Using Screen-Based Virtual Simulation in Family Nurse Practitioner Education

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Study Purpose

- Funded 2020-2022

- Test the effects of using screen-based virtual simulation on attaining mastery of concepts in the domains of:

  - assessment, diagnosis, treatment, and evaluation

  - across the populations of pediatrics, adults, and geriatrics

Need for the Study

- Lack of clinical sites
- Lack of preceptors
- Pandemic interrupted clinical experiences
- Variability and lack of experiences > inequitable learning environments
- Dreifuerst & McNelis study

National Study of Clinical Education in FNP Programs

- 2016-2018: Funded by National Council of State Boards of Nursing

- Study purpose: develop an in-depth understanding of FNP students' clinical experiences (practice activities and cognitive work) that occur during clinical education

- Sample: 3946 FNP students

Findings

- 84 specific tasks: assessment, diagnosis, treatment, and evaluation in adult, geriatric, and pediatric clients

- common tasks students reported **never** experiencing
  - mental health assessment *
  - ordering diagnostic tests
  - performing primary care procedures
  - evaluating treatment and educational outcomes related to chronic pain

Simulation Study

- Evaluated the use of 70 hours of screen-based virtual clinical simulation experiences compared to 70 hours of traditional precepted clinical experiences on mastery of assessment, diagnosis, treatment, and evaluation in pediatrics, adults and geriatrics.

Research Questions

1. Are there differences in improvement scores on domain and population between the groups from pre-test to post-test as measured by performance on the FNP diagnostic readiness test?

2. Are there differences in likelihood of attaining proficiency in domain (assessment, diagnosis, treatment, evaluation) and population (pediatrics, adults, geriatrics) between experimental and control groups at post-test on the FNP diagnostic readiness test?

Methods

- Quasi-experimental/pre-post design
- Enrolled after completing 500 hours
- 5-week intervention of screen-based virtual simulation (5 cases/week with 2-hour debriefing)
  - 25 patient cases: 40% peds/adolescents, 20% adult, 40% gero
  - Increasing level of difficulty/complexity

Measures

- Diagnostic Readiness Test: a 100-item online exam assessing mastery of concepts in the FNP specialty
  - administered 1 week prior to intervention and 1 week after for both groups

Results

Sample

- Experimental group: 98/Control group: 80
- Age: Range 23-56 years, Mean = 33.9 (7.5)
- Gender: 162 female (91%), 15 male (8.4%)
- Highest Degree in Nursing: 161 Bachelors (90%), 16 Masters (9%)
- Race: 114 White (67%), 29 Asian (17%), 19 Black (11%)
- Ethnicity: 154 Not Hispanic or Latino (86.5%)

Research Question 1

- Are there differences in improvement scores on domain and population between the groups from pre-test to post-test as measured by performance on the FNP diagnostic readiness test?

Change in DRT domain scores from pre to post

Measure	Pre Mean (SD)	Post Mean (SD)	Change Mean (SD)	p-value	Effect size*
DRT Domains					
Assessment				.61	0.07
Control (n=65)	64.5 (9.1)	69.0 (10.8)	+ 4.5 (12.4)		
Exptl (n=95)	63.9 (9.4)	69.7 (11.9)	+ 5.8 (13.3)		
Diagnosis				.76	0.04
Control (n=65)	62.7 (13.1)	71.0 (11.6)	+ 8.3 (17.2)		
Exptl (n=95)	62.5 (12.3)	71.6 (13.5)	+ 9.1 (14.7)		
Manage/Treat	63.5 (8.8)	72.6 (10.7)	+ 9.1 (13.1)	.73	0.05
Control (n=65)	65.9 (9.3)	73.9 (11.2)	+ 8.0 (11.6)		
Intervention (n=32)					
Lab/Diagnostic				.18	**0.18**
Control (n =65)	57.9 (13.1)	65.5 (13.8)	+ 7.6 (15.7)		
Exptl (n=95)	58.2 (12.7)	68.5 (14.3)	+ 10.2 (15.8)		

Change in DRT population scores from pre to post

Measure	Pre Mean (SD)	Post Mean (SD)	Change Mean (SD)	*p*-value	Effect size*
DRT Populations					
Pediatric					
Control (n=65)	59.3 (9.5)	68.2 (11.8)	+ 8.9 (14.1)	.50	0.09
Exptl (n=95)	60.4 (10.4)	69.7 (11.7)	+ 9.3 (13.8)		
Adolescent					
Control (n=65)	71.7 (15.4)	87.1 (15.2)	+ 15.4 (16.5)	.01	-0.33
Exptl (n=95)	74.1 (15.4)	81.5 (17.6)	+ 7.4 (20.2)		
Adult					
Control (n=65)	62.6 (8.7)	68.6 (9.5)	+ 6.0 (10.3)	.35	0.13
Exptl (n=95)	62.4 (9.3)	70.0 (11.0)	+ 7.6 (11.4)		
Geriatric					
Control (n=65)	39.6 (21.4)	56.4 (31.8)	+ 26.8 (38.0)	.85	-0.03
Intervention (n=32)	34.2 (22.1)	56.2 (31.7)	+ 22.0 (35.5)		

Research Question 2

- Are there differences in likelihood of attaining proficiency in domain (assessment, diagnosis, treatment, evaluation) and population (pediatrics, adults, geriatrics) between experimental and control groups at post-test on the FNP diagnostic readiness test?
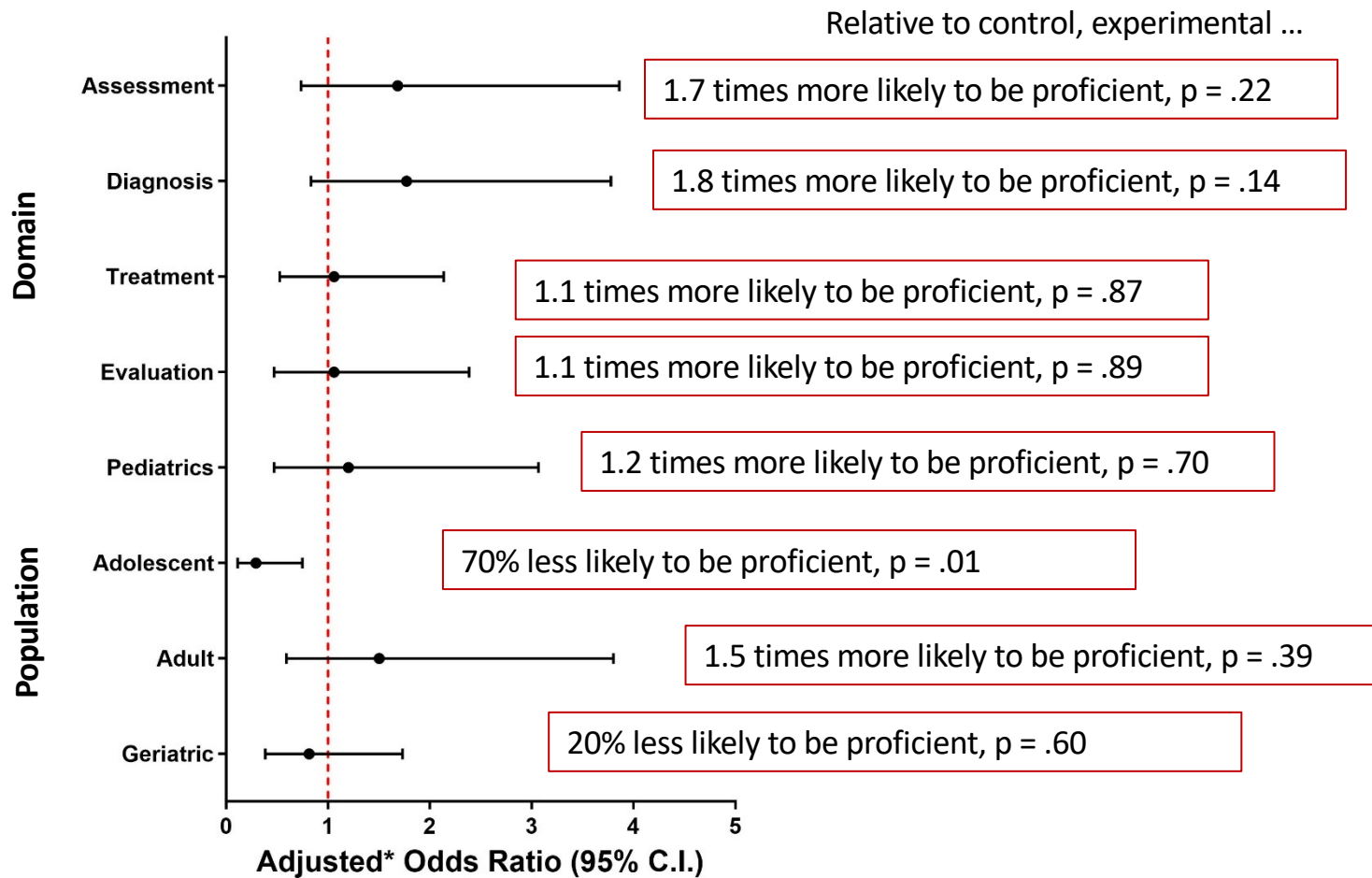
Discussion

- No evidence that simulation is less effective than traditional clinical in mastering the 4 domains of assessment, diagnosis, evaluation, and treatment or in caring for the populations of pediatric/adolescent, adult, and geriatric populations

  - No differences between groups
  - Both improved over time

Conclusion

- Screen-based virtual simulation as a substitute

- Equitable

- Standardized/consistent learning environment

- Simulation data > competency assessment

Policy/Regulation Implications

- Need breadth and depth in domains and populations
- 🚫 assumptions about traditional clinical setting
- Programs need valid & reliable competency assessments
- Competency assessment: cognitive & performance testing
- Simulation should be allowed/advocated by BON to prepare safe and competent practitioners

Publications from first study

- McNelis, A. M., Dreifuerst, K. T., Beebe, S. L., &. Spurlock, D. (2021). Types, frequency, and depth of direct patient care experiences of Family Nurse Practitioner students in the United States. Journal of Nursing Regulation, 12(1), 19-27.

- McKague, D. K., Beebe, S. L. McNelis, A. M., & Dreifuerst, K. T. (2021). Lack of pediatric mental health clinical experiences among FNP students. Archives of Psychiatric Nursing, 35(3), 267-270. https://doi.org/10.1016/j.apnu.2021.03.008

- McNelis, A.M., Dreifuerst, K.T., & Beebe, S.L. (2023). The interface of social media recruitment and nursing education research. Computers, Informatics, Nursing, 1(7):491-496: DOI: 10.1097/CIN.0000000000001002

Questions

- Thank you to NCSBN for supporting this work