

# Predictors of Success on Comprehensive Pathophysiology & Pharmacology Exams in a Clinical Nurse Leader Program

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# Acknowledgements

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- EII Educational Research Fellowship 😊
- Dr. Jennifer Waller, Statistician
- Dr. Kelli Braun, EII Team Leader
- Dr. Tasha Wyatt, EII Team Leader
- Dr. Jake Turrentine, EII Fellow colleague



Keep in mind...

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- I have more research to do to really answer my question!



# Learner Objectives

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- Gain exposure to new methodologies of designing a **syllabus** to allow students to engage in optional assignments for bonus credit in core nursing courses (i.e., Pathophysiology & Pharmacology)
- View data about use/effectiveness of:
  - 1) **adaptive quizzing** from multiple publishers (i.e., Lippincott & Elsevier) &
  - 2) using **standardized, comprehensive final exams** (i.e., HESI exams)

# Background

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- The Clinical Nurse Leader (CNL) is a newer role to nursing.
- Augusta University's Model C CNL Program is a 16 month, pre-licensure program designed to equip students for nursing, leadership, & research capabilities within their microsystem.

(American Association of Colleges of Nursing, 2007)

# Background

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- Pathophysiology & Pharmacology are taken semester one & two, respectively.
  - Fall & spring
- Each course is designed to prepare students for NCLEX (National Council Licensure Examination) success.
  - “Nursing boards”

# Background

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- The Health Education Systems Incorporated (HESI) end-of-course comprehensive subject exams (i.e., Pathophysiology, Pharmacology) are used to predict likelihood of NCLEX success (i.e., pass).
- Pathophysiology/ Pharmacology courses include mandatory (i.e., Exams, HESI final) & optional assignments (i.e., Lippincott Prep U Adaptive Quizzing & Elsevier Adaptive Quizzing).

# Research Purpose

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- To determine:
  - 1) if student completion of optional assignments (i.e., Bonus) predicted success for mandatory assignments
  - 2) if student exam score(s) predicted HESI score



# Syllabi & Schedule

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## Pathophysiology

- 4 modules (i.e., 1-4)
  - 1<sup>st</sup> half of Module 1 = fundamental concepts
- 3 exams
- 1 standardized, comprehensive final
  - HESI (Health Education Systems Incorporated)
- 9 mandatory adaptive quizzes
  - Lippincott Prep-U
- Bonus plan
  - 35 optional adaptive quizzes

## Pharmacology

- 4 modules (i.e., 1-4)
  - 1<sup>st</sup> half of Module 1 = fundamental concepts
- 3 exams
- 1 standardized, comprehensive final
  - HESI (Health Education Systems Incorporated)
- 54 mandatory adaptive quizzes
  - Elsevier Adaptive Quizzing
- Bonus plan
  - 59 end-of-chapter question rationales

# Pathophysiology

<b>TYPE OF EVALUATION:</b>	Prep U Mastery Quizzes - <b>Required</b>	9%
	Exam 1	24%
	Exam 2	24%
	Exam 3	24%
	HESI Cumulative Final Exam	19%
	<b>TOTAL</b>	<b>100%</b>
	<b>BONUS – <i>Optional</i></b>	<b>Up to + 3%</b>
	<ul style="list-style-type: none"><li>• Students may opt to take additional Prep U Quizzes for bonus credit up to an additional 3% added to <i>their final grade</i>. These are specified as recommended (vs. required).</li><li>• There are 35 additional Prep U quizzes in this course (not including the required 9 concept quizzes). Each quiz is worth 0.0857.</li><li>• A mastery level of 4 out of 8 must be achieved for credit to be awarded.</li><li>• <b>All bonus quizzes must be taken within the specified timeframe per the schedule; these quizzes cannot be taken at the end of the semester once final averages are calculated after the final exam.</b></li><li>• Bonus credit can only be awarded to students whose final average prior to bonus credit is above 70%.</li></ul>	

# Pharmacology

METHODS OF EVALUATION		Required
	Orientation Quiz	
	Elsevier Adaptive Quizzing - Required	14%
	Exam I	22%
	Exam II	22%
	Exam III	22%
	HESI Patient Reviews	2%
	Comprehensive Final Pharmacology Exam	18%
	<b>TOTAL</b>	<b>100%</b>

BONUS –

*Optional Up to + 4%*

- Students may opt to take additional Elsevier Adaptive Quizzes and complete additional homework (end-of-chapter rationales for NCLEX items) for bonus credit up to an additional 4% added *to their final grade*. These items are specified as recommended on the course schedule.
- There are 59 total bonus items, including 4 Elsevier Adaptive Quizzes and 55 Kee end-of-chapter homework assignments in this course (not including the required 55 Elsevier Adaptive Quizzes). Each bonus item is worth 0.0677966. Prorated credit is available for all bonus items completed, even if all are not.
- A complete mastery level of 1 out of 3 must be achieved for credit to be awarded for Elsevier Adaptive Quizzes. All end-of-chapter rationales must be completed as well.
- **All bonus items must be taken/submitted within the specified timeframe per the schedule; these quizzes/assignments cannot be taken at the end of the semester once final averages are calculated after the final exam.**

Bonus credit can only be awarded to students whose final average prior to bonus credit is above 70%.

# Methods

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- SAS 9.4
- Simple linear regression
  - Optional content participation (i.e., Bonus) percentages or exam score percentages on HESI performance percentages within each course were examined
- Multiple linear regression
  - Optional content participation (i.e., Bonus) and exam score percentages was examined to determine the contribution of both variables on HESI performance
- Statistical analyses: alpha level of 0.05
- Required content participation percentages were not included as there was little variability in the percentages and the majority were 100%

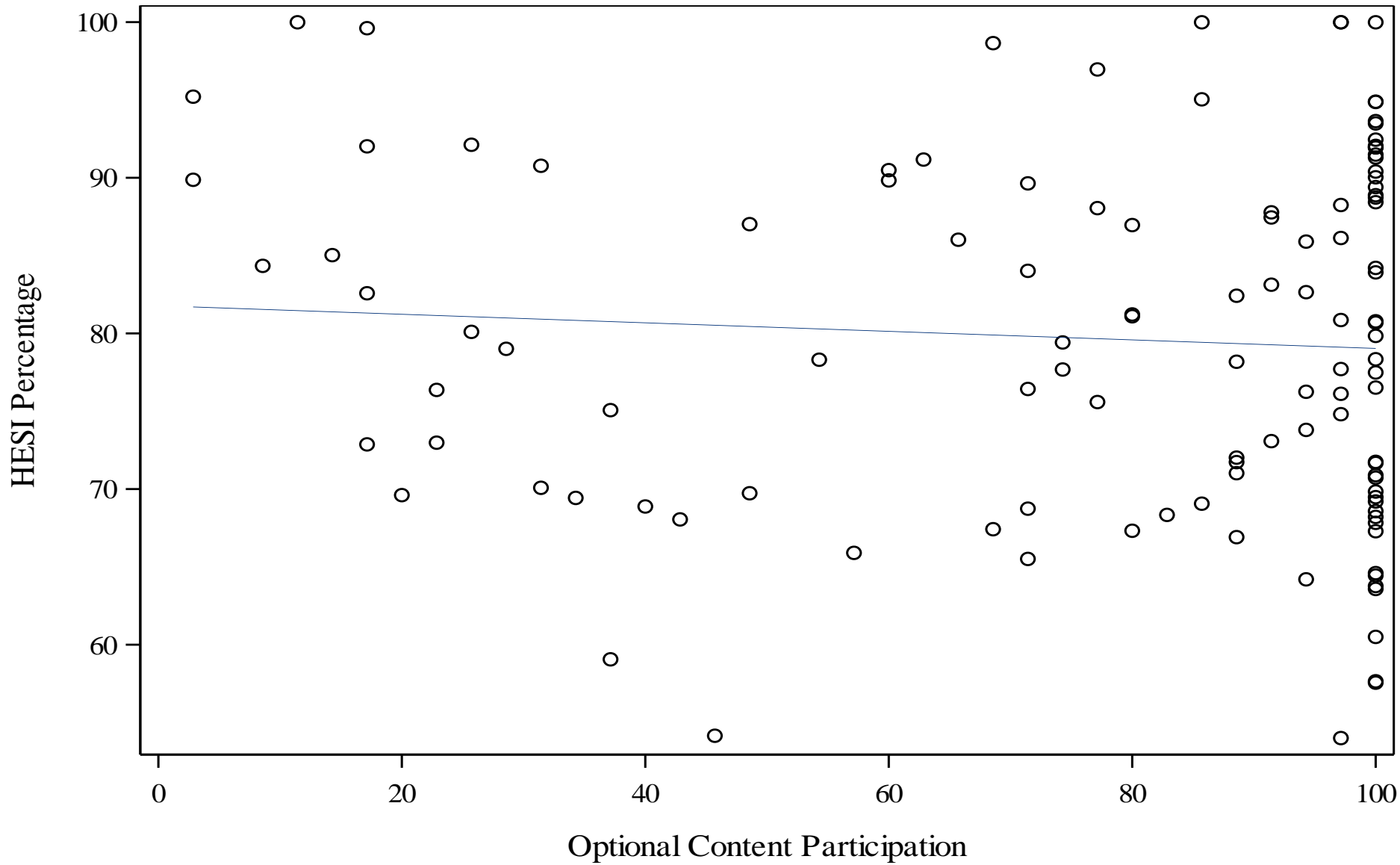
# Descriptive Statistics for Continuous Variables Percentages within Pathology & Pharmacology Courses

Percentage Variable	Pathophysiology		Pharmacology	
	Mean	SD	Mean	SD
Required Content Participation	99.3	3.7	97.4	5.1
Optional Content Participation	77.0	29.4	76.8	32.6
Exam Score	86.5	6.3	85.2	4.5
HESI	79.7	11.4	85.2	8.5

# Linear Regression on HESI Scores Results for Pathology & Pharmacology Courses

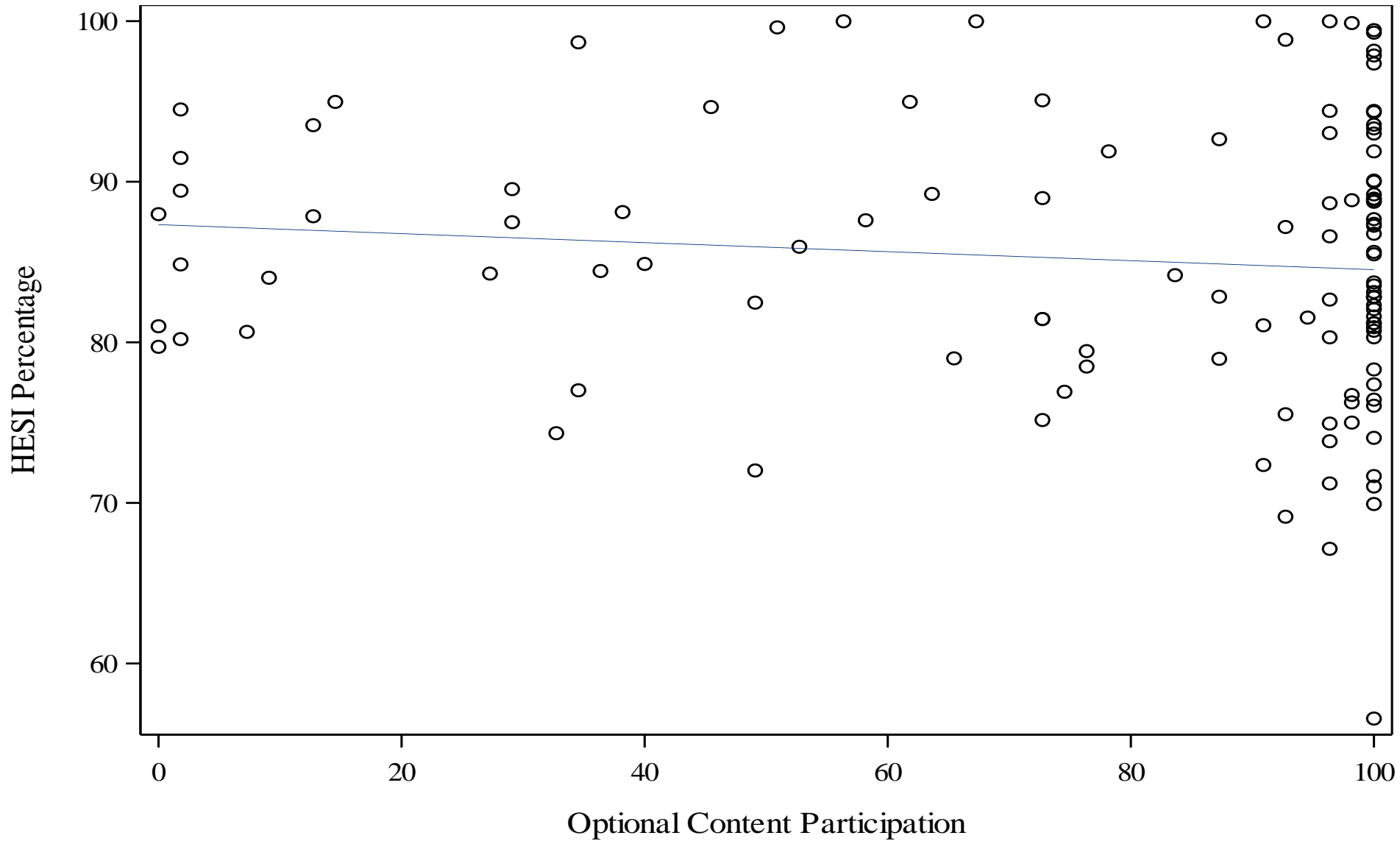
Model	Effect in Model	Pathophysiology					Pharmacology				
		R <sup>2</sup>	Estimate	SE	t	p	R <sup>2</sup>	Estimate	SE	t	p
<b>Simple Linear Regression Models</b>											
Optional Content Participation	Intercept	0.0050	81.78	2.97	27.53	<0.0001	0.0115	87.33	2.02	43.23	<0.0001
	Slope		-0.03	0.04	-0.76	0.4483		-0.03	0.03	-1.16	0.2490
Exam Score	Intercept	0.3683	-15.92	11.65	-1.37	0.1746	0.1858	16.36	13.45	1.22	0.2265
	Slope		<b>1.11</b>	0.13	8.22	<b>&lt;0.0001</b>		<b>0.81</b>	0.16	5.12	<b>&lt;0.0001</b>
<b>Multiple Linear Regression Model</b>											
Optional Content Participation	Intercept	0.3823	-13.82	11.65	-1.19	0.2378	0.2141	16.04	13.27	1.21	0.2294
	Slope		-0.05	0.03	-1.61	0.1096		-0.04	0.02	-2.03	0.0451
Exam Score	Slope		<b>1.12</b>	0.13	8.38	<b>&lt;0.0001</b>		<b>0.85</b>	0.16	5.42	<b>&lt;0.0001</b>

HESI vs. Optional Content (i.e., Bonus) Participation  
Pathophysiology



Regression  
line for  
optional  
content  
participation  
on HESI  
performance

HESI vs. Optional Content (i.e., Bonus) Participation  
Pharmacology

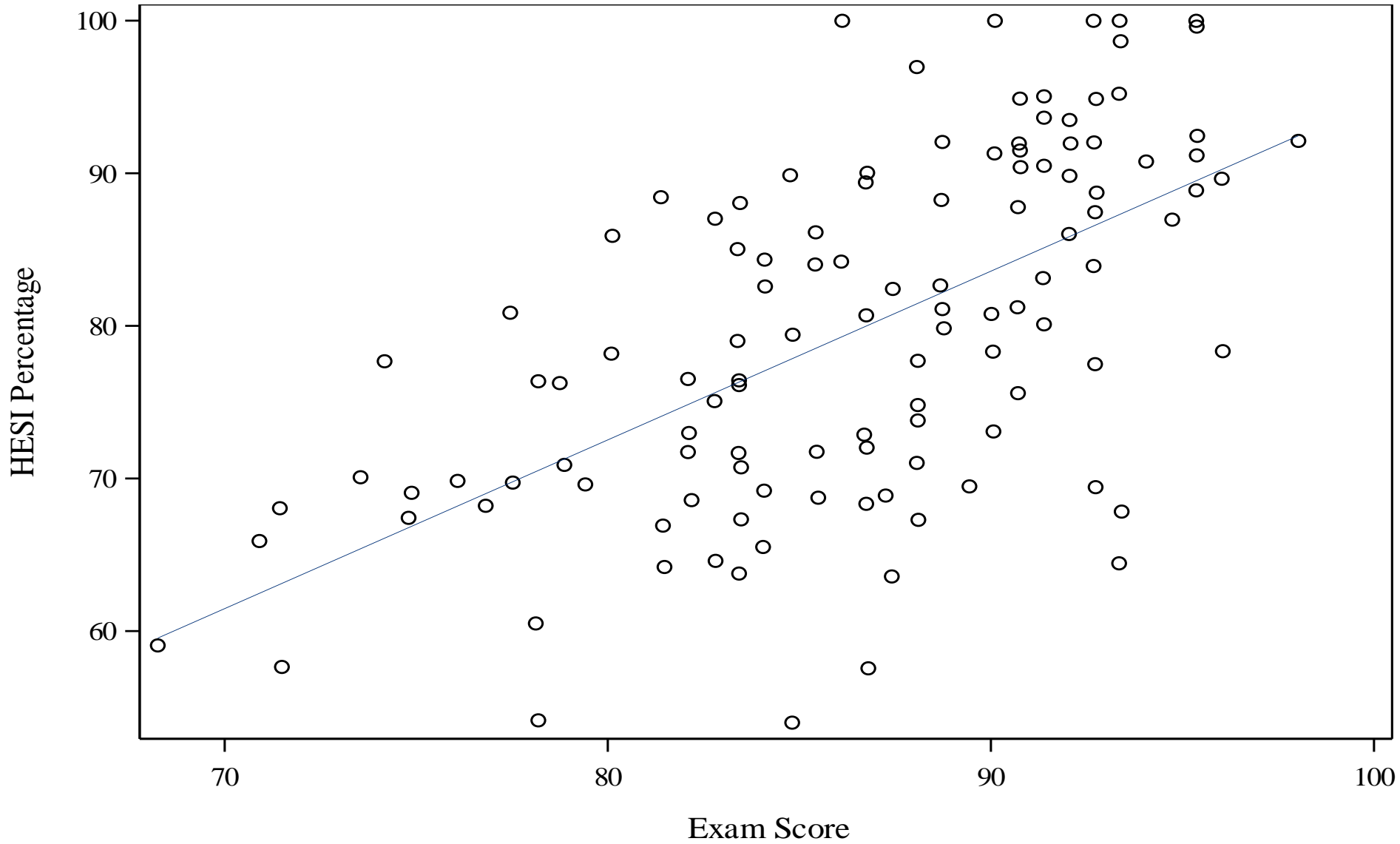


Regression line for optional content participation on HESI performance



# HESI vs. Exam Score

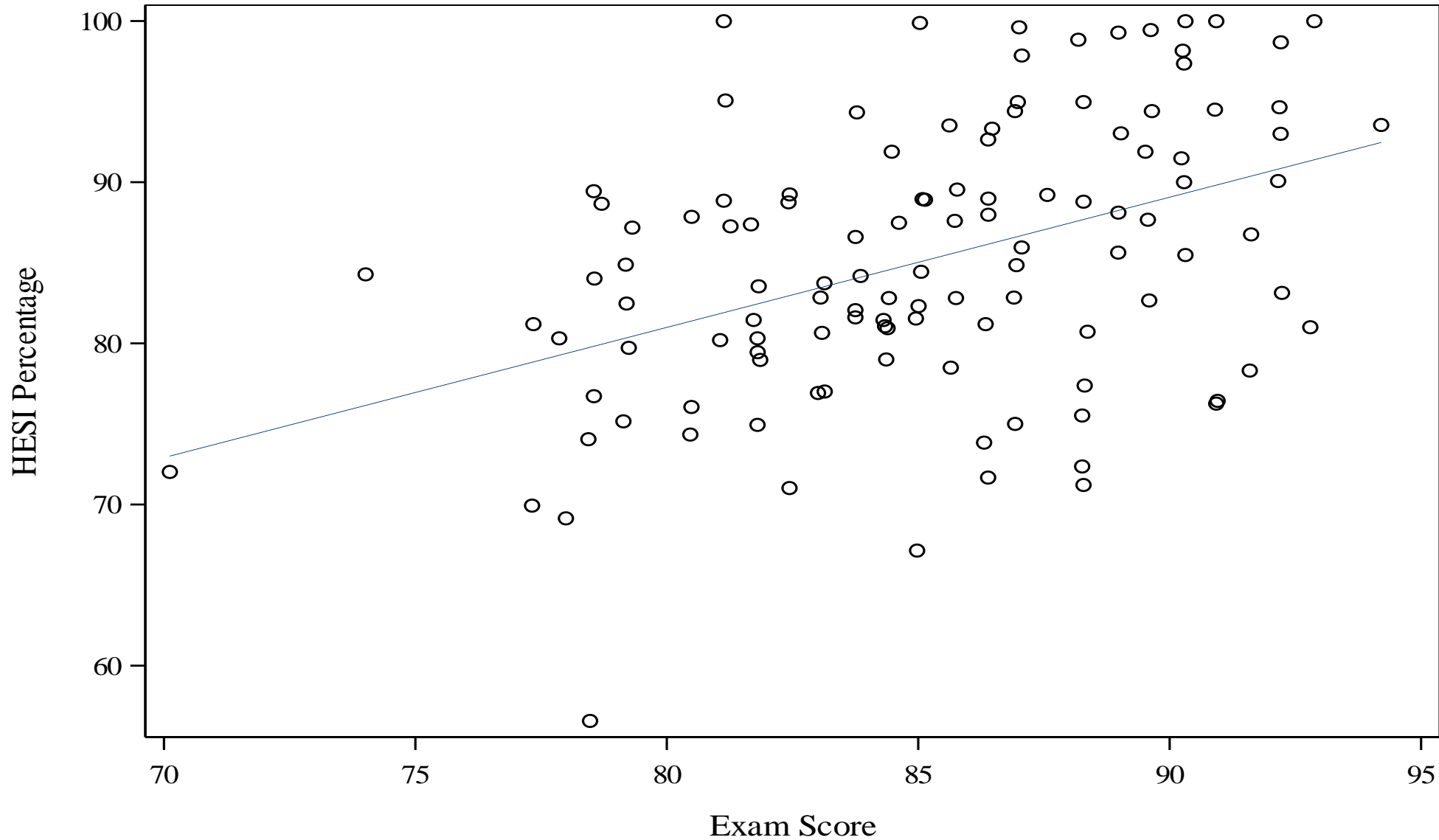
## Pathophysiology



Regression line for exam score on HESI performance

# HESI vs. Exam Score

## Pharmacology



Regression  
line for exam  
scores on HESI  
performance

# Simple Linear Regression Models

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## Optional Content

- Optional content participation (i.e., Bonus) was **not significantly associated** with HESI scores for either **Pathophysiology** ( $p=0.4483$ ) or **Pharmacology** ( $p=0.2490$ )

## Exam Scores

- Exam scores were **positively associated** with HESI performance for both **Pathophysiology** ( $p<0.0001$ ) & **Pharmacology** ( $p<0.0001$ )

# Simple Linear Regression Models

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## Pathophysiology

- A 1% increase in exam scores resulted in a **1.12% increase** in HESI performance.

## Pharmacology

- A 1% increase in exam scores resulted in a **0.81% increase** in HESI performance.

# Multiple Linear Regression Models

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- For **Pathophysiology**
  - When optional content participation (i.e., Bonus) & exam scores were in the model, the optional content participation ( $p=0.1096$ ) **wasn't significantly associated**, but the exam score ( $p<0.0001$ ) **was significantly associated** with HESI performance.
  - For every 1% increase in exam scores, HESI performance increased 1.12%.

# Multiple Linear Regression Models

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- For **Pharmacology**
  - When optional content participation (i.e., Bonus) & exam scores were in the model, both the optional content participation ( $p=0.0451$ ) & the exam score ( $p<0.0001$ ) were **significantly associated** with HESI performance.
  - For every 1% increase in optional content participation (i.e., Bonus) HESI performance **decreased by -0.04%**
  - For every 1% increase in exam scores, HESI performance **increased by 0.85%**.

# Additional Research

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- Additional research is needed to determine how performance within adaptive quizzing (i.e., scored performance, not only “completed”/“not completed”) may impact course exam & HESI scores.



# References

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American Association of Colleges of Nursing. (2007). White paper on the education and role of the clinical nurse leader. *Washington, DC: AACN.*

Morrison, S., Adamson, C., Nibert, A., & Hsia, S. (2004). HESI exams: An overview of reliability and validity. *CIN: Computers, Informatics, Nursing, 22(4), 220-226.*

