Clinical Simulation in Nursing (2019) 29, 9-14

Clinical Simulation in Nursing

www.elsevier.com/locate/ecsn

Featured Article

Virtual Gaming Simulation in Nursing Education: A Mixed-Methods Study

Margaret Verkuyl, NP PHC, MN*, Michelle Hughes, RN, MEd

Professor Nursing, School of Community and Health Studies, Centennial College, Toronto, ON M1C 5J9, USA

KEYWORDS
nursing education;
virtual simulation;
mixed methods research;
bridging nursing students;
simulation design;
self-confidence;
satisfaction;
focus groups

Abstract

Background: Virtual simulations can provide students with an opportunity to apply theoretical concepts to simulated clinical experiences.

Method: A mixed-method design using surveys and focus groups was used to explore student satisfaction, self-confidence, engagement, and simulation design.

Results: High levels of effective simulation design elements were reported. Survey results indicated positive outcomes in self-confidence and satisfaction. Focus group data revealed three main themes: virtual gaming simulation design elements, expanding knowledge, and experiential learning.

Conclusions: The high level of realism and authentic storyline in this virtual gaming simulation contributed to the learning experience and enhanced knowledge, engagement, and self-confidence among bridging nursing students.

Cite this article:
Verkuyl, M., & Hughes, M. (2019, April). Virtual gaming simulation in nursing education: A mixed-methods study. *Clinical Simulation in Nursing, 29*(C), 9-14. https://doi.org/10.1016/j.ecns.2019.02.001.

Virtual simulations provide nursing students with an opportunity to apply theoretical concepts in a simulated clinical experience, encouraging reflection on decision-making in a safe and controlled learning environment (DeGagne, Oh, Kang, Vorderstrasse, & Johnson, 2013; Ulrich, Farra, Smith, & Hodgson, 2014). Virtual gaming simulation (VGS) is a Web-based, interactive, experiential clinical environment where students are required to make decisions to move forward in the game (Verkuyl, Romaniuk, Atack, & Mastrilli, 2017b). Recent literature supports virtual simulation as an effective learning strategy. Virtual simulation can trigger visceral responses and emotional connections between the learner and the virtual patient (Johnsen, Fossum, Vivekananda-Schmidt, Fruhling, & Slettebø, 2016; Verkuyl, Hughes, Tsui, Betts, St-Amant & Lapum, 2017a) and can promote learner engagement (Duff, Miller, & Bruce, 2016; Irwin & Coutts, 2015). The experiential nature of VGS has the potential to develop the skills required for clinical practice (Johnsen et al., 2016). In learning mental health education, virtual simulations provide a forum in which to practice essential skills such as critical thinking, communication, and decision making (Guise, Chambers, & Välimäki, 2012). In a scoping review by Duff et al. (2016), virtual simulation was found to have equal and, in some cases, superior engagement outcomes when compared with in-person simulation. Verkuyl and Mastrilli's (2017) scoping review found several studies that identified positive findings regarding satisfaction and self-efficacy when nursing students used virtual simulations.

A collaborative group of nursing faculty and a team of distance-learning experts created a community home visit

* Corresponding author: mverkuyl@centennialcollege.ca (M. Verkuyl).

1876-1399/$ - see front matter
https://doi.org/10.1016/j.ecns.2019.02.001

VGS called, *Skills Practice: A Home Visit Simulation Game* (see weblink: https://de.ryerson.ca/games/nursing/mental-health/game.html#/). In-person simulation design elements were used as a basis to create the VGS. The simulation encourages students to make decisions focusing on interpersonal violence and mental health assessments. Film clips provide the learner with a realistic clinical experience of a home visit. Learners assess data provided in the film clips, make decisions based on their assessments, and experience the consequences of their decisions in a safe environment. Learners are provided with rationale and feedback for each decision point. When the VGS is complete, the learner receives a score of how many decisions were "correct," "not the best," and "incorrect" and a summary report outlining each of the learner's decisions with hyperlinks to relevant module educational content. There are 12 main decision points in the game, which takes about 30 to 60 minutes to play. Usability testing was conducted and changes made to increase the ease of use and perceived usefulness of the VGS (Verkuyl, Romaniuk, & Mastrilli, 2018). Although there have been several studies of baccalaureate students playing VGS, there have not been any studies with students who are registered practical nurses (RPNs) in bridging programs that are designed to assist the student to enter a higher education institution. These students tend to take online or hybrid courses because they are often working, come from a wide geographical area, and frequently have difficulty attending traditional in-person simulations. The purpose of the study was to explore the RPN to RN bridging students' perception of the VGS design and its impact on student engagement, satisfaction, and self-confidence.

Key Points

- Virtual simulations provide students with an opportunity to apply theoretical concepts to simulated clinical experiences.
- Results of a mixed-methods study found high levels of effective simulation design elements and positive outcomes related to self-confidence and satisfaction.
- High levels of realism and an authentic storyline embedded in an effective simulation design affects the students' experience.

Ethics

The study was approved by the research ethics board at the institution. Participants provided informed consent before participation.

Theory

The theoretical framework for the study was Kolb's learning model (Kolb, Kolb, Passerelli, & Sharma, 2014). VGS activities, using Kolb's experiential learning model, can provide transformative opportunities to engage learners in active experimentation and support reflection and analysis of mental health concepts.

Method

A convergent parallel mixed-method study design using surveys and focus groups was conducted to gain a more complete understanding of our research questions. The VGS was embedded as a required second-term learning activity in the Mental Health and Community Practice course, which is part of a year-long RPN to RN bridging program. Two cohorts (n = 127) played the VGS after being taught the mental health content in class. The VGS included a prebrief that contained information on the options in the game, the learning objectives, and how the game progresses. Throughout the VGS, feedback was provided related to "incorrect" or "not the best" responses. For example, when the nurse chooses to sit on the couch, the following reflective questions are provided: "If you needed to make a quick exit to maintain your safety, what barriers would you encounter between the couch and the door?" "How could you avoid these barriers?"

Data Collection

Data were collected using four surveys and focus groups after students played the VGS. All survey items were reviewed by the research team, with expert experience in simulation to enhance content validity and evidence for the survey items. The Student Satisfaction and Self Confidence in Learning Scale and Simulation Design Scale were developed in the National League for Nursing and the Laerdal Simulation Study Project to assess learning through simulation experiences (Jeffries & Rizzolo, 2006). We adapted the items for this study to include the term virtual simulation and content on mental health assessment and deleted the items related to the instructor as this was not the study focus. In addition, the rating of item importance component of the Simulation Design Survey was not included. Reliability testing for these three surveys using Cronbach alpha was found to be above 0.8 (Jeffries & Rizzolo, 2006), providing evidence for reliability (Salkind, 2014). In this study, a Cronbach alpha was completed with each survey to determine item reliability.

Demographic Survey

Data were collected regarding age, sex, years practicing in health care, practice area, and primary language.

Self-Confidence in Learning Survey

This eight-item instrument measured students' perception of their confidence in the knowledge they acquired from the VGS using a five-point Likert scale where 1 = strongly disagree to 5 = strongly agree. One question was excluded from the survey. The Cronbach alpha for the present study was 0.90.

Satisfaction with Current Learning Survey

This five-item survey measured student satisfaction with different components of the simulation activity such as the teaching method, format, and learning materials using a five-point Likert scale where 1 = strongly disagree to 5 = strongly agree. The Cronbach alpha for the present study was 0.93.

Simulation Design Scale

This survey measured students' perception with five simulation design features, which included (a) objectives/information, (b) support, (c) problem solving, (d) feedback, (e) fidelity. The Cronbach alpha for the present study was 0.92.

Data Analysis

Descriptive statistics were calculated for the survey data using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp, Armonk, NY).

Focus Group

Focus group methodology was used to explore students' experiences and outcomes using the VGS, as well as to describe and expand on the findings from the quantitative data. The focus group method is an effective forum utilizing a multivocal approach to facilitate the sharing of peoples' experiences of a phenomenon within a group setting (Liamputtong, 2011). Semistructured open-ended questions were used to guide the discussion. Sample questions included the following: "Tell me about your experience with the virtual gaming activity" and "Tell me about the level of engagement you had with the virtual gaming activity?" The sessions were taped and transcribed. A team approach following the process outlined by Braun and Clarke (2006) was used to complete the thematic analysis, adding rigor to theme identification. Three faculty members first coded each line and then categorized the codes and finally named the themes. It was not a linear process but an iterative approach, which allowed for the defining and refining of codes and themes as required to capture the essence of the focus groups.

Results

Surveys

A convenience sample of 43 (34%) students completed the post surveys. Most (90%) participants were female. The majority (63%) were aged 20 to 30 years; nine percent were 40 years or older. Most (77%) had at least 1 to 3 years of experience working in health care; none had mental health nursing experience. Sixty percent identified English as their first language.

Self-Confidence in Learning Survey

The total mean score was 27.7/35 points or 79.3/100 indicating a fairly high level of self-confidence regarding learning gained after playing the VGS. Two items had scores less than 4/5 and these related to mastering the content (3.83) and confidence that critical content (3.90) had been covered.

Satisfaction with Current Learning Survey

The total mean score was 20.3/25 or 81/100 indicating a high level of satisfaction with learning gained from the VGS.

Simulation Design Scale

The total mean for this survey was 77.4/95 or 81/100 indicating students rated the VGS design features positively. All items scored 4/5 except the item, "The virtual simulation provided enough information in a clear manner for me to problem solve the situation" (3.8/5). Three items related to support scored 4/5. The items were as follows: support was offered in a timely manner, I felt supported by the feedback provided during the simulation, and I was supported in the learning process.

Focus Group

Two focus groups were conducted with a convenience sample of 20 participants; most (80%) were women. Half of the participants were aged 18 to 25 years; all were under 45. Three main themes were identified: VGS design elements, expanding knowledge, and experiential learning. Each of these themes had three subthemes (Table 1). The themes highlighted and supported our survey findings and provided insight into the use of experiential learning.

VGS Design Elements

Three key design elements were identified: the storyline, control, and format. As the action in the storyline reached a peak, participants became more focused and the degree of engagement increased. One participant said, "You had no choice but to be engaged." Another elaborated, "By the third decision point, when the guy came in, and that's when all of us were like, what's going on here? How is this going to play out?" Participants explained why they were engaged, "I wanted to know what was behind the doors, it was curiosity" and, "I wanted to see how it ended." The storyline sparked curiosity, interest, and engagement, which encouraged participants to keep playing and focused on their decisions.

Control of decisions within the game and where the learners' played the VGS were identified as important. Students liked being able to play the VGS at home. Controlling the VGS environment provided a feeling of psychological safety, as one participant said, "You are doing it in your own space and you know you're not being

Table 1 Focus Group Themes and Subthemes

Theme	VGS Design Elements	Expanding Knowledge	Experiential Learning
Subthemes	Storyline	Reflection	Psychological safety
	Control	Knowledge retention	Thinking beyond
	Format	Knowledge application	Praxis

Note. VGS = virtual gaming simulation.

judged." Another participant, when comparing it to an in-person simulation said, "… in the virtual simulation there is no one watching me, so I can do it myself and I can pick up any option." The freedom to see the decision impact and to replay decisions had a positive impact. One student noted, "It's not like watching a video, you watch it and nothing changes, but here, your decisions impacted the outcomes." Others noted, "I realized that I had free reign" and, "I can do it over and over."

The VGS format influenced the learning experience; filming using a first-person lens enhanced the realism of the VGS. A participant said, "That made it a big difference because you're not one person looking into a situation, you're actually in it and that engaged me right there." Realism impacted memory as one participant shared, "I can vividly remember every scenario, every scene." Another commented, "I've done other simulations before where it was cartoon based, but here, with the real-life experience, it makes you feel like you're within the actual setting." The VGS design influenced the student experience regarding the two major outcomes: expanding knowledge and experiential learning.

Expanding Knowledge

The theme expanding knowledge through playing the VGS was identified with three subthemes: reflection, knowledge retention, and knowledge application. Reflection was a key component that helped participants expand knowledge. One participant commented on her decision making saying, "You critically think, what is the best situation that's both going to be safe for me and also going to foster good communication between the client?" Participants repeatedly said they were able to relate to the scenario, which stimulated reflection. Participants also reflected on the mistakes they made in the VGS: "I really think that it made me more aware that it is something I need to work on as well as the critical thinking." Another shared, "When I saw that my answers were wrong or not appropriate, maybe not the best answers that was perhaps one of the best parts for me." A desire to continue to dialog and continue the reflective process after the VGS was expressed. The participants felt that a chance to reflect on the VGS by writing, "A reflective piece on their experience" or "Having a discussion in class" would encourage learning.

Knowledge retention emanated from visceral responses and emotions evoked while playing the VGS. One participant said, "You felt for the patient." These feelings influenced memory: "I find that it is easier to remember because it is a real person and later in life you can remember their reactions, their emotions." Psychological involvement with the storyline enhanced memory of the VGS content. One participant stated, "This was the first time I felt that most engaged and the most involved, where I learned something in what, twenty minutes that it took to complete it and I actually went back and did it again."

Scenario realism provided a basis for participants to apply their knowledge. A participant who had never had this particular experience in clinical said, "Seeing it in a simulation form really gives me some sort of basic knowledge in what I would do in case I did experience that." Others felt the VGS improved their clinical knowledge as a participant shared, "I feel as if my therapeutic communication was enhanced tremendously." Another noted, "It educates you on how you should be taking the steps in real life."

Experiential Learning

The experiential learning theme had three subthemes: psychological safety, thinking beyond, and praxis. Feeling psychologically safe while playing the VGS had a positive impact on the students' learning outcomes. Participants said they felt they could make mistakes safely and comfortably. One commented that the VGS would be a good supplement before doing an in-person simulation and stated feeling, "Safe within your time and your environment and you make your mistakes … it's a good supplement, an additional thing to build that confidence." Another participant expanded on why a safe environment is important, "You're watching it, you're comfortable, you're giving your options … I feel like because it is less stress, you learn more. You're more open. The information sticks." The safe learning environment provided a space for students to think beyond themselves and focus on the scenario. One participant described the VGS as "An eye opener for me too actually, thinking bigger picture." The VGS helped participants to go beyond the virtual client's experience to reflect on their professional role. One explained how the VGS, "Made me aware about how I word things, a little more conscious on … trigger words … it does affect the client." Students began to reflect on how their decisions impacted the client's reactions within the game.

Making client-based decisions in the VGS enabled students to connect what they learned in class to their professional experience. Praxis occurred when theory was embodied through their actions within the VGS. One participant said, "We learn from the textbooks the way we should react but then, when you're actually put through that simulation, it's more realistic." Another participant agreed, stating, "I saw her reaction, I was actually taken back, I wasn't expecting it at all … wow, you don't realize the impact of what you say and how it affects the person. That's the reflective piece of it." Through praxis, participants reflected on how they could incorporate their new learning from the VGS into their current nursing practice.

One participant commented, ''Because we did the simulation, if it did happen in real life, we would have a better idea how we, as nurses, should handle ourselves in that situation.'' Another participant agreed, ''Being able to learn from the scenario and then applying it in another situation … I feel like a lot of the things that happened I will be able to take it and use it for my own practice.'' Further reflection occurred as participants talked about applying VGS concepts to their current and future nursing practice.

Discussion

The surveys and the focus group interviews in this study yielded different yet complementary data. The relatively high satisfaction, self-confidence, and design survey scores were supported by results from the focus group interviews which helped the team to interpret the quantitative data related to those outcomes. Those results add to the growing body of literature on VGS in nursing education by identifying critical VGS design features that influence student learning, an important finding as education increasingly moves from in-person to virtual simulations. The study also provides evidence of the impact of experiential learning strategies using VGS on learning outcomes with registered practical nurses, a previously unexplored subject. Our study also corroborates findings from other studies regarding knowledge gain and retention through VGS (Farra, Miller, Timm, & Schafer, 2012; Schaffer, Tiffaincy, Kantack & Anderson, 2016; Verkuyl et al., 2017b).

Similar to the findings from Duff et al. (2016) scoping review on virtual simulation in health care education, our participants found the virtual experience to be an engaging and effective learning activity. Bouvier, Laevoué and Sehaba (2014) defined engagement in digital games as, ''The willingness to have emotions, affect, and thoughts directed toward and around the mediated activity in order to achieve a specific objective'' (p.496). Curiosity, connectivity, arousal, and social connection are characteristics that suggest engagement (Bouvier, Lavoué, & Sehaba, 2014). Our participants demonstrated engagement by their visceral responses to the scenario, connection to the simulated characters, and their curiosity about the client's outcome resulting in high levels of satisfaction with the experience. The game design esthetics created a realistic storyline using visual and aural sensory phenomena to evoke the users' emotional and physiological responses (Johnsen et al., 2016). The VGS storyline was heightened in the virtual environment through the characters' vocal intonation and facial expressions. Aesthetics, game flow, and storyline are important design elements that enhance learner engagement and satisfaction with the quality of the experience (Bouvier et al., 2014; Kapp, 2012).

The participants voiced their suspension of disbelief during the VGS, something which is critical in convincing the user that the simulation is real and contributes to learning (Muckler, 2017). Suspension of disbelief was achieved by creating a high level of realism in the 2D virtual world (Faiola, Newlon, Pfaff, & Smyslova, 2013) and a psychologically safe environment (Muckler, 2017). Participants reported that they felt safe to make mistakes. These design elements contributed to enhanced user immersion, engagement, and deepening of knowledge.

It is interesting to note that none of the focus group participants worked in mental health; however, they reported increased confidence in both the surveys and focus groups regarding their ability to apply the skills learned from the VGS to their current and future practice. One major advantage of the VGS is that it is online; open access allows students unlimited, repetitive opportunities to play the game at their convenience. Evidence suggests that student confidence levels increase with repeated simulation activities (Cummings & Connelly, 2016).

One weakness reported by students in both the surveys and the focus group interviews was the lack of user support, as they played individually online. Students were expected to read all the information on the opening Web page before accessing the VGS; however, there is no way to determine if that was done. A mandatory virtual tutorial would increase student preparedness and decrease the need for support throughout the VGS.

Our study focused on the perceptions of RPNs who have current professional nursing experience and supports other studies with prelicensure nursing students with limited clinical experience (Anderson, Page, & Wendorf, 2013; Duff et al., 2016; Verkuyl et al., 2017a,b; Verkuyl & Mastrilli, 2017). The participants found the VGS engaging, realistic, and applicable to their nursing education and practice. One recommendation would be to build on the RPN student's knowledge and experience and add a structured VGS debrief to further integrate their previous clinical experience, a step based on adult learning principles for regulated professionals (Curran, 2014).

The positive simulation design scale scores suggest the VGS included components fundamental to achieving positive learning outcomes (Groom, Henderson, & Sittner, 2014) and then heightened the experience by effective game esthetics. In summary, results suggest that the VGS design helped students work through Kolb's experiential learning cycle: the concrete game experience stimulated reflection, helped students gain new knowledge, and gave many students the confidence to apply new learning to their practice (Kolb et al., 2014).

Limitations

This study included a small convenience sample size from one institution, which limits the generalizability of data results. Repeating the study with a larger, multisite sample would be a useful next step. That said, the study identified key VGS design elements, which the literature suggests are essential for gaming simulation in a range of fields

(Bouvier et al., 2014). Further research is needed on the process of incorporating VGS into RPN to RN bridging nursing programs, the impact of repetitive play, and exploring the impact of VGS with debriefing as a way to enhance the learning experience for this bridging student population (Verkuyl, et al., 2017a,b).

Conclusion

Positive outcomes were reported with RPN to RN bridging students who used VGS as a learning activity. Key design elements such as storyline, control, and format contributed to a positive VGS experience supporting VGS as an effective way to enhance the clinical experience and promote learning outcomes. As educators, we need to ensure these design elements are present in future VGS.

Acknowledgment

Thanks to Eric MacMullin for the assistance in analyzing the focused group data.

The team thanks Centennial College's Scholarship of Teaching and Learning for funding this study.

References

Anderson, J. K., Page, A. M., & Wendorf, D. M. (2013). Avatar-assisted case studies. *Nurse Educator*, *38*(3), 106-109. https://doi.org/10.1097/NNE.0b013e31828dc260.

Bouvier, P., Lavoué, E., & Sehaba, K. (2014). Defining engagement and characterizing engaged- behaviors in digital gaming. *Simulation & Gaming*, *45*(4-5), 491-507. https://doi.org/10.1177/1046878114553571.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Cummings, C. L., & Connelly, L. K. (2016). Can nursing students' confidence levels increase with repeated simulation activities? *Nurse Education Today*, *36*, 419-421. https://doi.org/10.1016/j.nedt.2015.11.004.

Curran, M. K. (2014). Examination of the teaching styles of nursing professional development specialists, part I: Best practices in adult learning theory, curriculum development, and knowledge transfer. *Journal of Continuing Education in Nursing*, *45*(5), 233-240. https://doi.org/10.3928/00220124-20140417-04.

DeGagne, J. C., Oh, J., Kang, J., Vorderstrasse, A. A., & Johnson, C. (2013). Virtual worlds in nursing education: A synthesis of the literature. *Journal of Nursing Education*, *52*(7), 391-396. https://doi.org/10.3928/01484834-20130610-03.

Duff, E., Miller, L., & Bruce, J. (2016). Online virtual simulation and diagnostic reasoning: A scoping review. *Clinical Simulation in Nursing*, *12*(9), 377-384. https://doi.org/10.1016/j.ecns.2016.04.001.

Faiola, A., Newlon, C., Pfaff, M., & Smyslova, O. (2013). Correlating the effects of flow and telepresence in virtual worlds: Enhancing our understanding of user behavior in game-based learning. *Computers in Human Behaviour*, *29*(3), 1113-1121. https://doi.org/10.1016/j.chb.2012.10.003.

Farra, S., Miller, E., Timm, N., & Schafer, J. (2012). Improved training for disasters using 3-D virtual reality simulation. *Western Journal of Nursing Research*, *35*(5), 655-671. https://doi.org/10.1177/0193945912471735.

Groom, J. A., Henderson, D., & Sittner, B. J. (2014). NLN/Jeffries simulation framework state of the science project: Simulation design characteristics. *Clinical Simulation in Nursing*, *10*(7), 337-344. https://doi.org/10.1016/j.ecns.2013.02.004.

Guise, V., Chambers, M., & Välimäki, M. (2012). What can virtual patient simulation offer mental health nursing education? *Journal of Psychiatric and Mental Health Nursing*, *19*, 410-418. https://doi.org/10.1111/j.1365-2850.2011.01797.x.

Irwin, P., & Coutts, R. (2015). A systematic review of the experience of using second life in the education of undergraduate nurses. *Journal of Nursing Education*, *54*(10), 572-577. https://doi.org/10.3928/01484834-20150916-05.

Jeffries, P. R., & Rizzolo, M. A. (2006). Designing and implementing models for the innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study. Retrieved from http://www.nln.org/docs/default-source/professional-development-programs/read-the-nln-laerdal-project-summary-report-pdf.pdf?sfvrsn=0.

Johnsen, H., Fossum, M., Vivekananda-Schmidt, P., Fruhling, A., & Slettebø, Å. (2016). Teaching clinical reasoning and decision-making skills to nursing students: Design, development, and usability evaluation of a serious game. *International Journal of Medical Informatics*, *94*, 39-48. https://doi.org/10.1016/j.ijmedinf.2016.06.014.

Kapp, K. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*. San Francisco, CA: Pfeifer.

Kolb, A. Y., Kolb, D. A., Passerelli, A., & Sharma, G. (2014). On becoming an experiential educator: The educator role profile. *Simulation and Gaming*, *42*(2), 204-234. https://doi.org/10.1177/1046878114534383.

Liamputtong, P. (2011). *Focus Group Methodology: Principles and Practice*. Los Angeles, CA: Sage.

Muckler, V. C. (2017). Exploring suspension of disbelief during simulation-based learning. *Clinical Simulation in Nursing*, *13*(1), 3-9. https://doi.org/10.1016/j.ecns.2016.09.004.

Salkind, N. J. (2014). *Statistics for People Who Think They Hate Statistics* (5th ed.). Thousand Oaks, CA: Sage.

Schaffer, M., Tiffany, J., Kantack, K., & Anderson, L. (2016). Second Life virtual learning in public health nursing. *Journal of Nursing Education*, *55*(9), 536-540. https://doi.org/10.3928/01484834-20160816-09.

Ulrich, D., Farra, S., Smith, S., & Hodgson, E. (2014). The student experience using virtual reality simulation to teach decontamination. *Clinical Simulation in Nursing*, *10*(11), 546-553. https://doi.org/10.1016/j.ecns.2014.08.003.

Verkuyl, M., Hughes, M., Tsui, J., Betts, L., St-Amant, O., & Lapum, J. (2017a). Virtual gaming simulation in nursing education: A focus group study. *Journal of Nursing Education*, *56*(5), 274-280. https://doi.org/10.3928/01484834-20170421-04.

Verkuyl, M., & Mastrilli, P. (2017). Virtual simulations in nursing education: A scoping review. *Journal of Nursing & Health Sciences*, *3*(2), 39-47.

Verkuyl, M., Romaniuk, D., Atack, L., & Mastrilli, P. (2017b). Virtual gaming simulation for Nursing education: An experiment. *Clinical Simulation in Nursing*, *13*(5), 238-244. https://doi.org/10.1016/j.ecns.2017.02.004.

Verkuyl, M., Romaniuk, D., & Mastrilli, P. (2018). Virtual gaming simulation of a mental health assessment: A usability study. *Nurse Education in Practice*, *18*(31), 83-87. https://doi.org/10.1016/j.nepr.2018.05.007.