

The Effect of Deliberate Practice and Peer Mentoring on Baccalaureate Nursing Students'
Competence in Vital Signs, Breath Sounds, and Heart Sounds

Abstract

Background: Nursing students often do not have adequate opportunities to practice psychomotor skills within patient care settings, but skill decay can occur without regular practice.

Methods: A one-group, repeated-measures study (n=69) explored the effect of deliberate practice with peer mentoring on skill competence and retention in baccalaureate nursing students. Skill competence in vital signs, and auscultation of breath and heart sounds was measured using a task-specific checklist before, immediately after, and four months after a deliberate practice program with peer mentoring.

Results: Skill competence in vital signs significantly increased after deliberate practice. Skill competence in vital signs, and auscultation of breath and heart sounds did not significantly change four months after deliberate practice indicating skill retention.

Conclusions: This study suggests that the use of deliberate practice with peer mentoring may be an effective teaching strategy to enhance skill competence and retention; however more research is needed to support these findings.

Introduction

Nursing students often do not have adequate opportunities to practice and refine psychomotor skills within patient care settings due to busy clinical environments, nursing and faculty shortages, large classes, and limited clinical placement sites. Moreover, the focus on patient safety in today's healthcare environment affects student nurses' scope of practice and ability to perform skills in the clinical setting because inexperienced students increase risk of patient harm. Consequently, nursing students often do not receive adequate skill practice in the clinical setting to promote skill retention which can lead to skill decay over time (Oermann, Molloy, & Vaughn, 2015). This skill decay, plus concerns about inadequate clinical competence in graduate nurses (Liou, Chang, Tsai, & Cheng, 2013) necessitates consideration of innovative, evidence-based teaching strategies for supporting skill development and retention in nursing education (Gonzalez & Kardong-Edgren, 2017).

Background

Undergraduate nursing students may seem inadequately prepared when first entering clinical practica because of their inability to perform critical patient care skills confidently and competently in the clinical setting. Despite learning essential patient care skills during fundamental undergraduate nursing curriculum, skill competence can deteriorate rapidly after learning (Gonzalez & Kardong-Edgren, 2017; Oermann et al., 2011). Consequently, students who demonstrate initial mastery in basic nursing skills within the academic laboratory setting may not demonstrate the same level of competence when entering the clinical setting months or years later. Therefore, it is imperative that students not only demonstrate initial competence in psychomotor skills early in their undergraduate curriculum, but also retain such competence throughout their program of study and after graduation.

While academic laboratory skill assessments ensure skill competence at one time point (Clapper & Kardong-Edgren, 2012), after learning and being tested on skill competence in the academic setting, students often fail to further practice and refine their performance on these skills causing skill decay and an inadequate performance in the clinical setting (Ross, Bruderle, & Meakim, 2015). Consequently, it is imperative that nursing students have multiple, purposeful opportunities to practice skills throughout their curriculum to promote skill mastery and retention (Oermann et al., 2015).

Because of recommendations from professional nursing and healthcare organizations related to patient safety and healthcare professional education (AACN, 2008; IOM, 2003; IOM, 2010), the skill competence required for graduate nurses, and clinical faculty concerns at the site of data collection about student proficiency in basic nursing skills, faculty in the sophomore nursing courses at the study school determined that the traditional methods used to support skill acquisition needed to be enhanced to promote skill mastery and retention (Ross et al., 2015). The critical nursing skills of vital signs, and auscultation of breath and heart sounds were selected because of their complexity, high frequency of use in the clinical setting (Oermann, 2011), and clinical faculty concerns about students' inability to adequately perform these specific skills throughout the undergraduate clinical rotations (Ross et al., 2015). Deliberate practice and peer mentoring, as active, student-centered teaching strategies, were selected to support the skill mastery and retention of vital signs, and auscultation of breath and heart sounds (Ross et al., 2015).

Deliberate Practice

Deliberate practice is cited in the literature as one solution to address the lack of sustained skill competence in undergraduate nursing students (Chee, 2014; Clapper & Kardong-

Edgren, 2012; Gonzalez & Kardong-Edgren, 2017). As an active, student-centered teaching strategy, the process of deliberate practice incorporates repetitive performance of motor skills followed by immediate individualized feedback with the goal of skill mastery (Gonzalez & Kardong-Edgren, 2017). This repetitive practice fosters development of the motor as well as cognitive components of a skill leading to full proficiency and, ultimately, mastery (Chee, 2014; Oermann, 2011).

Peer Mentoring

As identified above, a crucial component of deliberate practice is individualized feedback (Gonzalez & Kardong-Edgren, 2017). Peer mentoring offers a method to provide personalized feedback to students during deliberate practice while fostering peer interactions and without increasing faculty workload. During mentoring, a more experienced individual (mentor) helps to foster increased knowledge and skills in a less experienced individual (mentee) (Dorsey & Baker, 2004). In peer mentoring, more experienced students are paired with novice students which promotes a student-centered approach to learning and professional development through increased student interactions and collegial role modeling (Dorsey & Baker, 2004; Giordana & Wedin, 2010).

Review of Literature

Though medical education has demonstrated that deliberate practice supports mastery and retention of skills (Arthur, Bennett, Stanush and McNelly, 1998; McGaghie, Issenberg, Petrusa, & Scalese, 2010; McGaghie, Issenberg, Cohen, Barsuk, & Wayne, 2011), there is a dearth of empirical evidence within the nursing education literature to support the relationship between deliberate practice and skill competence (Clapper & Kardong-Edgren, 2012; Oermann et al., 2011). In 2011, Oermann, et al. reported that nursing students who completed six minutes of

deliberate practice of cardiopulmonary (CPR) skills every month had significantly better CPR skill retention than those who did not. In 2013, Liou et al. identified that nursing students who engaged in deliberate practice of skills had a significantly higher post-test skill competence as compared to those that did not.

Research indicates that peer mentoring programs create a positive learning environment while increasing learner confidence, reducing anxiety, and improving student retention rates (Colalillo, 2007; Dennison, 2010; Dorsey & Baker, 2004; Giordana & Wedin, 2010). In addition to these values for the learner, peer mentors also reap the benefits from involvement in the peer mentoring process. Through the peer mentoring process, mentors act as role models, foster leadership skills, augment their own knowledge and skills, network, and enjoy the personal satisfaction and reward in helping others (Dorsey & Baker, 2004; Giordana & Wedin, 2010; Ross et al., 2015).

The limited nursing education research related to peer mentoring is primarily qualitative in nature and explores peer mentoring only in the clinical setting. In 2004, Sprengel and Job reported that benefits of peer mentoring in the clinical setting for both mentor and mentee included decreased anxiety and confusion, and increased student responsibility and active learning. Likewise, Giordana and Wedin (2010) identified that both mentors and mentees perceived that a clinically-based peer mentoring experience was positive. Mentees identified decreased anxiety, increased confidence, and less intimidation when working with peer mentors (Giordana & Wedin, 2010). No academic-based peer mentoring research studies are currently available in the nursing education literature.

Furthermore, there are currently no available studies within the nursing education literature exploring the effect of combining the strategies of deliberate practice and peer

mentoring on skill competence and retention. The primary aim of this study was to address this gap in the nursing education literature by exploring the effect of a combination of deliberate practice and peer mentoring on critical skill competence and retention.

Theoretical Framework

As a leading pioneer of deliberate practice, Ericsson's Theory of Expertise provides an appropriate framework for deliberate practice and peer mentoring activities. Ericsson purports that deliberate practice is the most fundamental element that contributes to expert performance. Practice that is deliberate must incorporate and build upon previous knowledge in a purposeful, concentrated way. Ericsson identifies that the quantity of deliberate practice is directly related to performance level; therefore with increased deliberate practice, performance will improve towards the mastery or expert level (Ericsson, 2008; Ericsson & Charness, 1994; Ericsson, Krampe, & Tesch-Romer, 1993).

Feedback is a crucial component of deliberate practice since immediate, constructive feedback is necessary to allow the student to enhance his or her performance and guide further individual practice (Ericsson et al., 1993). Because of the importance of feedback, the role of the teacher within deliberate practice is essential. The instructor establishes guidelines for deliberate practice schedules, explains the evidence-based rationale, monitors performance, and offers feedback for improvement (Ericsson, 2008; Ericsson & Charness, 1994; Ericsson et al., 1993). In peer mentoring, peer mentors assume the role of instructor and provide feedback and support to students during their deliberate practice sessions. (Giordana & Wedin, 2010)

Methods

Purpose of Study

The purposes of this one-group, repeated measures, pre-test/post-test study were to determine the effect of deliberate practice and peer mentoring on baccalaureate nursing students competence in, and retention of, vital signs assessment, auscultating breath sounds, and auscultating heart sounds.

Research Questions

This research study addressed the following research questions: 1) Do deliberate practice and peer mentoring increase competence in vital signs assessment in baccalaureate nursing students? 2) Do deliberate practice and peer mentoring increase competence in auscultation of breath sounds in baccalaureate nursing students? 3) Do deliberate practice and peer mentoring increase competence in auscultation of heart sounds in baccalaureate nursing students? 4) Do baccalaureate nursing students retain competence in vital signs assessment four months after deliberate practice and peer mentoring? 5) Do baccalaureate nursing students retain competence in auscultation of breath sounds four months after deliberate practice and peer mentoring? 6) Do baccalaureate nursing students retain competence in auscultation of heart sounds four months after deliberate practice and peer mentoring?

Sample

Following Institutional Review Board (IRB) approval, a convenience sample of sophomore baccalaureate nursing students enrolled in a Health Assessment course in a mid-sized, private, Catholic university in the mid-Atlantic region of the United States (U.S.) was recruited to participate in this study (n=69). Students were invited to participate in the study during class by the Principle Investigator (PI) who was not a faculty member in the course. All participants completed a written consent to participate. Students were informed that while

participation in all deliberate practice and peer mentoring activities related to the curriculum was mandatory, participation in the study by completing the pre and post-tests was voluntary and participation would not affect their course grades. All collected data was coded with a participant-selected number to ensure confidentiality.

Four males (6%) and 63 females (92%) participated in the study (two individuals did not identify gender on the demographic data form). This sample was somewhat under-representative of males since approximately nine percent of all nurses in the U.S. are male (U.S. Census Bureau, 2013). Most participants were 19 years old ($n=55$, 80%) with an age range from 19 to 21 ($\mu= 19.21$). The subjects in the sample were strong academic students with 61 (88%) having a grade point average of 3.0 or higher on a 4.0 scale. The majority of participants ($n=53$, 77%) indicated they did not have experience practicing vital signs, breath sounds, or heart sounds outside of the nursing curriculum.

Instrumentation

As identified above, the nursing skills selected for this study were vital signs, auscultation of breath sounds, and auscultation of heart sounds. As standard nursing assessments, these skills all have pre-established criteria for competency. Task-specific checklists offer structured guidelines of the proper sequence of steps for psychomotor skills; they are easy to use and allow for objective evaluation and measurement of psychomotor skill competency (Lammers et al., 2008). Existing research supports the use of task-specific checklists as an appropriate method of data collection for competence in psychomotor skills.

For this study, the PI created a checklist for each skill (vital signs, auscultation of breath sounds, and auscultation of heart sounds) utilizing existing checklists from the nursing textbooks used at the site of data collection. Deriving the study instruments from the existing textbooks

provided consistency between the readings, lecture, guided laboratory practice, and evaluation criteria. The exact textbook checklists were not used as data collection instruments to allow for deletion of redundancies and steps that were not applicable in the laboratory setting. The researcher-developed checklists provided logical step-by-step directions for performing each skill. There were 33 steps in the vital signs checklist, 10 in the auscultation of breath sounds checklist, and 6 in the auscultation of heart sounds checklist. Each step was scored as “yes” (1 point) or “no” (0 points). Subjects that completed all required components of a step using recommended practice were scored with a “yes” while subjects that either did not complete a step, did not perform a component of a step, or did not use recommended practice were scored with a “no.” Scores for each participant on each skill were computed by totaling the number of points earned on each skill checklist.

Content validity of all three checklists was established by having four seasoned Essentials of Nursing Practice instructors review the checklists for content. The vital signs checklist had a scale-level content validity index (S-CVI) of 0.99 and the auscultation of breath sounds and auscultation of heart sounds checklists each had S-CVIs of 1. A scale-level CVI of 0.9 or higher is considered excellent (Polit & Beck, 2006).

Data Collection

All data were collected by trained Research Assistants (RAs) using the task-specific checklists created by the PI. Research Assistants were either doctoral (PhD) students or masters’ (MSN) students in the nursing education or acute-care nurse practitioner tracks in the College of Nursing at the University where data was collected. All RAs were Registered Nurses (RNs) licensed in the U.S. Multiple RAs were recruited because of the need to collect data on several subjects simultaneously during laboratory sessions. All RAs were trained by the PI in the use of

all data collection tools. To ensure inter-rater reliability, two RAs rated each pre-test and the results were evaluated for inter-rater reliability. Inter-rater reliability for all the data collection instruments was excellent (0.81 to 0.983).

Procedure

Traditional four-year sophomore baccalaureate nursing students were recruited to participate in the study during their third semester of the eight semester undergraduate nursing program. Prior to recruitment, all participants received usual, standard training for vital signs, and auscultation of breath and heart sounds, which included textbook readings, audiovisuals, didactic lecture, and guided learning laboratory skills practice in the Simulation and Learning Resource Center (SLRC). Participants were pre-tested on competency in vital signs and auscultation of breath and heart sounds in the SLRC under standard learning laboratory conditions using standardized patients (SPs) during their Practicum in Health Assessment laboratory final exam in November or December of their third semester of the program.

Following standard skill training and pre-test, all subjects participated in a program of deliberate practice with peer mentoring in the SLRC as part of their Practicum in Essentials of Nursing Practice laboratory course during the following semester (semester four of the program). Students self-selected deliberate practice groups of three to work with throughout the semester. During two of the scheduled Practicum in Essentials of Nursing Practice laboratory sessions, students worked with their deliberate practice groups to practice vital signs and auscultation of breath and heart sounds with faculty guidance. Students used their skill checklists to provide immediate feedback to each other during these sessions.

Additionally, students practiced vital signs, and auscultation of breath and heart sounds outside of class twice with upperclassman peer mentors in the SLRC. The peer mentors were

junior and senior nursing students who had demonstrated mastery of the selected skills in the clinical and laboratory setting. Peer mentors must have recommendations from clinical or laboratory faculty to work in the peer mentor role. Peer mentors offered immediate feedback and constructive criticism of the students' performance of the skills during the sessions (Ross et al., 2015).

All participants were post-tested on competence in vital signs, and auscultation of breath and heart sounds under standard learning laboratory conditions in the SLRC at the end of their Practicum in Essentials of Nursing Practice course (in April of their fourth semester of the program) (post-test one) to determine change in skill competence based on the deliberate practice and peer mentoring intervention. Additionally, all participants were post-tested on competence in vital signs, and auscultation of breath and heart sounds under standard learning laboratory conditions in the SLRC four months later on the first day of the fall semester (semester five of the program) (post-test two) in their Practicum in Nursing Care of Adults and Older Adults course to determine skill retention.

Data Analysis

Descriptive statistics were used to describe the sample. Differences in the mean scores of each task-specific checklist from pre-test to post-test one were analyzed using Analysis of Variance (ANOVA) to determine the effect of deliberate practice and peer mentoring on skill competence. Differences in the mean scores of each task-specific checklist from post-test one to post-test two were analyzed using ANOVA to determine skill retention.

Results

There was a statistically significant increase in vital signs competence from pre-test to post-test one [$F(2, 62) = 10.353, p = 0.001$], indicating that deliberate practice and peer mentoring

improved vital sign competence. There was no statistically significant difference in vital signs competence from post-test one to post-test two [$F(2,62)= 10.353, p= 0.964$], suggesting that vital signs skill competence was retained over four months' time. There was no statistically significant difference in auscultation of breath sounds competence [$F(2,64)= 2.263, p= 0.929$] or auscultation of heart sounds competence [$F(2,62)= 0.541, p= 1$] from pre-test to post-test one indicating that deliberate practice and peer mentoring did not affect competence in auscultating breath or heart sounds. There was also no statistically significant difference in auscultation of breath sounds competence [$F(2,64)= 2.263, p= 0.199$] or auscultation of heart sounds competence [$F(2,62)= 0.541, p= 0.975$] between post-test one and post-test two indicating that competence in the skills of auscultating breath and heart sounds were retained over four months' time.

Discussion

There is a dearth of nursing education research exploring the use of deliberate practice and peer mentoring to support skill development and retention in undergraduate nursing students. In its current guidelines for nursing education research, the National League for Nursing (NLN) supports the need for nursing education research that will “build the science of nursing education through the discovery and translation of innovative evidence-based strategies” (NLN, 2016, p. 2). The current study, the first to explore a program that combined deliberate practice with peer mentoring in nursing education, attempted to address this gap in the nursing education literature to evaluate the impact of a program of deliberate practice and peer mentoring on nursing student outcomes (NLN, 2016).

The results from this study demonstrate that deliberate practice coupled with peer mentoring show promise as teaching strategies to support skill mastery and retention in

undergraduate nursing students. However, due to the one-group design and relatively small sample size, further research is needed to fully support the use of deliberate practice and peer mentoring for skill competence and retention. The findings from this study align with the existing literature that deliberate practice enhances skill mastery and retention (Arthur et al., 1998; Liou et al., 2013; McGaghie et al., 2010; McGaghie et al., 2011; Oermann, 2011).

Although not a formal part of the study, peer mentors also provided anecdotal feedback about the peer mentoring experience. Junior and senior undergraduate peer mentors enjoyed working with sophomore nursing students and felt adequately prepared in their role through orientation and personal skills review. Peer mentors noticed that the sophomore nursing students appeared at ease working with upperclassman students with whom they could relate. This allowed for a relaxed practice environment where the upperclassman peer mentors could act as role models and share their personal experiences (Ross et al., 2015).

Limitations

The major limitation of this study was the one-group design with a lack of a control group for comparison to determine causation. The PI acknowledges that a two-group design with an experimental group and a control group would be a more rigorous research design, however due to curricular implementation of deliberate practice and peer mentoring, a control group could not be secured at the site of data collection. Due to curricular variations, the PI felt that obtaining a control group from another college of nursing would not produce the most accurate results because of multiple confounding variables including variations in teaching strategies and course progression.

There is also the possibility that students could have practiced any psychomotor skills on their own outside of the parameters of the course requirements meaning that they could have

practiced the study skills more than the required number of times. This is a limitation of the study since this was a confounding variable that was not controlled. However, the majority of participants identified that they had not practiced vital signs assessment or breath and heart sound auscultation outside of the curricular requirements.

Another limitation of this study is generalizability. First, the sample was from a single site which limits generalizability. The homogeneous age and gender of the sample also limits generalizability. Ethnic background was not collected as part of the demographic data which limited the description of the sample and thus limits generalizability.

Implications

Nurse competence and patient safety. A primary goal for nursing education is to produce safe, competent graduate nurses. Competence in nursing requires the ability to meet standards of practice and safely apply knowledge and skills during patient care. Because of the current emphasis on patient safety in today's healthcare environment, it is imperative that nurse educators prepare proficient graduates that can safely provide all aspects of patient care including proficient skill mastery. However, skill decay occurs quickly without repetitive practice (Oermann et al., 2011; Gonzalez & Kardong-Edgren, 2017) because nursing students do not have sufficient opportunities to practice skills in the clinical setting (Oermann et al., 2015). The findings from this study suggest that the use of deliberate practice with peer mentoring within an academic laboratory environment may be an effective teaching strategy to foster skill competence and retention, thus promoting patient safety in the clinical setting through student and graduate nurse competence.

Evidence-based teaching strategies. In 2005, the NLN issued a position statement highlighting the importance of evidence-based nursing education. The call from the

NLN charges nurse educators to implement innovative educational strategies that are supported by research. Deliberate practice and peer mentoring are innovative, active, student-centered teaching strategies that are applicable to skill mastery and retention in nursing education. However, the limited empirical research supporting the use of deliberate practice and peer mentoring to support skill mastery and retention in nursing education suggests the need for more nursing education research to support these teaching strategies as evidence-based to advance the science of nursing education. The findings from the current study help to address this gap in the literature.

Recommendations for Future Research

Because of the limited support for deliberate practice and peer mentoring in the nursing education literature, more research is needed related to the effect of deliberate practice and peer mentoring on undergraduate nursing students' skill competence and retention. Specifically, in order to expand the generalizability of the current study, this study should be replicated with a larger sample and at multiple sites. Moreover, replication of this study with a control group for comparison would provide causation for the findings. Skill retention should be explored more longitudinally by looking at skill competence later in the nursing program as well as after graduation. More varied psychomotor skills, including frequently performed skills as well as less commonly used skills, should be assessed to more comprehensively determine the effect of deliberate practice and peer mentoring on motor skill attainment and retention.

Conclusion

Given the focus of the current U.S. healthcare system on patient safety, limited opportunities for psychomotor skill practice in the clinical setting, and the call by national organizations such as the IOM (2003) to reform healthcare professional education, it is imperative that nurse educators incorporate strategies to enhance skill mastery and skill retention

in pre-licensure nursing education. The current study suggests that deliberate practice coupled with peer mentoring may be an effective teaching strategy to enhance skill competence in vital signs assessment, and skill retention of vital signs, and auscultation of breath and heart sounds in baccalaureate nursing students. More research is needed to increase the generalizability of the current study and further explore the effect of deliberate practice and peer mentoring on skill mastery and retention in undergraduate nursing students.

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