



White Paper

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# 2022 Scientific Evidence for Elsevier HESI<sup>®</sup> RN and HESI<sup>®</sup> APRN Exams



# 2022 SCIENTIFIC EVIDENCE FOR ELSEVIER HESI RN AND HESI APRN EXAMS

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## INTRODUCTION

Preparing practice-ready nursing graduates has never been more critical. This holds true for those entering the profession for the first time and those transitioning into advanced nursing roles. Nursing faculty rely on evidence-based resources to enhance the extensive nursing curricula provided within time constraints, and outcomes of faculty work are often measured through student performance. Resources used to enhance teaching-learning processes and to evaluate teaching-learning outcomes need to be based on scientific evidence. This paper provides a focused review of evidence surrounding Elsevier HESI® Registered Nurse (RN) and Advanced Practice Registered Nurse (APRN) Exams used as resources within and across nursing programs. These exams are used in teaching-learning processes and can evaluate teaching-learning outcomes.

The research examined in this review came from a variety of peer-reviewed sources. Journal articles and reports were culled from scientific research databases (e.g., CINAHL and Medline) and repositories of scientific information, doctoral projects, and dissertations (e.g., ProQuest). Studies were selected if they addressed the predictive validity of HESI RN or HESI APRN exams. Furthermore, research from prelicensure undergraduate and graduate-entry registered nursing programs as well as post-licensure programs preparing nurse practitioners were sought.

The results provided in this paper demonstrate the current predictive validity of HESI RN and HESI APRN materials. Following the overview of HESI materials, a summary of findings is provided first for the HESI RN Specialty Exams, followed by the HESI RN Exit Exam (E2). The research team has identified factors or program policies present in the literature that may influence the predictive validity of the E2. HESI APRN Specialty Core Exam results are highlighted before those from the APRN End-of-Program Exit Exams. Policies relevant to graduate/doctoral education are summarized, as well as implications of the findings and suggestions for future research.

## OVERVIEW OF HESI RN AND HESI APRN EXAMS

HESI exams are updated regularly to reflect current evidence that supports nursing practice and testing practices of national councils or boards administering licensure exams. Most HESI exams come in multiple versions used when a repeated measurement is needed. Additional versions of the exam allow for more valid retesting than using the same exam multiple times.

Several **HESI RN Specialty Exams** are available for use in entry-level nursing programs that measure mastery of unique course material. Specialty exams used early in the curriculum include Dosage Calculations, Fundamentals, Health Assessment, Nutrition, Pathophysiology, and Pharmacology. Those targeted for more advanced courses include Community Health, Critical Care, Gerontology, Management, Management/Community Health, Maternity Nursing, Maternity/Pediatrics, Medical-Surgical, Pediatric Nursing, Psychiatric/Mental Health, and Research. Providing a standardized end-of-course assessment suitable to incorporate into a course score, faculty may use these exams to re-evaluate specialty content knowledge if needed at the end of a program of study. Scores on each specialty exam are determined from 50 scored items. Reliability of specialty exams is reported with KR20 values between 0.92 to 0.98 (Vesey & Brunnert, 2019).

The **HESI RN Exit Exam (E2)** aligns with the NCLEX® test plan for both Client Needs (Safe and Effective Care Environment, Health Promotion and Maintenance, Psychosocial Integrity, Physiological Adaptation) and Integrated Processes (Nursing Process, Caring, Communication and Documentation, Teaching/Learning, Culture and Spirituality). Varied item-response formats on the E2 simulate those students will have on the NCLEX-RN. These may include multiple response, fill-in-the-blank, ordered response, chart-related items, and hot spot items. Test items are application-oriented and generally reflect higher cognitive domains of learning (Anderson & Krathwohl, 2001). The E2 provides a barometer of comprehensive nursing knowledge acquired across the nursing curriculum and serves as a predictor of readiness to pass the NCLEX-RN. Scores on the E2 come from 150 exam items; average internal consistency is 0.90 (KR20; Vesey & Brunnert, 2019).

In addition to the above, HESI provides several exams to support the advanced preparation of graduate-level nurses. They are appropriate for prelicensure graduate-entry programs or post-licensure programs preparing RNs at the graduate or clinical doctorate/DNP-level. The exams can be divided into two categories — one focusing on core graduate-level advanced practice specialty nursing courses and an exit exam focusing on cumulative knowledge needed at the end of the program in preparation for certification exams.

**HESI APRN Core Course Assessments/Specialty Exams** provide a standardized outcome measure of knowledge used within specialty advanced practice courses. The Advanced Pathophysiology Exam assesses general pathophysiologic knowledge needed across the human lifespan. The Advanced Pharmacotherapeutics Exam evaluates the student's understanding across broad categories of drugs and therapeutic agents. Lastly, the Advanced Physical Assessment Exam evaluates cognitive knowledge of human systems and advanced assessment techniques and approaches. Each specialty exam provides a score from 50 items.

There are three **HESI APRN End-of-Program/Exit Exams** to provide an evaluation of a student's cumulative body of knowledge in advanced nursing domains; these domains align with areas mapped to certification licensing exams. There is one Family Nurse Practitioner Exit Exam, and two Adult-Gerontology Exams depending on the expected NP setting (Primary or Acute Care). All End-of-Program Exams are comprised of 100 items; reliability estimates (KR20) of .91 to .92 have been reported (Willson et al., 2018).

## RESULTS

### HESI RN Specialty Exams

Ten sources addressed the utility and predictive validity of HESI Specialty Exams. Although the exams are used in different ways, three trends were clear:

1. Specialty exam use was positively related to E2 scores. Thus, students scoring more highly on specialty exams were more likely to score highly on the E2. This was noted for exams used early in the nursing curriculum<sup>1</sup> (Hansen, 2017; Johnson et al., 2017; Johnson et al., 2020) and those used later toward the end of the curriculum<sup>2</sup> (Johnson et al., 2017; Johnson et al., 2020; Moore et al., 2021; Zweighaft, 2013).
2. Students with multiple exposures to specialty exams across the nursing curriculum rather than in a select few courses have higher E2 scores (Gouveia et al., 2021; Homard, 2013; Sportsman, 2020). Researchers suggested the process of completing several standardized exams in a proctored electronic format helped prepare students for electronic and secured submission of their licensing exam (Gouveia et al., 2021; Homard, 2013; Moore et al., 2021).
3. Students scoring more highly on specialty exams are more likely to pass the NCLEX-RN exam on their first attempt. While this was often reported for specialty exams used later in a nursing curriculum, the trend was connected to those used early as well (Kim et al., 2019; Zweighaft, 2013; Zweighaft, 2017).

<sup>1</sup> Early program specialty exams include Fundamentals, Dosage Calculations, Health Assessment, Pathophysiology, and Pharmacology.

<sup>2</sup> Advanced specialty exams include Medical-Surgical, Critical Care, Pediatrics, and Obstetrics.

### HESI RN Exit Exam (E2)

The predictive validity of the HESI RN E2 has been reported for more than 20 years. While many factors may influence a student's ability to pass the NCLEX-RN, scores on the E2 repeatedly demonstrate a significant relationship with first-time NCLEX outcomes. This finding is noted in seven single-program studies (Cobbett et al., 2016; Czekanski et al., 2018; Havrilla et al., 2018; Homard, 2013; Johnson et al., 2017; Kim et al., 2019; March & Ambrose, 2010) as well as 13 multi-site studies (see Table 1) evaluating predictive validity. As noted in Table 1, predictive validity was substantial for students scoring between 850-899 and higher still for those with scores >900. The E2 was also used to identify areas of student strength, areas where improvement was needed, and provide evidence of a program's preparation of graduates (Dreher et al., 2019).

Table 1 reflects cumulative standardized RN results across national studies. Only verifiable RN data is presented. The study sample size (N) reported was often different than the sample size in reported scoring brackets (n); thus, these sample size differences are noted. While the test structure has remained stable over time, scoring guidelines have been updated. As product analytics have advanced, discernment concerning validity at diverse scoring intervals has increased. Predictive validity according to scoring bracket is noted in Table 1.

**Table 1: Predictive Validity of the HESI RN E2 with First-Time Passing of the NCLEX-RN**

Authors	Data Year	N	% Predictive Validity Reported	% Predictive Validity Scores ≥ 900 n=subsample	% Predictive Validity Scores 850-899 n=subsample
Lauchner et al., 1999	1996-97	2555	97.3 n=1248		
Newman et al., 2000	1997-98	2657	97.4 n=1385		
Nibert & Young, 2001	1998-99	5588	97.6 n=2206		
Nibert et al., 2002	1999-2000	5903	98.3	98.3 n=2059	94.1 n=1014
Lewis, 2005	2001-02	9695	97.8	97.8 n=2714	96.0 n=1300
Adamson & Britt, 2009	2004	10147	96.4	94.7 n=5537	
Young & Willson, 2012	2006-07	4383	99.2	97.4 n=1102	
Langford & Young, 2013	2007-08	3758	98.3 n=1132	96.6 n=1487	92.4 n=721
Zweighaft, 2013	2008-09	3790	96.6	96.6 n=1326	
Barton et al., 2014	2009-10	5038	98.3	98.3 n=2084	95.1 n=879
Zweighaft, 2017	2010-11	8463	98.2	98.2 n=447	96.3 n=163
Greene et al., 2018	2014-16	2981 <sup>3</sup>		96.4	90.1
Shah et al., in press <sup>4</sup>	2018-19	3686	96.3	97.3 n=1770	93.8 n=680

<sup>3</sup> Validity 12 RN summary (2018, March 12). [Sample size from unpublished data]. Elsevier.

<sup>4</sup> For E2 scores greater than or equal to 850, predictive validity was reported at 96.3% (n=2450).

## RN Program Policies

Various factors may influence student performance on standardized exams. Several researchers suggest that policies to enhance exam performance are essential, but some flexibility regarding outcomes needs to be considered (Stonecypher et al., 2015). Most recently, exam use and reporting have supported the philosophy of ‘continuous quality improvement’ (Olsen et al., 2021; Stonecypher et al., 2015). Most policy-related research centers around the E2; generalizability to HESI Specialty Exams is underexplored. While additional studies are needed, the review of relevant literature provided several insights.

### *Preparation Policies*

- HESI practice exams and the use of supplemental teaching resources are frequently recommended preparation strategies. Most schools provide a menu of options that students use to self-guide their exam preparation (Barton et al., 2014). These may be supported by faculty-led preparatory practices, such as individual or group reviews.
- Schools that have exam preparation policies report higher E2 scores and NCLEX-RN pass rates than schools not having specific preparation policies (Shah et al., in press). The most effective preparation policies include specialty exam content review, exam practice tests, case studies, adaptive quizzing, and NCLEX review materials (Shah et al., in press).
- Innovative preparation policies included pretesting as part of a formative assessment process. This is followed by a summative assessment at the end of a program. In these cases, alternate versions of the exams are used to ensure students have exposure to new test items to measure performance improvement at the end of the course (Stonecypher et al., 2015). As some students with the opportunity to retest may not engage in significant initial exam preparation, one innovative strategy was to celebrate “First-Time Pass” as an incentive to boost initial student preparation.

### *Use of HESI Exams Within and Across Courses*

- Specialty exam use is related to higher E2 scores (Gillespie & Nadeau, 2019; Gouveia et al., 2021; Hansen, 2017; Johnson et al., 2017; Johnson et al., 2020; Kim et al., 2019; Moore et al., 2021). While some studies indicate use of particular HESI specialty exams are related to higher E2 scores, additional studies could support this generalization. What is clear is that programs supporting more frequent use of specialty exams throughout a prelicensure nursing program report a positive relationship with higher E2 scores (Gouveia et al., 2021; Sportsman, 2020).
- Exam feedback provided to students highlights strengths and areas needing improvement. Faculty report using the multiple exposures of individualized feedback to ensure students fully understand their test results (Gillespie & Nadeau, 2019; Kim et al., 2019).
- Incorporating standardized exams into course scores may incentivize students to increase test preparation. Program policies varied, but most schools use the exam to comprise 10-20% of a course score (Barton et al., 2014; Shah et al., in press).

*Progression Policies*

- There is some diversity of policies related to benchmark scores. Most schools establish a benchmark that students are required to meet with their HESI exams. Earlier research found scores  $\geq 850$  as the most frequent benchmark (Barton et al., 2014). More recent research notes the most common benchmark requirement is  $\geq 900$  (Shah et al., in press). However, progression policies deviate concerning the consequences of not meeting the minimum scores expected on the exam. These differences are based on older research. Mandating a minimum E2 score was related to higher NCLEX pass rates in older studies (Barton et al., 2014; Lauer & Yoho, 2013; Lewis, 2005; Schroeder, 2013).
- Pre- and post-graduation consequences of not meeting a minimal E2 score varied. Some programs may delay graduation until a benchmark score is achieved. Some programs may delay a student’s opportunity to take the licensing exam until evidence of adequate remediation and performance is noted (Barton et al., 2014; Lauer & Yoho, 2013). However, most recent recommendations suggest nursing programs should not delay graduation if one benchmark is not met (“The Fair Testing Imperative...,” 2021).
- Remediation activities for students scoring below the minimum benchmark support improved outcomes on subsequent testing. Most remediation policies are student-driven and most likely come from a program-level menu of options (Barton et al., 2014). Research supports the use of focused remediation to improve test scores including the opportunity to pass the NCLEX-RN on the initial attempt (Shah et al., in press).

**HESI APRN Exams**

Research reporting HESI APRN findings was noted in two single-program studies (Binder et al., 2009; Gravel, 2018). Three reports were found representing multiple programs and sites (Willson et al., 2018; Willson & Goodman, 2015; Willson & Throckmorton, 2017). Gravel (2018) provided the most detail surrounding the HESI APRN Specialty Exams. Table 2 demonstrates all three specialty exams were significantly correlated with the HESI FNP Exit Exam. However, contrary to other studies, Gravel did not find statistical significance of the HESI Exit Exam with the national FNP certification exam.

**Table 2: Correlations between HESI APRN Specialty Exams and the HESI FNP Exit Exam (N=117)**

HESI Specialty Exam	HESI FNP Exit Exam
Advanced Pathophysiology	.34 (p < .01)
Advanced Pharmacotherapeutics	.21 (p < .05)
Advanced Physical Assessment	.35 (p < .01)

Most HESI APRN research focused on **End-of-Program Exit Exams**. Table 3 presents verifiable outcome data as reported in scholarly research. All studies reported significant findings between end-of-program exams and first-time certification pass rates. Policies that may impact HESI APRN Exam outcomes were identified and are summarized in the following section.

**Table 3: Predictive Validity of the HESI APRN Exit Exam Scores with Successful First Time Passing of National Certification Exams**

Authors	Data Year	N	APRN Group	% Predictive Validity Scores ≥ 900 n=subsample	% Predictive Validity 850-899 n=subsample	% Predictive Validity 800-849 n=subsample	% Predictive Validity 700-799 n=subsample
Binder et al., 2009	2005-07	49	FNP	100 n=17	100 n=5	100 n=15	91 n=11
Willson & Goodman, 2015	2010-11	141	FNP and ANP	100 n=22	100 n=23	100 n=30	100 n=38
Willson & Throckmorton, 2017 <sup>5</sup>	2013-16	356	FNP	100 n=42	93 n=28	100 n=58	91 n=113
Willson & Throckmorton, 2017 <sup>5</sup>	2013-16	141	AGNP	100 n=17	100 n=12	100 n=15	100 n=48

<sup>5</sup> Willson and colleagues combined the 2017 FNP and AGNP sample in a subsequent publication (N=497, 2018).

### APRN Program Policies

APRN program policies revealed some trends that may influence student outcomes. Willson and colleagues (2018) provided the most comprehensive APRN policy summary to date. Policies reflected using the exams for programmatic review, program and course improvement, and strategies that may directly impact student exam performance.

- *Consequences* of not meeting established program benchmark scores ranged from course failure, delayed graduation, or a delayed program completion letter needed to register for the national certification exam.
- Most schools surveyed either offered or required *remediation strategies*. Remediation strategies were listed as certification preparation courses, faculty review sessions including those aimed at understanding personalized summary test reports, and targeted textbook or computer-based tutoring.
- Following remediation, *repeat testing* was required. Options discussed included students repeating the relevant HESI APRN Exit Exam or completing a faculty-generated written comprehensive exam.



## Summary and Recommendations

Research evidence *strongly supported the beneficial outcomes of HESI RN Exams*. This was noted with HESI Specialty Exams and the E2. Positive results were observed when specialty exams were used within and across prelicensure courses on the E2 and the NCLEX-RN. Student performance was enhanced when programs engaged in active test preparation strategies, supported focused student-centric remediation options, and used the exam outcomes for the nursing program and course improvements.

Five studies evaluated the use of HESI APRN Exams. One study reported significant correlations between the APRN Specialty/Core Exams and the HESI FNP Exam. Four studies reported significant relationships between the clinically oriented APRN Exit Exams with the respective national certification exam.

Faculty rely on evidence to inform their teaching-learning decisions. NCLEX changes coming in 2023 will require new prelicensure research to assess teaching-learning processes, and student and program performance. There are many opportunities for scholarly research related to HESI APRN Exams. Future studies may investigate program policies related to the use of HESI Specialty/Core and Exit Exams, and outcomes of HESI APRN Exams with first-time certification pass rates. The use of the exams for curricular evaluation and revision are needed. Disseminating research findings via scholarly presentations and publications will contribute to the growing body of knowledge in this area.

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