3.429$ ), 3) to understand the patient’s perspective ( $M=3.286$ ), and 4) how to

deal with a patient who is ambivalent to change ( $M=3.143$ ). One student chose not to complete the assessment on the use of Second Life for motivational interviewing training. Completion was not required under the terms of the IRB.

All eight students completed the usability survey and agreed: 1) Second Life was useful to teach motivational interviewing ( $M= 3.125$ ), 2) Second Life was easy to use ( $M=3.250$ ), 3) Second Life was a useful teaching tool ( $M=3.125$ ), 4) Second Life was enjoyable to use ( $M=3.125$ ), and 5) the students would recommend the use of Second Life in other educational activities in the future ( $M=3.125$ ).

### **3.4 Transcribed Data Analysis**

The transcripts of each pre-intervention and post-intervention student-patient interactions were analyzed for any common trends of questions, comments and approach to the interaction. The transcript from the focus group session was used to obtain additional detailed feedback from the students not available through the use of self-assessment, learnability and usability surveys. Next, the transcripts were analyzed manually to determine the average number of hesitations (“um” and “ah”) the students had throughout the interaction, as well as the number of technical difficulties that may have occurred.

The transcripts were analyzed to determine any common trends of questions, comments and approach to a scenario using motivational interviewing and the student’s approach to the scenario in both the pre- and post-intervention interactions. During the pre-intervention, the students interacting with the alcohol-drinking patient tended to begin the interaction by informing the patients about a current health condition and how it is related to the lifestyle habits of alcohol drinking. The most commonly asked questions were: “Do you drink regularly?” and “How much do you drink?” The students then either directed or suggested to the patient that they reduce the amount of alcohol consumed in order to improve the patient’s current health problems. A few students asked further detailed questions such as “Have you ever felt guilty about your drinking?” or “Are other people bothered by your drinking at all?” Though these are important questions, they are asked in a directive and close ended method rather than allowing the patient to describe his/her own behavior. All students concluded the interaction by providing the suggestion that the patient reduces the amount of alcohol consumed on a daily or weekly basis, rather than allowing the patient to set his/her own goals. A similar trend occurred with the students interacting with the smoking patient during the pre-intervention interactions. They began by informing the patient that a current health condition is related to the current smoking habits. Their follow up questions included “Do you smoke?” “How often do you smoke?” and “Have you tried to quit?” The students then proceeded to provide suggestions such as reducing the amount of cigarettes smoked on a weekly basis, the use of patches and nicotine gum. A few students inquired about family history and if there were other smokers in the household, but all students concluded the interaction by making the suggestion to cut down on the amount of cigarettes. As with the alcohol consumption case scenario, the students asked questions in a directive and close-ended method rather than allowing the patient to describe his/her behavior and set his/her own goals. During the post-intervention interactions with the alcohol consuming patient, the students took a similar approach as in the pre-intervention, the main difference being that the students allowed the patient to participate more in the discussion to determine his/her understanding of current health status, how the patient felt about health status and willingness, confidence, and readiness to change, on the part of the patient. The students also repeated the patient’s response to several questions and allowed the patient to set the goal rather than just suggesting a specific goal. Through this approach, students applied the motivational principles and skills of open-ended questions, listened to the patient by repeating/rephrasing what was said, and determined the patient’s readiness/willingness to change his/her lifestyle. The post-intervention interaction with the

smoking patient was very similar to the pre-intervention interaction with only one difference: The students tended to allow the patient to make the decision on what they would like to do and what they were willing to do.

Next, the transcripts were analyzed for the number of times a student hesitated during the course of the interaction by looking for specific trends in statements and hesitations during the interaction. The number of hesitations and trends of specific statements was counted manually. The results of the pre-intervention interactions showed that students hesitated between questions, saying “um,” an average of 23 times ( $M=22.750$ ) and “ah” on average 10 times ( $M=10.500$ ) during the interaction. The average number of technical difficulties with the use of voice that the students encountered was 3 ( $M=3.125$ ) throughout the interaction with the patient. When analyzed by student category, the second year medical students tended to hesitate more often than the fourth year medical students, whereas the non-medical student’s hesitations ranged greatly. During the post-intervention interaction, students hesitated, saying “um,” an average of 33 times ( $M=33.250$ ) and used “ah” an average of 12 times ( $M=12.625$ ). The number of technical difficulties during the post-intervention was 12 ( $M=11.875$ ). The trend in the number of hesitations by the category of students remained the same, but the number of hesitations was lower for each category, with the exception of the non-medical students, which remained rather the same or increased slightly.

During the focus group session, students were asked to elaborate further on why they felt the Second Life virtual world platform was or was not a useful teaching tool. All students agreed that the Second Life virtual world platform is a good tool for learning. The medical students stressed that it would be especially useful for the first year medical students who are not yet exposed to the clinical setting. They believed that it would be best for first year medical students to prepare for their first student-real patient encounter. One student stated “I guess it is good to start off with when you are not sure how to interact with the patients and how to communicate with them”. Another fourth year medical student stated “I can see how it could be useful in the beginning of medical school like just figuring out what questions you should be asking because that is such a big part of medicine.” All students, however, stressed that the Second Life virtual world platform should not replace traditional learning, but rather should be used in addition to traditional learning as a method to provide students with more opportunities to spend more time learning about certain topics and practicing certain skills. Finally, when asked specifically about the use of Second Life virtual world for learning motivational interviewing, all students agreed that it was a good tool to teach motivational interviewing. The fourth year medical students, however, felt that motivational interviewing was something they already knew (despite the fact that the questions they asked were not using the principles and skills of motivational interviewing) and, therefore, they felt using Second Life for learning motivational interviewing was not beneficial to them.

#### 4. Discussion

Second Life is one of the most common 3D virtual worlds, which are internet-based, but run on stand-alone applications that must be downloaded onto the computer. In virtual worlds, the participant is represented by a 3D graphic referred to as an avatar (Dickey, 1999). Just as Cognitive and Constructivist learning theories are applied to traditional e-learning, there is a learning theory associated with the 3D virtual worlds referred to as the Siemens Connectivism. This theory focuses on how technology changes the way we communicate and learn. More specifically, the theory of Connectivism focuses on forming networks and communities where students communicate, share ideas, and work as a group with other fellow students.

This pilot study was implemented to further explore the feasibility of using virtual worlds with a virtual standardized patient to teach motivational interviewing. An internet-based learning environment was built for the students to learn and practice their motivational interviewing skills with real-time standardized patients. Previous studies had used scripted avatars as virtual standardized patients with pre-determined statements, which required the programming of all possible key terms that a student may ask (Gorini et al., 2008). This study used live actors logged in as avatars in a 3D virtual world environment. In addition, rather than being dependent on only self-reported data by the students and standardized patient assessment, this study included triangulation by the principle investigator.

The results of this study present both positive and negative outcomes. The standardized patient and principal investigator assessment data added to our understanding of the feasibility of using virtual worlds to teach motivational interviewing as an alternate to the webpage virtual standardized patient. The standardized patient assessment showed a significant improvement in the students' abilities to determine the patient's readiness to change using the scaled readiness ruler. What must be explored in future studies is whether this improvement continues to exist when removing the lecture presentation, since the level of learning that might be attributed to the lecture itself is unknown.

The principal investigator assessment revealed not only a significant improvement in the student's ability to determine the patient's readiness to change, but also found significant improvement in other principles and skills of motivational interviewing. This analysis found significant improvements in the students' abilities to acknowledge the difference between the patient's behavior and goals, acknowledge patients' emotions, and believe in the patients' abilities to change their lifestyle. It is possible, however, that the noted difference between the standardized patient and principal investigator assessments was a result of insufficient training of the standardized patients to recognize some key statements and questions associated with the principles and skills of motivational interviewing. As a result, the standardized patients may have rated the student's performance the same in both the pre- and post-intervention assessments. The confounding factor of lack of training is not present in the case of the principal investigator assessment as the principle investigator, who designing the case scenario, should be aware of what specific statements and questions a student should ask.

The qualitative data analysis confirmed the principal investigator's assessment that the students appeared indeed to learn to ask certain questions, allowed the patient to set the goal, determined the patient's confidence, expressed belief in the patient's ability and readiness to change. In addition, the students included the patient more often in discussing the patient's current health status and in determining the next steps of treatment. Each of these specific skills is important for allowing the patients to even consider the option of changing their lifestyles. One may argue that the number of hesitations during the interaction may have altered the assessments of both the virtual standardized patient and the principal investigator of the student's ability to perform the proper motivational interviewing skills. The quantitative and the qualitative analyses, however, suggest that students did learn several of the motivational interviewing skills and principles, and demonstrated their learning by asking specific questions and statements.

This pilot study suggests a positive outcome in the use of the Second Life platform as an educational tool. It appears students did not find the new technology a barrier to learning the principles and skills of motivational interviewing. The study's small sample size and lack of comparison group, however, limits its generalizability. The challenges faced by those planning curricular studies among health science colleges are worth exploring further, as these must be carefully considered in planning future research. This study was originally designed for third and fourth year medical students on a volunteer basis. With too limited a number of student volunteers, the student pool was expanded to



include second year medical students and other health science professions. The number of volunteers remained small, so the study population was again expanded to all students from the University of Illinois at Chicago. This resulted in the study being rescheduled multiple times, and, in the end, despite all efforts to recruit students, only eight students participated. It is likely that it was, therefore, more motivated students willing to learn motivational interviewing skills who volunteered for this study, meaning a non-representative sample. It is also possible that the low student response rate could have been due to schedule conflicts with their other courses and clinic schedules, as well as a general lack of experience with e-learning.

Others considering future research in this field should consider the limitations imposed by a limited budget and timeframe to conduct the study. The study was an internally funded department project, and the budget covered only the costs of two virtual standardized patients. Future studies should consider the costs for additional virtual standardized patients, and for consulting time to professionally program Second Life.

Studies like this are constrained by the physical size and hours of operation of the simulation center in which they take place. Simulation centers across the country are scheduled to maximize throughput of very large numbers of students and a wide variety of modalities. This study was rescheduled several times to accommodate other simulations and examinations taking place at the University of Illinois at Chicago Dr. Allan and Mary L. Graham Clinical Performance Center. Having a sufficient number of computers and microphones capable of running the Second Life virtual world program, with good visual and audio quality, is another consideration. Having good internet connection is a necessity to support students completing all of the required tasks for the study. Other limitations to overcome are the inability to follow-up with the students and observe the students' abilities to perform motivational interviewing skills over time. Investigator bias in assessing the students, whether there is one person or a team of many, must be minimized. Finally, purchasing, designing and building a clinical environment within the Second Life environment is not a trivial challenge, as it requires not only experience with virtual worlds, but in presenting instructions comprehensible for new users of the program.

Each of these challenges suggests ways to overcome these barriers in similar future research studies. The challenge of recruiting students may be avoided by incorporating the research study into an existing course or a required program requirement; for example, it was not until after the research study was completed that it became known that second year medical students could have received credit as an alternative required elective. This would have increased the potential sample population within a specific group of students. Also, by incorporating the research study into an existing course or program requirement, opportunities to seek additional financial support from other departments may have emerged, providing a larger number of standardized patients. The challenge of the room and time availability to conduct the study could have also been avoided or simplified if this research was incorporated into existing activities such as the clinical examinations that occur several times during the course of the academic year. With more departments involved in the research study, it may have eliminated the challenge of being unable to obtain enough computers and microphone headsets able to run the Second Life virtual world program with good visual and audio quality.

Despite the limitation and challenges of this study, all students agreed that it was a good tool to teach motivational interviewing. Some students felt the lack of personal contact with the patient and not seeing the patient made them hesitant on when they may or may not ask the next question. In regard to the Second Life Virtual world platform, the students did not find it difficult to use. Some students stated that they were mainly dependant on vocal gestures as the patient may not have always used the visual

gestures. The second-year medical students found Second Life useful to practice motivational interviewing skills as their current curriculum covered only a minimal amount of material on physician-patient communication. All students agreed, however, that this would be a useful tool for first-year medical students, who have little to no experience with patients, in practicing how to ask questions and what types of questions to ask. The limitations and challenges overcome with this study should serve as a roadmap for future researchers building studies on the use of Second Life for training.

## References

- Abramowitz, S., Flattery, D., Franes, K., and Berry, L. (2010). Linking a motivational interviewing curriculum to the chronic care model. *Journal of General Internal Medicine*, 25 Suppl. 4, 620-626.
- Aldrich, C. (2005). Four traditional simulation genres. In Aldrich, C, *Learning by Doing* (pp 3-6). San Francisco, CA: Pfeiffer.
- Ankerstjerne, C., Becker C., Bell H., Berry-Edwards J., Early T., Garell K. (2004). Motivational Interviewing. In Corcoran J. (Ed.), *Building Strengths and Skills: A Collaborative Approach to Working with Clients* (pp.19-35). Cary NC: Oxford University Press.
- Atkinson, T. (2008). Second Life for educators inside Linden Lab. *TechTrends*, May/June 52:3, 16-18.
- Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annu. Rev. Psychol*, 52, 1-26.
- Barrows, H. (1987). *Simulated (Standardized) Patients and Other Human Simulations*. Chapel Hill NC: Health Sciences Consortium.
- Bell, K., and Cole, B. A. (2008). Improving medical students' success in promoting health behavior change: A curriculum evaluation. *Journal of General Internal Medicine: Official Journal of the Society for Research and Education in Primary Care Internal Medicine*, 23:9, 1503-1506.
- Bell, M. (2001). Online role-play: Anonymity, engagement and risk. *Educational Media International*, 38:4, 251-260.
- Beullens, J, Rethans, J. J., Goedhuys,J., and Buntin F. (1997). The use of standardized patients in research in general practice. *Family Practice*, 14(1), 58-62.
- Blackboard. Retrieved January 7, 2009, from Blackboard website, <http://www.blackboard.com/>.
- Boulos, M. N. K., Hetherington, L., and Wheeler, S. (2007). Second life: An overview of the potential of 3-D virtual worlds in medical and health education. *Health Information and Libraries Journal*, 24(4), 233-245.
- Boulos, M. N. K., Ramlool, R., Jones, R., and Toth-Cohen, S. (2008). Web 3D for public, environmental and occupational health: Early examples from Second Life. *International Journal of Environmental Research and Public Health*, 5, 290-317.
- Bouras, C., and Tsiatsos T., (2006). Educational virtual environments. Design rationale and architecture *Multimedia Tools and Applications*, 29(2), 153-173.
- Bricken, M. (1991). Virtual Reality Learning Environments. Potentials and Challenges. *ACM SIGGRAPH Computer Graphics*, 25(3), 178-184.
- Bronack, S., Riedl, R., and Tashner, J. (2006). Learning in the zone: A social constructivist framework for distance education in a 3-dimensional virtual world. *Interactive Learning Environments*, 14(3), 219-232.
- Carpenter, K. M., Cohn L. G., Glynn L. H., and Stoner S. A. (2008). Brief interventions for tobacco users: Using the internet to train healthcare providers. *International Electronic Journal of Health Education*, 11, 1-12.

- Carpenter, K. M., Watson, J. M., Raffety, B., and Chabal, C., (2003). Teaching brief interventions for smoking cessation via an interactive computer-based tutorial. *Journal of Health Psychology*, 8(1), 149-60.
- Center for Disease Control and Prevention (CDC). Fact sheets - Alcohol use and health. Retrieved July 10, 2009, from [http://www.cdc.gov/alcohol/quickstats/general\\_info.htm](http://www.cdc.gov/alcohol/quickstats/general_info.htm).
- Center for Disease Control and Prevention (CDC). Overweight and Obesity. Retrieved July 10, 2009, from <http://www.cdc.gov/obesity/causes/health.html>.
- Center for Disease Control and Prevention (CDC). Smoking. Retrieved July 10, 2009, from [http://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/health\\_effects/effects\\_cig\\_smoking/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm).
- Center for Disease Control and Prevention (CDC). Summary Health Statistics for U.S Adults: National Health Interview Survey, 2007. Retrieved July 10, 2009, from [http://www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_240.pdf](http://www.cdc.gov/nchs/data/series/sr_10/sr10_240.pdf).
- Cleland, J., Abe K., and Rethans, J. (2009). The use of simulated patient in medical education: AMEE Guide No 42, *Medical Teacher*, 31, 477-486.
- Conrad, E., Kavia, S., Burden, D., Rice, A., Woodham, L., Beaumont, C., Savin-Baden, M. and Woodham, L. (2009). Virtual Patients in a Virtual World: Training Paramedic Students for Practice. *Medical Teacher*, 31, 713-720.
- Curtis, P., and Nichols, D. A. (1993). *MUDs Grow Up: Social Virtual Reality in the Real World*. Retrieved April 20, 2009, from <http://citeseerx.ist.psu.edu/viewdoc/download?rep=rep1&type=pdf&doi=10.1.1.38.1688>
- Dembo, S., (2008). Virtual worlds for educators - Second Life creates a new dimension for K12 learning and collaboration. *District Administration*, 48-52.
- DeNeve, K. M., and Heppner, M. J.: Role play simulations (1997). The assessment of an active learning technique and comparisons with traditional lectures. *Innovative Higher Education*, 21(3), 231.
- Dickey, M. (1999). *3D virtual worlds and learning: An analysis of the impact of design affordance and limitations in active worlds, Blaxxun Interactive, and Onlive! Traveler; and a Study of the Implementation of Active Worlds for Formal and Informal Education* (Doctoral Dissertation). Retrieved from ProQuest Digital Dissertations and Theses database. (AAT 9941313).
- Egnew T. and Wilson, H. (2010). Faculty and medical students' perceptions of teaching and learning about the doctor-patient relationship. *Patient Education and Counseling*, 79, 199-206.
- Fiscella, K., and Epstein, R. (2008). So much to do, so little time care for the socially disadvantaged and the 15 minute visit. *Archives of Internal Medicine*, 168(17), 1843-1852.
- Fleming, M., Olsen D., Stathes, H., Boteler, L., Grossberg, P., Pfeifer, J., . . . Kochelak, S. (2009). Virtual reality skills training for health care professionals in alcohol screening and brief intervention. *Journal of American Board Family Medicine*, 22, 387-398.
- Gillani, B. (2003). Behavioral theories and E-learning. In Gillani B., *Learning Theories and the Design of E-Learning Environments*. (pp.25-48). Lanham, MD: University Press of America, Inc.



- Goggin, K., Hawes, S., Duval, E., Spresser, C., Martinez, D., Lynam, I., . . . Catley, D. (2010). A motivational interviewing course for pharmacy students. *Journal of Pharmaceutical Education*, 74(4) Article 70.
- Good, J., Howland, K., Thackray, L. (2008). Problem-based learning spanning real and virtual worlds: a case study in Second Life. *ALT-J Research in Learning Technology*, 16(3), 163-172.
- Gorini, A., Gaggioli, A., Vigna, C., and Riva, G. (2008). A Second Life for eHealth: Prospects for the use of 3-D virtual worlds in clinical psychology. *Journal of Medical Internet Research*, 10 (3).
- Guri-Rosenblit, S. (2005). "Distance education" and "E-learning": Not the same thing. *Higher Education: The International Journal of Higher Education and Educational Planning*, 49 (4), 467-493.
- Hansen, M. M. (2008). Versatile, immersive, creative and dynamic virtual 3-D healthcare learning environments: A review of the literature. *Journal of Medical Internet Research*, 10 (3), e26.
- Hmelo-Silver, C. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16 (3), 235-266.
- Holsbrink-Engels, G. A. (1997). Computer-based role-playing for interpersonal skills training. *Simulation & Gaming*, 28 (2), 164.
- Homes, B., and Gardner, J. (2006). A potted history of E-learning. In Homes, B., and Gardner, J., *E-Learning Concepts and Practice* (pp.35- 50). Thousand Oaks, CA: Sage Publications.
- Hrastinski, S. (2008). Asynchronous & synchronous E-learning. *EDUCAUSE Quarterly*, 31 (4), 51-55.
- Huang, S. (2005). Diffusion theory in an internet environment: Testing four key components. Retrieved from *The 6<sup>th</sup> International Symposium on Online Journalism*, <http://online.journalism.utexas.edu/2005/papers/huang.pdf>.
- Hudson, K., and Degast-Kennedy, K. (2009). Pedagogy, education and innovation in a 3-D virtual worlds. *Journal of Virtual Worlds Research*, 2 (1), 3-11.
- Humair, J.P, Cornuz, J., and Cornuz, J. (2003). A new curriculum using active learning methods and standardized patients to train residents in smoking cessation. *Journal of General Internal Medicine*, 18 (12), 1023-7.
- Joyner, B., and Young, L. (2006). Teaching medical students using role play: Twelve tips for successful role plays. *Medical Teacher*, 28 (3), 225-229.
- Kapp, K. and O'Driscoll, T. (2010). *Learning In 3D: Adding a New Dimension to Enterprise Learning and Collaboration* (pp.69-88). San Francisco, CA: Pfeiffer A Wiley Inprint.
- Kelton, A. (2007). Second Life: Reaching into the virtual world for real-world learning. *EDUCAUSE Research Bulletin*, 17.
- Kelton, A. (2008). Virtual worlds? "Outlook good": Whether it is second life or another virtual world, this foundational movement is not going away. *EDUCAUSE Review*, 43 (5), 14-23.
- King, S., Greidanus, E., Carbonaro, M., Drummond, J., Boechler P., Kahlke R. (2010). Synchronous problem-based e-learning (ePBL) in interprofessional health science education. *Journal of Interactive Online Learning*, 9 (2), 133-150.

- Kipper, D. and Har-Even, D. (1984). Role-playing techniques: The differential effect of behavior simulation interventions on the readiness to inflict pain. *Journal of Clinical Psychology*, 40 (4), 936-941.
- Kirriemuir, J. (2008). Second Life in higher education, medicine and health. *He@lth Information on the Internet*, 64, 6-8.
- Kumar, S., Chhugani, J., Kim, C., Kim, D., Nguyen, A., Dubey, P., . . . Kim, Y. (2008). Second Life and the new generation of virtual worlds. *Computer*, 41 (9), 46-63.
- Lane, C., Huws-Thomas, M., Hood, K., Rollnick, S., Edwards, K., and Robling, M. (2005). Measuring adaptations of motivational interviewing: The development and validation of the behaviour change counseling index (BECCI). *Patient Education and Counseling*, 56, 166-173.
- Lane, J. L., Slavin, S., and Ziv, A. (2001). Simulation in medical education: A review. *Simulation & Gaming*, 32 (3), 297-314.
- Lowenstein, A. (2007). Role play. In M. Bradshaw, A. Lowenstein (Eds.), *Innovative Teaching Strategies in Nursing and Related Health Professions*, (pp.173-181). Sudbury MA: Jones and Bartlett Publishers, Inc.
- Mantovani, F., Castelnovo, G., Gaggioli, A., and Riva, G. (2003). Virtual reality training for health-care professionals. *CyberPsychology & Behavior*, 6 (4), 389-395.
- Martino, S., Haeseler, F., Belitsky, R., Pantaloni, M., and Fortin, A. H (2007). Teaching brief motivational interviewing to year three medical students. *Medical Education*, 41 (2), 160-167.
- Mayrath, M., Sanchez, J., Traphagan, T., Heikes, J., Trivedi, A. (2007). Using Second Life in an English course: Designing class activities to address learning objectives. In C. Montgomerie and J. Seale (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 4219-4224). Chesapeake, VA: AACE.
- Miller, W., Rollnick, S. (2002). Phase 1 Building Motivation for Change. In Miller, W., Rollnick, S., *Motivational Interviewing Preparing People for Change*, (pp.52-84). New York: The Guilford Press.
- Miller, W., Rollnick, S. (2002). What is Motivational Interviewing? In Miller, W., Rollnick, S., *Motivational Interviewing Preparing People for Change*, (pp.33-42). New York: The Guilford Press.
- Moyers, T. (2004). History and happenstance: How Motivational Interviewing Got Its Start. *Journal of Cognitive Psychotherapy: An International Quarterly*, 18(4), 291-298.
- Nestle, D., and Tierney, T. (2007). Role-play for medical students learning about communication: Guidelines for maximizing benefits. *BMC Medical Education*, 7(3).
- Nicholson, P. (2007). A History of E-Learning: Echoes of the Pioneers. In Bravo-Rodriguez J., Fernandez-Manjon, B., Gomez-Pulido, J.A., Sanchez-Perez, J.M., Vega-Rodriguez, M.A. (Eds.) *Computers and Education: E-learning, From Theory to Practice*, (pp. 1-11). Dordrecht, The Netherlands, Springer Publishing.
- Parsons, T. D., Kenny, P., and Rizzo, A. (2008). Virtual human patients for training of clinical interview and communication skills. *Proceedings of the 7th international conference on disability, virtual reality and associated technologies, with ArtAbilitation (ICDVRAT 2008)* , 135-142.

- Poirier, M., Clark, M., Cerhan, J., Pruthi, S., Geda, Y., and Dale, L. (2004). Teaching motivational interviewing to first-year medical students to improve counseling skills in health behavior change. *Mayo Clinic Proceedings*, 79 (3), 327-331.
- Radon K., Kolb S., Reichert J., Baumeister T., Fuchs R., Hege I., ... Nowak D. (2006). Case-based E-learning in occupational medicine: The Networm Project in Germany. *Annals of Agriculture and Environmental Medicine*, 13, 93-98.
- Rollnick, S., Mason, P., Butler, C., (1999). *Health Behavior Change a Guide for Practitioners*. New York, NY: Churchill Livingstone.
- Rollnick, S., Miller, W., Butler, C., (2008). *Motivational Interviewing in Health Care*. New York: The Guilford Press.
- Russell C. & Shepherd J., (2010). Online role-play environments for higher education. *British Journal of Educational Technology*, 41(6), 992-1002.
- Rzymaszewski, M., Au, W.J., Ondrejka, C., Platel, R., Gorden, S. V., Cezanne, J., ... Rossignol, J., (2008). *Second Life The Official Guide 2<sup>nd</sup> ed*. Indianapolis, IN: Wiley Publishing.
- Savin-Baden, M., Tombs, C., Poulton, T., Conradi, E., Burden, D. and Beaumont, C. (2011). An Evaluation of Implementing Problem-based Learning Scenerios in an Immersive Virtual World. *International Journal of Medical Education*, 2, 116-124.
- Skinner, C., and Kreuter, M., (1997). *Health Promotion and Interactive Technology Theoretical Applications and Future Direction*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Stafford, R. S., Farhat, J. H., Misra, B., & Schoenfeld, D. A. (2000). National patterns of physician activities related to obesity management. *Archives of Family Medicine*, 9 (7), 631-638.
- Stevens, A., Hernandez, J., Johnsen, K., Dickerson, R., Raij, A., Harrison, ... Lind, S. (2006). The use of virtual patients to teach medical students history and communications. *The American Journal of Surgery*, 191(6) 806-811.
- Swink, D. F. (1993). Role-play your way to learning: to lead a successful role play, start by thinking about three things: The beginning, the middle, and the end. *Training & Development*, 47(5), 91.
- Temple University. Virtual Learning: In Search of a Psychological Model. Retrieved September 5, 2009 from [http://www.temple.edu/ispr/prev\\_conferences/proceedings/2001/Selverian.pdf](http://www.temple.edu/ispr/prev_conferences/proceedings/2001/Selverian.pdf).
- Treasure, J. (2004). Motivational Interviewing. *Advances in Psychiatric Treatment*, 10, 331-337.
- University of Illinois -at Chicago Center of Advancment in Distant Education (CADE). (2009). Train-The-Trainer workshop Guide. Retrieved November 10, 2011, from [http://www.virtualpublichealth.com/docs/IDPH\\_Virtual\\_Training\\_Workshop\\_Guide\\_V2.pdf](http://www.virtualpublichealth.com/docs/IDPH_Virtual_Training_Workshop_Guide_V2.pdf)
- University of Illinois at Chicago School of Continuing Studies. External Education. Retrieved January 7, 2009, from <http://exedweb.cc.uic.edu/exed/exedpublic/default.asp>.
- University of Richmond. *Build It*. Retrieved April 20, 2009, from <http://world.secondlife.com/a/place/aeb29ac8-b3c0-7947-8c1c-2d44f4419cd0>.
- Van der Vleuten, C.P.M, and Swanson, D. (1990). Assessment of clinical skills with standardized patients' State of the Art. *Teaching and Learning in Medicine*. 2(2), 58-76.

- Villaume, W. Berger, B., and Barker, B., (2006). Learning motivational interviewing: Scripting a virtual patient. *American Journal of Pharmaceutical Education*, 70(2), Article 33, 1-9.
- Wallace, P. (1997). Following the Threads of an Innovation: The History of Standardized Patients in Medical Education. *CADUCEUS*, 13(2), 5-28.
- Waterhouse, S. (2005). *The Power of eLEARNING The Essential Guide for Teaching in the Digital Age*, (pp.30-47). New York, NY: Pearson Education, Inc..
- Weinstein, N. D., Rothman, A. J., and Sutton, S. R. (1998). Stage theories of health behavior: Conceptual and methodological issues. *Health Psychology: The Official Journal of the Division of Health Psychology, American Psychological Association*, 17(3), 290.
- Williams, L. (1983). *Teaching for the Two-Sided Mind*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Winarski, J., Silver, S., Karybill, K., Lorello, T. (2003). Motivational interviewing: Application for PATH service providers. Retrieved January 16, 2009, from [http://pathprogram.samhsa.gov/pdf/Transcript\\_Motiv\\_Inter\\_2\\_11.pdf](http://pathprogram.samhsa.gov/pdf/Transcript_Motiv_Inter_2_11.pdf).
- Worcester Research and Publications. The virtual university and avatar technology: E- learning through future technology. Retrieved September 5, 2009 from [http://eprints.worc.ac.uk/766/1/iBot2000\\_paper\\_pdf](http://eprints.worc.ac.uk/766/1/iBot2000_paper_pdf).
- Yardlesy-Matwieczuk, K. (1997). *Role Play Theory & Practice*. Thousand Oaks, CA: Sage Publishing.
- Yellowlees, P., and Cook, J. (2006). Education about Hallucinations Using an Internet Virtual Reality System: A qualitative survey. *Academic Psychiatry*, 30(6), 534-539.
- Yudkowsky, R. (2002). Should We Use Standardized Patients Instead of Real Patients for High-Stakes Exams in Psychiatry? *Academic Psychiatry*, 26(3), 187-191.
- Zhang, D., and Nunamaker, J. F. (2003). Powering E-learning in the new millennium: An overview of E- Learning and enabling technology. *Information Systems Frontiers*, 5(2), 207-218.