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Heterogeneous Grouping and Reciprocal Peer Teaching in Anatomy Medical Education

Julia A. Jordon
University of New Mexico, Department of Cell Biology & Physiology, jujordan@salud.unm.edu

Rebecca S. Hartley
University of New Mexico, Department of Cell Biology & Physiology, rhartley@salud.unm.edu

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Julia Jordan, DPT
Rebecca Hartley, PhD

UNM HSC SEAC-Funded Study
UNM HRRC Study ID 21-006
COI - none

Clinical Morphology Block

- Foundational Anatomy, Embryology, and Histology

- 9 weeks of content delivery, active learning sessions, and assessments.

- Assessments (Pass Criteria $\geq$ 75%)
  - 8 Weekly quizzes
  - 3 Lab Practical exams
  - Summative NBME Final Exam

Reciprocal Peer Teaching (RPT)

Pizzimenti et al., 2016
Manyama et al., 2016
Bentley et al., 2009
Agius et al., 2018

Competence-Based Heterogeneous (CBH) Grouping

https://slidetodoc.com/managing-heterogeneous-audience-heterogeneous-audience-it-is-defines/

Donovan et al., 2018

Goals

Implement CBH grouping and RPT to

- Per UNM SOM Medical curriculum revision goals reduce the number of students
  - repeating Phase I for academic reasons to less than 5%
  - delaying STEP I to less than 10%.

- Elevate academic outcomes in Clinical Morphology for the lowest performing students without negatively impacting higher performing students

Demographics

	MS2026	MS2025	MS2024	MS2023
Total	109	114	108	109
Repeating	6	11	11	5
Female	63%	69%	55%	55%
Male	36%	31%	45%	43%

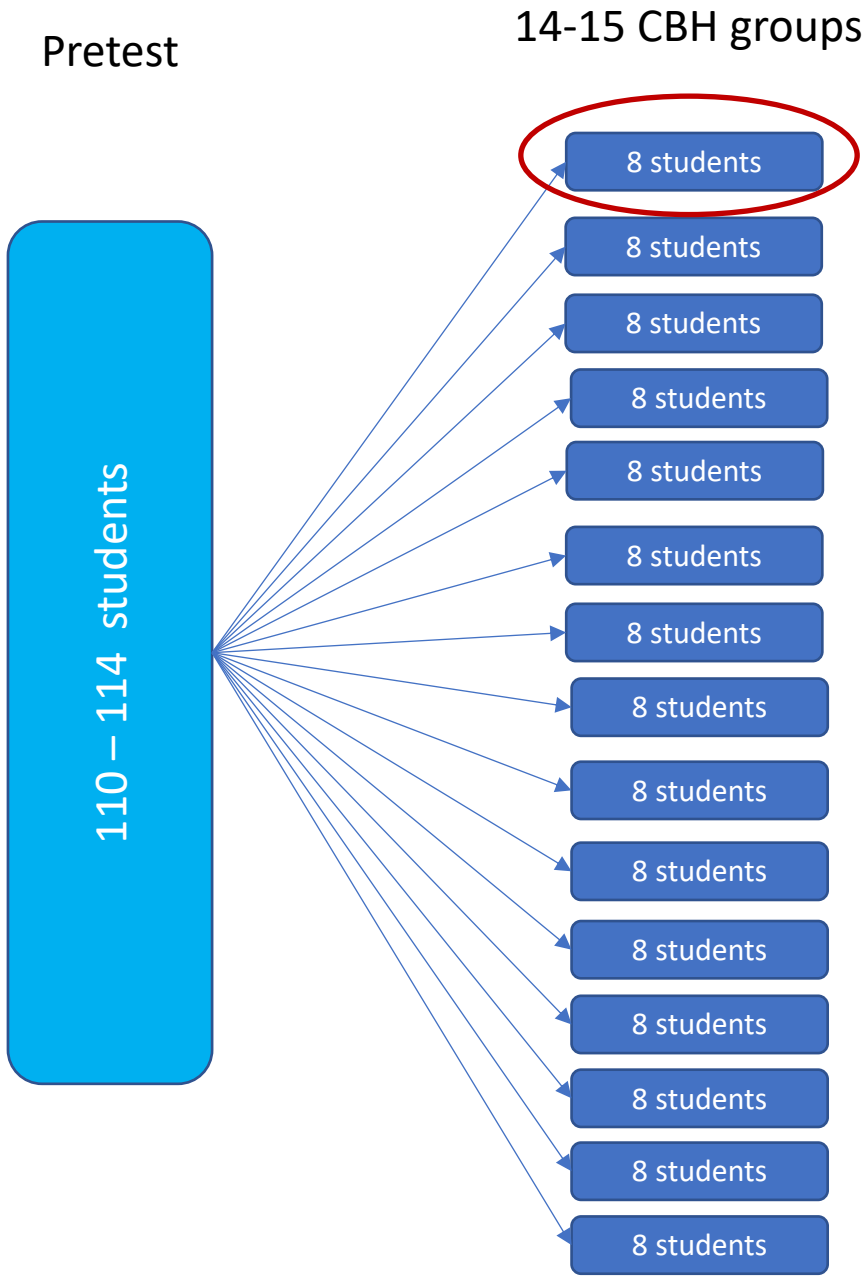
	Study Cohorts	Control Cohorts
Total	223	217
Repeating	17	16
Female	66%	55%
Male	33%	44%

Unless otherwise indicated, all data analyses are from non-repeating students in each cohort.

CBH

MS2025 – academic pretest

MS2026 – survey



Each CBH group

7 – 9 students

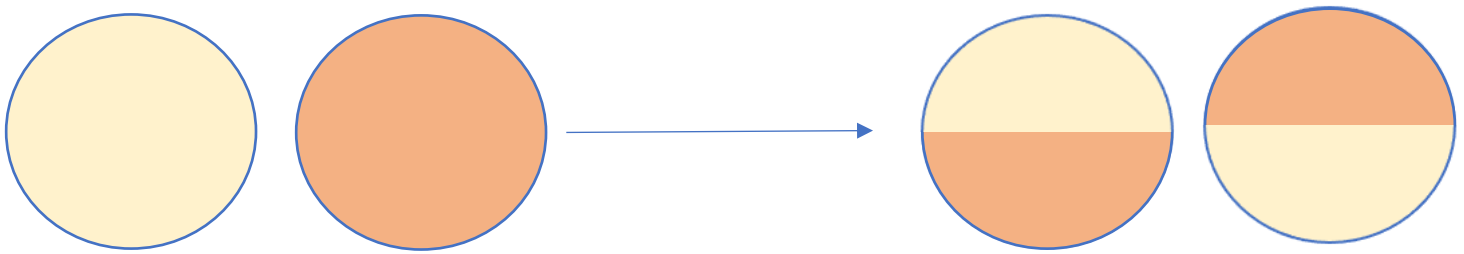
30 Dissection Tables
4 – 5 students each

Reciprocal Peer Teaching (RPT)

Goal: ***Enhance*** Active Learning in Anatomy Lab sessions

Each Dissection Table
4 students each

30 RPT Teaching Groups



Peer Teaching v Check list

Abdominal Contents
- **Organs**
- liver
  - lobes
    - right, left, caudate, quadrate
  - falciform ligament
  - round ligament
  - triangular ligament (right/left)
  - coronary ligament
  - bare area
- gallbladder
  - common hepatic duct
  - cystic duct
  - common bile duct
  - hepatopancreatic ampulla (of Vater)
- esophagus
- stomach
  - cardia
  - fundus
  - body
  - pylorus (antrum, canal, orifice, sphincter)
- spleen
- pancreas
  - head (uncinate process)
  - neck
  - body
  - tail
  - main pancreatic duct
- intestines
- *small*
  - *duodenum*
    - superior (first) part
    - descending (second) part
      - major duodenal papilla
    - horizontal (third) part
    - ascending (fourth) part
    - duodenojejunal flexure (suspensory ligament of the duodenum – ligament of Treitz)
  - *jejunum*
  - *ileum*
    - ileocecal junction
- *large (colon)*
  - cecum
  - appendix
  - ascending colon
  - right colic or hepatic flexure
  - transverse colon
  - left colic or splenic flexure
  - descending colon
  - sigmoid colon
  - rectum
  - teniae coli
  - haustra
  - epiploic appendages
- kidney
  - hilum
- suprarenal glands

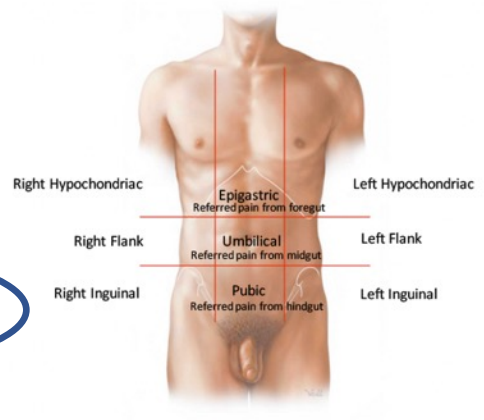
Peritoneum
- parietal
- visceral
- peritoneal cavity
  - greater/lesser sacs
  - epiploic (omental) foramen
- intraperitoneal
- retroperitoneal
- umbilical folds
  - median (urachus)
  - medial (obliterated umbilical arteries)
  - lateral (epigastrics)
- greater omentum
- lesser omentum
  - hepatogastric ligament
  - hepatoduodenal ligament
    - portal triad (hepatic artery, portal vein, portal triad)
- transverse mesocolon
- mesentery of the small intestine
- mesocecum
- mesoappendix
- sigmoid mesocolon

Teaching:

Differentiate and describe relationships between similar/close structures.
Unexpected findings or Anomalies
Clinical relevance

Unit-specific questions:

1. For the nine-region subdivisions, identify what organs are in each, and find them on your donor:
   a. epigastric, umbilical, pubic
   b. right/left hypochondriac
   c. right/left flank, and
   d. right/left inguinal
2. What artery is at risk of erosion if there is an ulcer in the first part of the duodenum?
3. For each vessel, identify the portion of the abdominal contents that are supplied by it:
   a. celiac trunk
   b. superior mesenteric artery
   c. inferior mesenteric artery
4. Describe/identify/draw a map of the tributaries of portal vein.
5. Which major veins in the abdomen are not part of the portal vein?
6. Describe the differences between indirect and direct hernias. How do these differ from femoral hernias? Discuss location, mechanism, and patient demographics.
7. Describe the progression of (visceral) referred to (parietal) somatic pain for an appendicitis.
8. Describe/identify the blood vessels that form anastomoses between
   a. two branches of the celiac trunk
   b. a branch of the celiac trunk and a branch of the SMA
   c. a branch of the SMA and a branch of the IMA



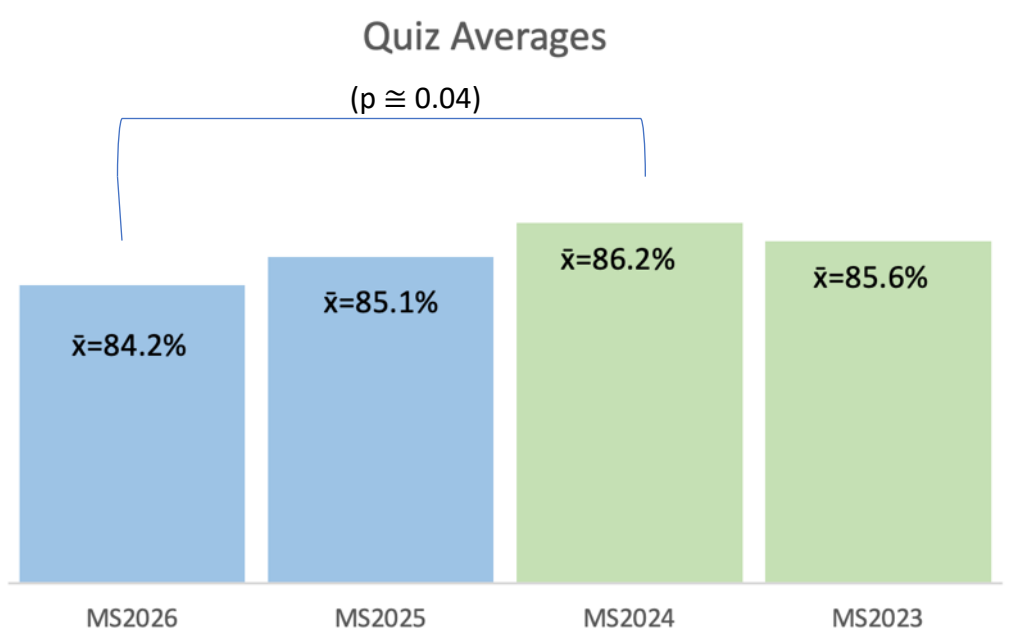
Peer Teaching v Check list

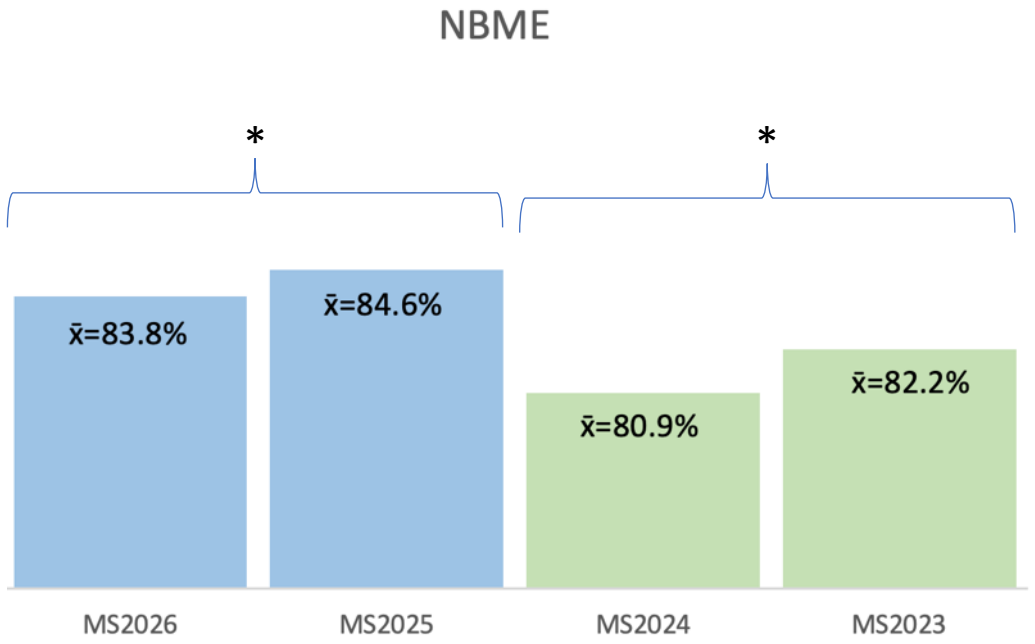
2. What artery is at risk of erosion if there is an ulcer in the first part of the duodenum?

7. Describe the progression of (visceral) referred to (parietal) somatic pain for an appendicitis.

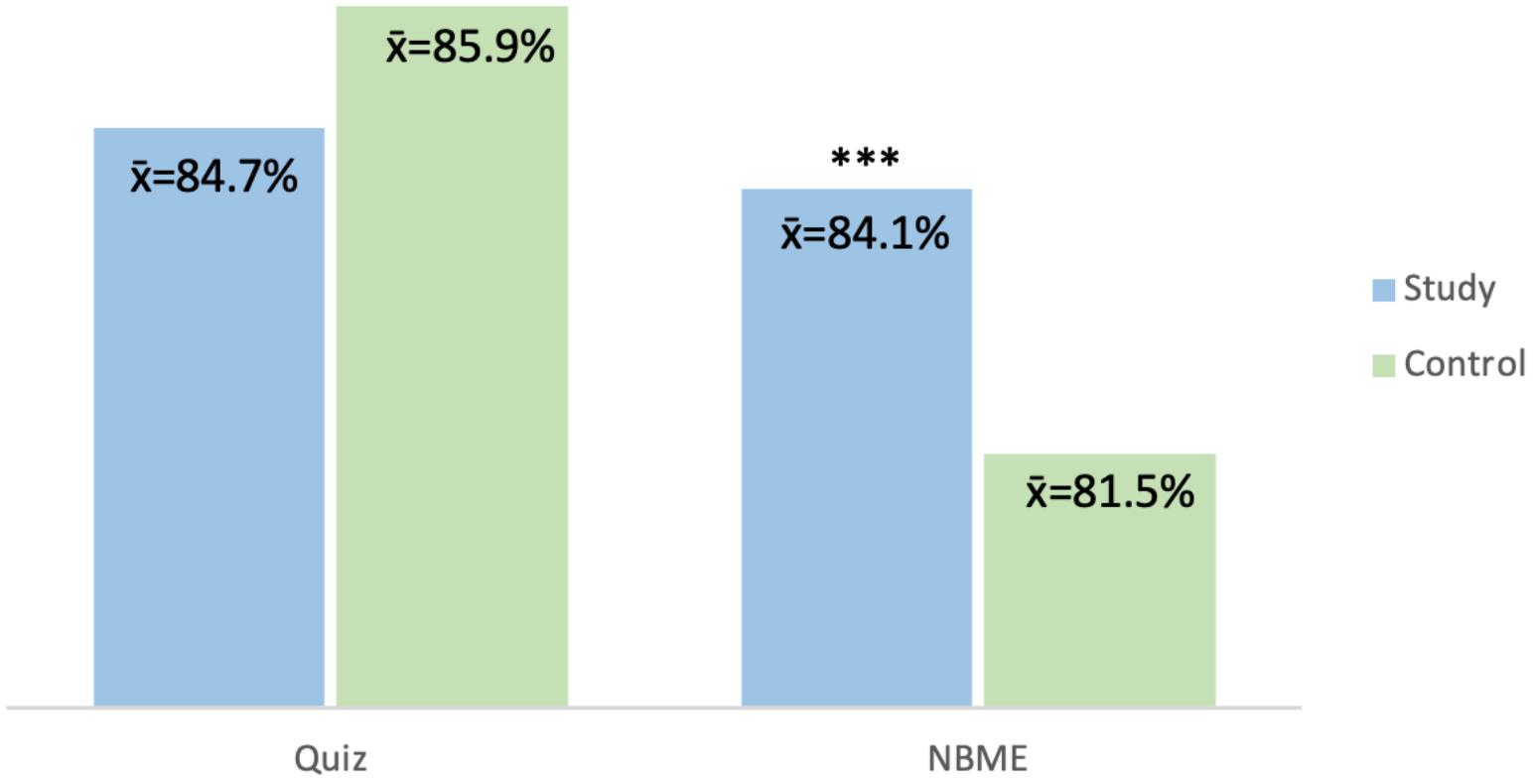
Results

Quiz and NBME Score Cohort Pairwise Comparisons





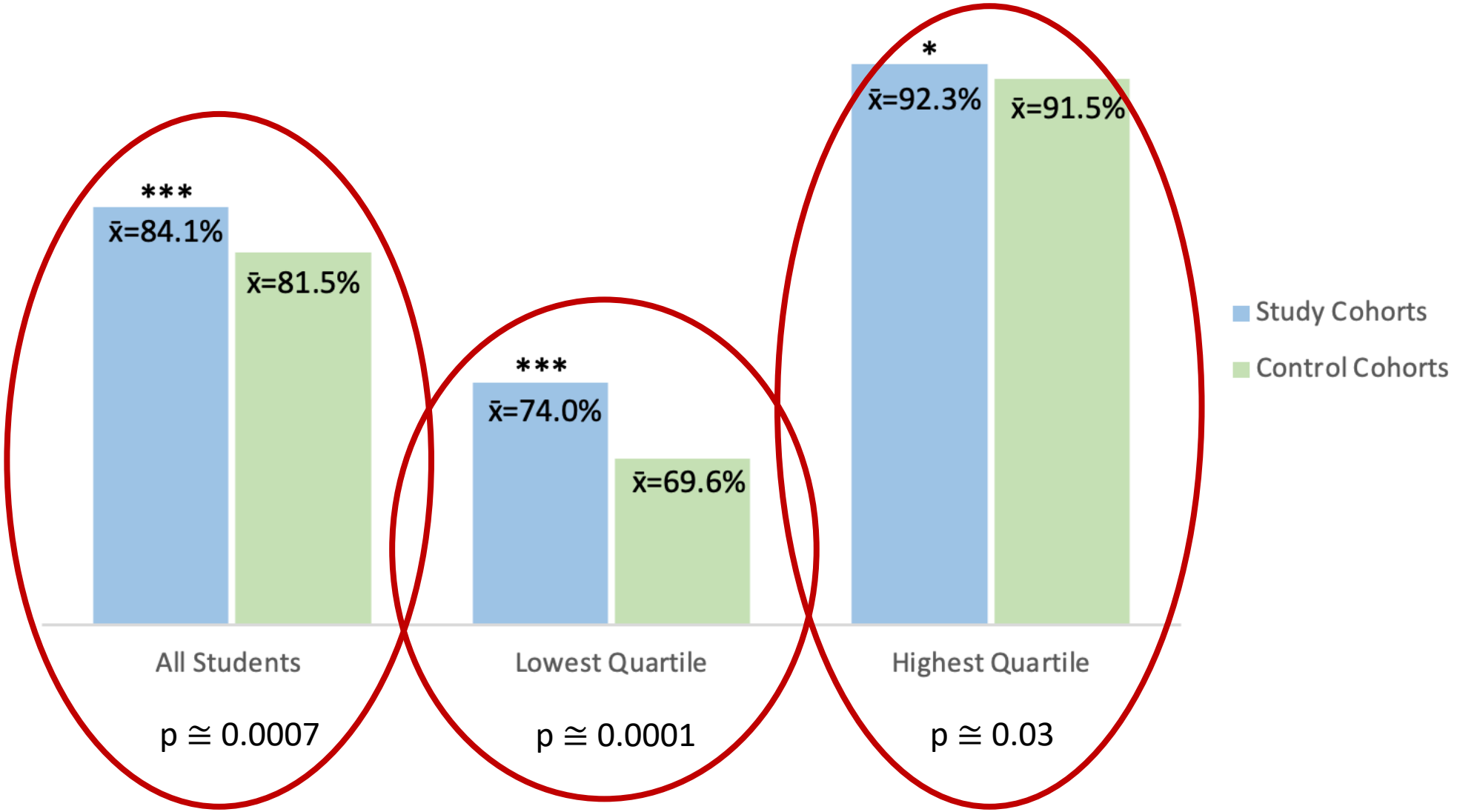
Quiz and NBME Score Study v Control Cohorts



n.s., p ≅ 0.055

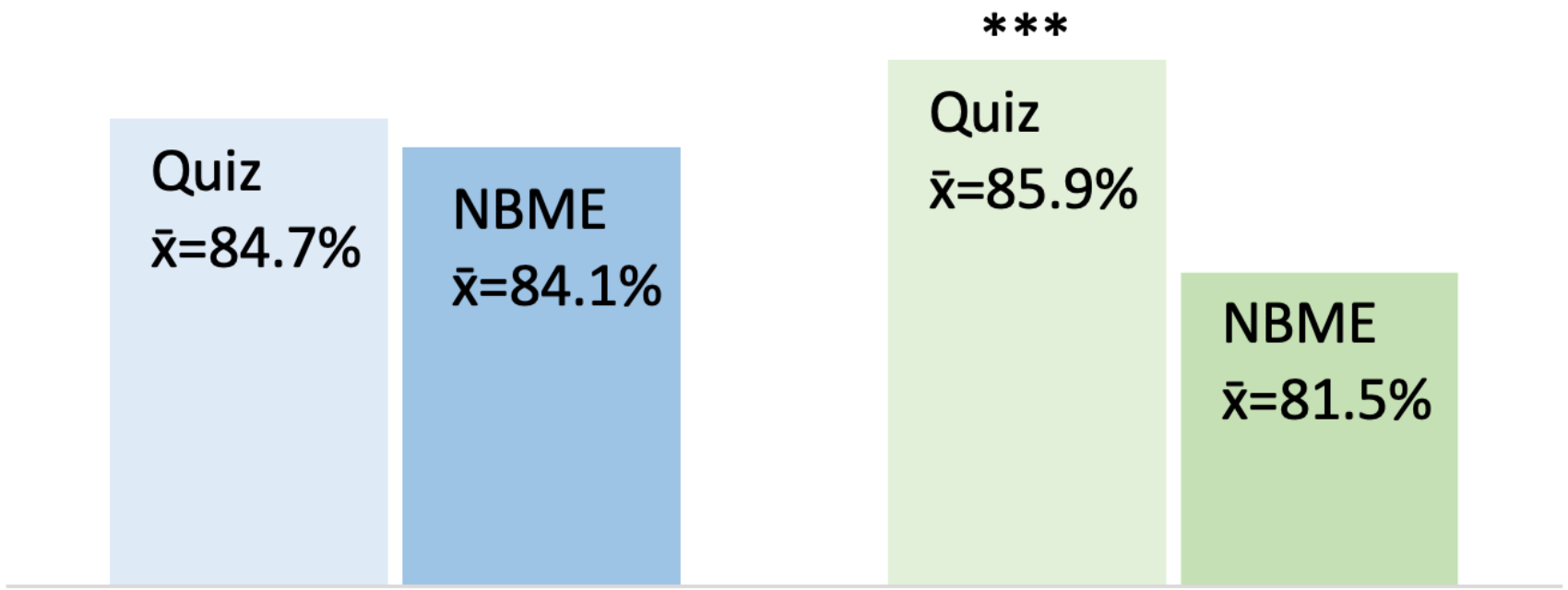
p ≅ 0.0007

NMBE Average by Quartiles

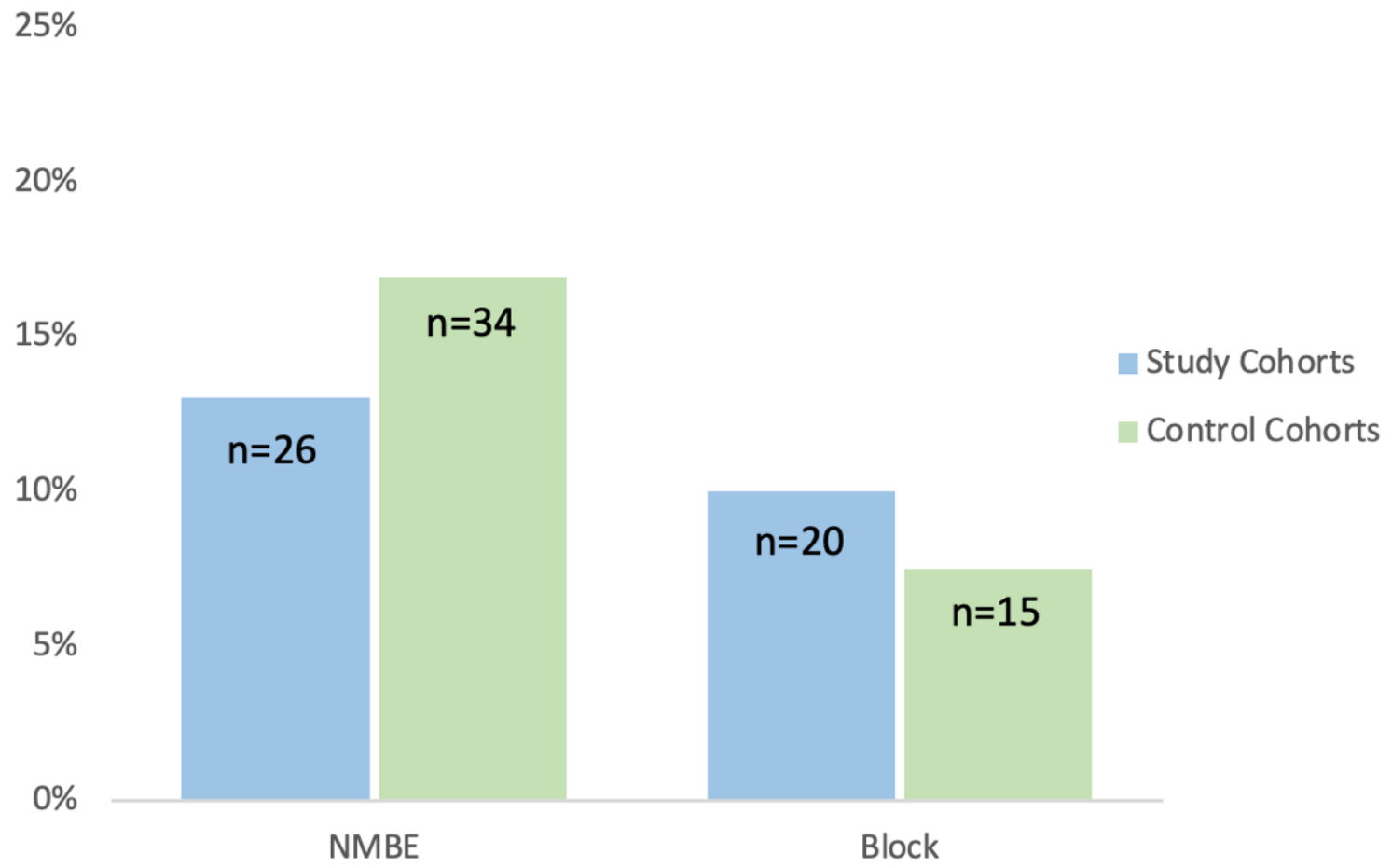


Quiz Average by Quartiles

Quiz v NBME

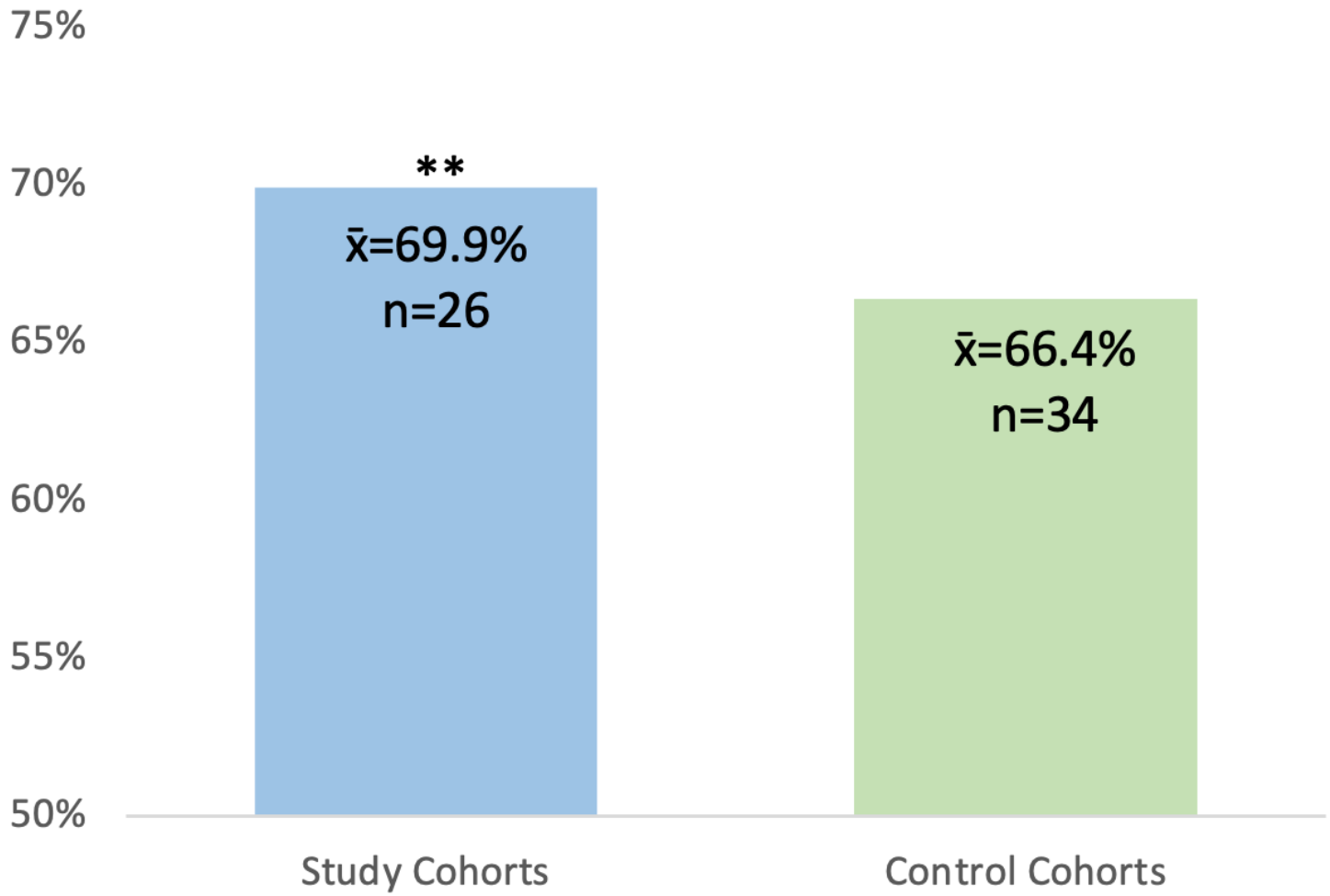

***
Quiz
x̄=84.7%
NBME
x̄=84.1%
Quiz
x̄=85.9%
NBME
x̄=81.5%
Study
n.s., p ≅ 0.06
Control
p < .0001
Pearson's r:
0.843
0.753

Results: NBME & Block Failure Rates by Cohort



Pairwise $\mathcal{X}^2$ comparisons, ns

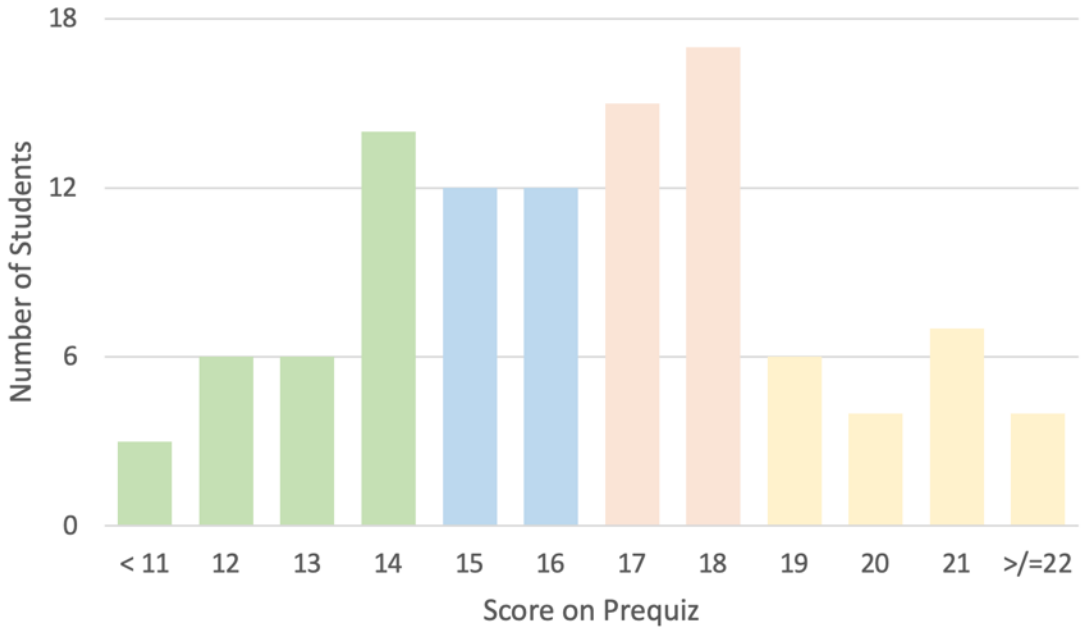
Mean Failing NBME Scores



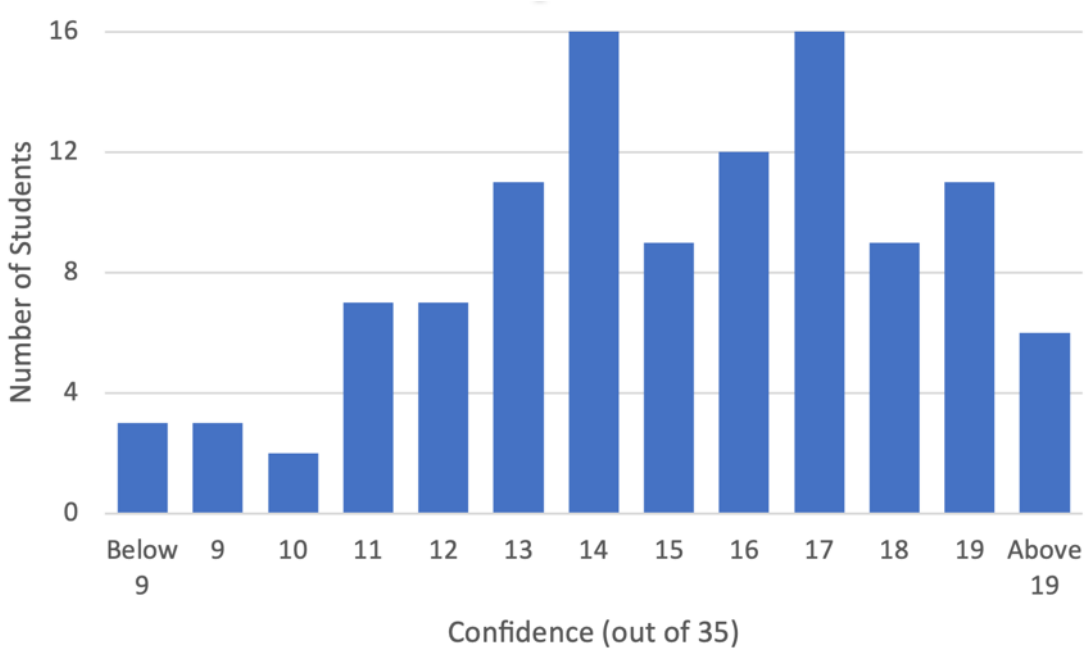
p ≅ 0.015

Year 1: Pretest for CBH Group Formation

- 28 foundational questions involving Anatomy, Histology, Embryology, Genetics, and Pathology.



- Students Self-Rated confidence with 7 content areas (1 to 5 scale)

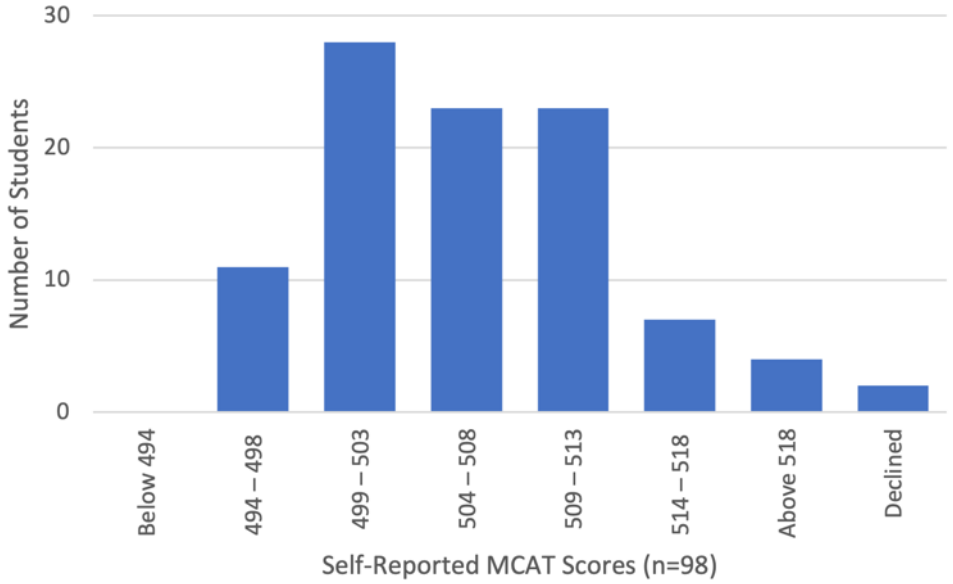


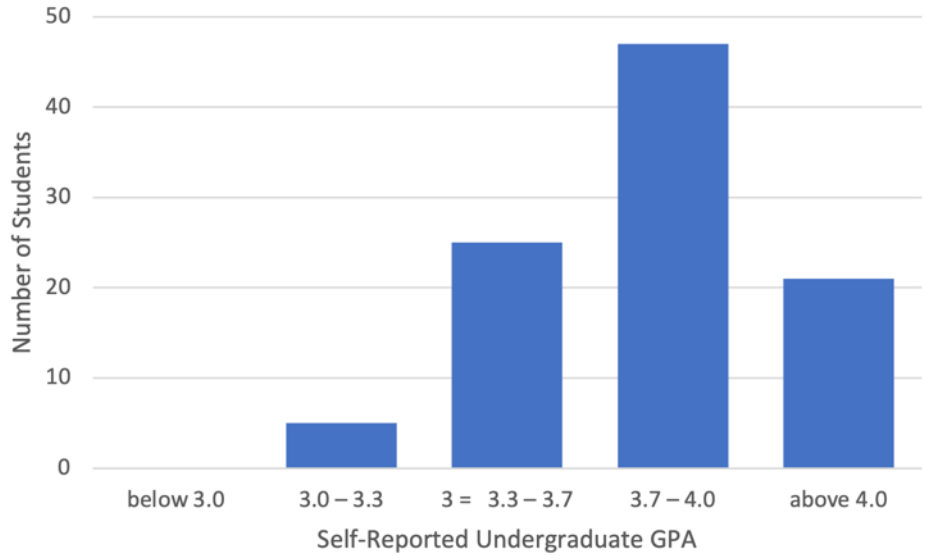
Correlate with block assessments??

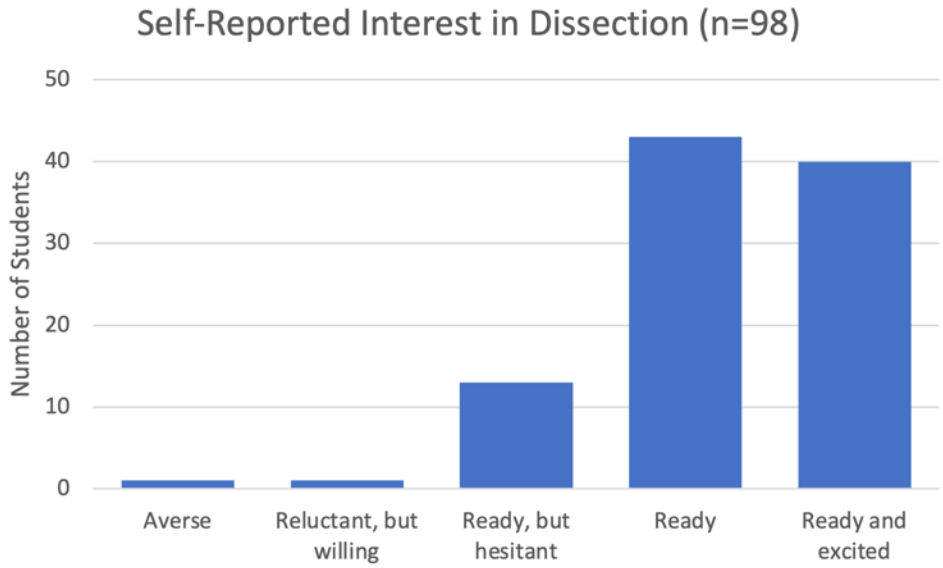
r < 0.26

r < 0.2

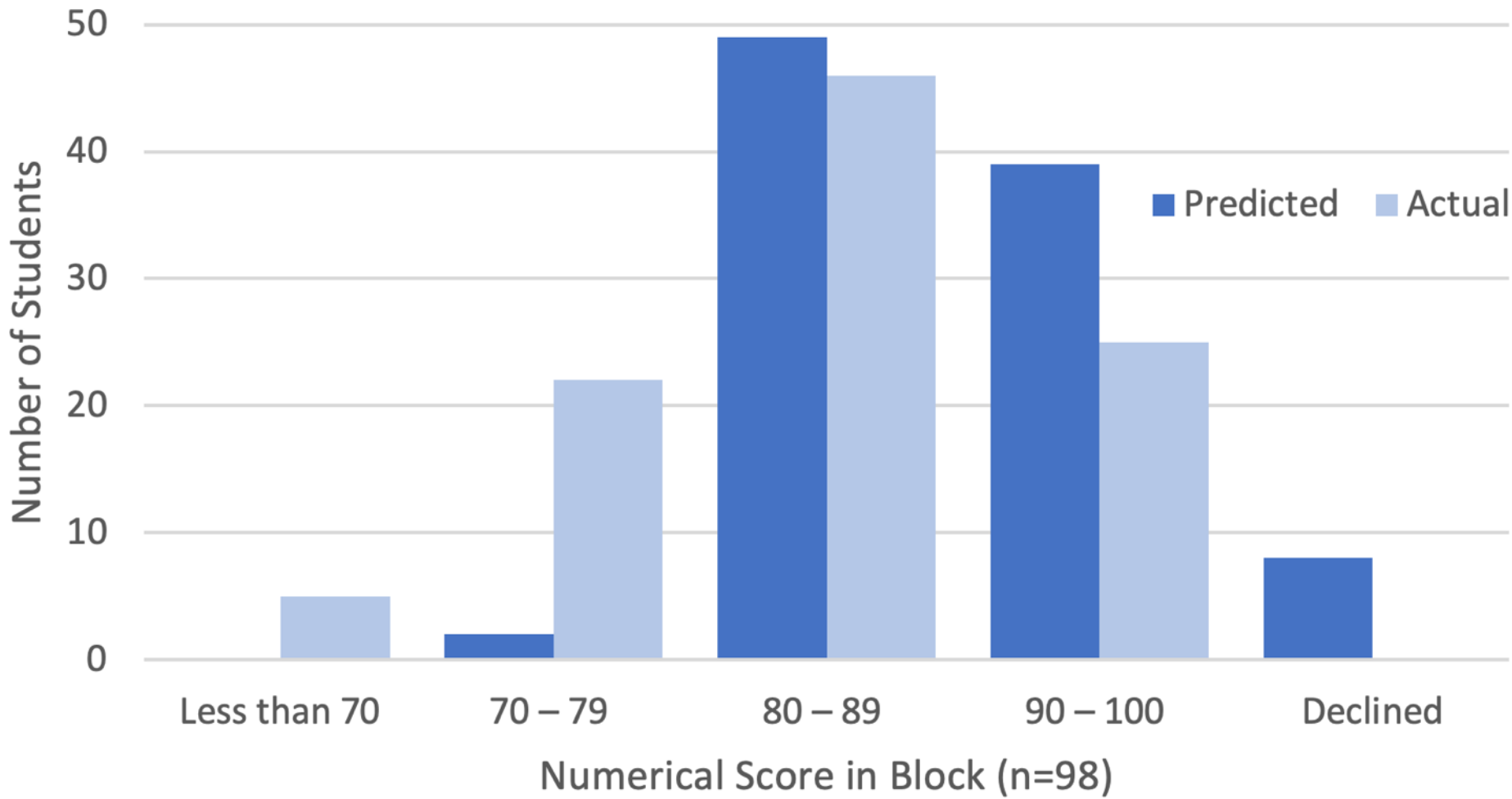
Year 2: Survey for CBH Group Formation (MS2026)





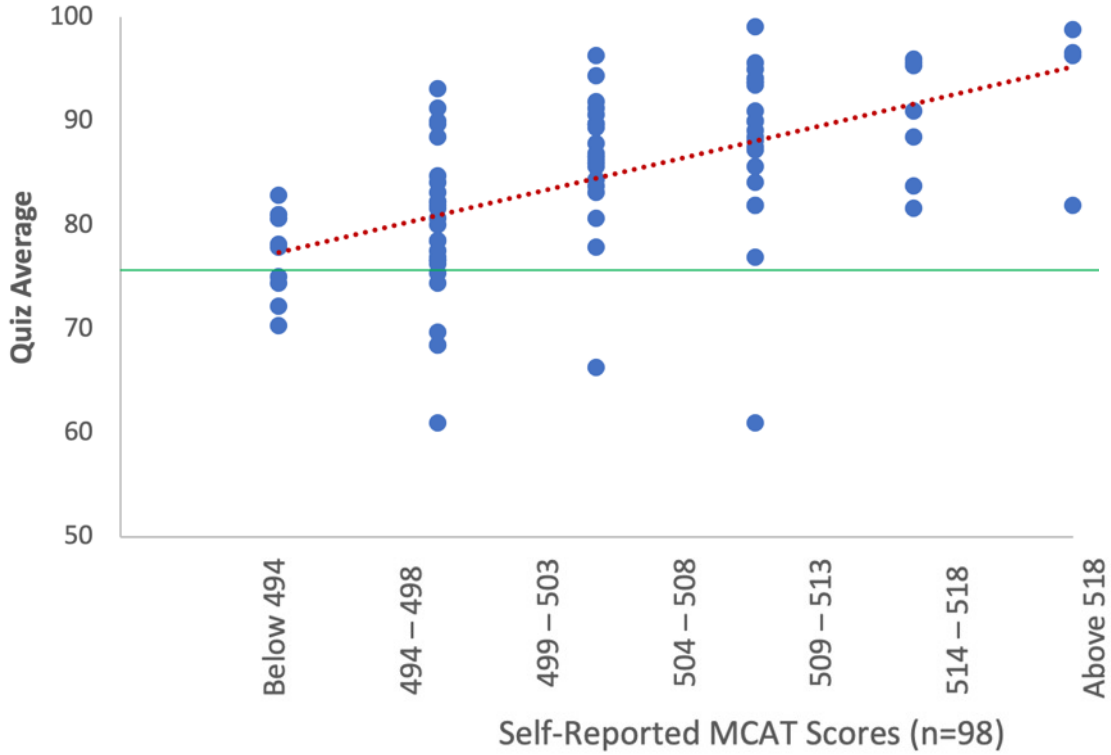


Based on your performance in prior science courses, what score do you predict for yourself in this course?

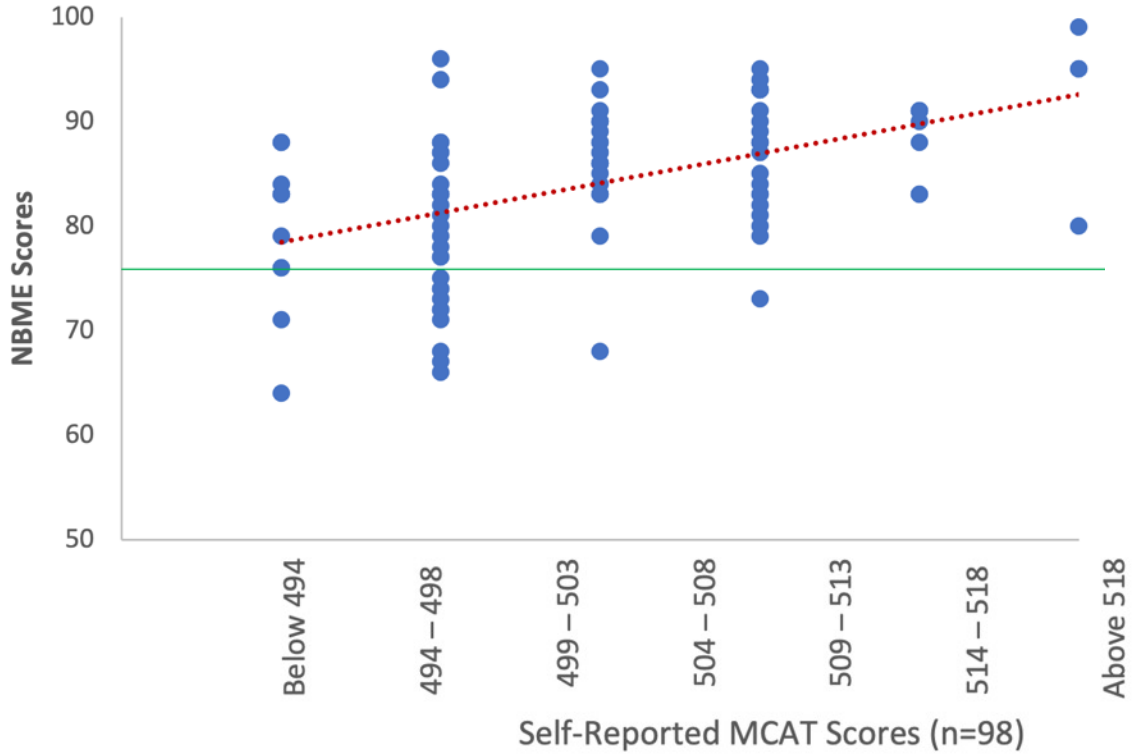


r ≅ 0.068

Did any of the other metrics correlate with block grade?



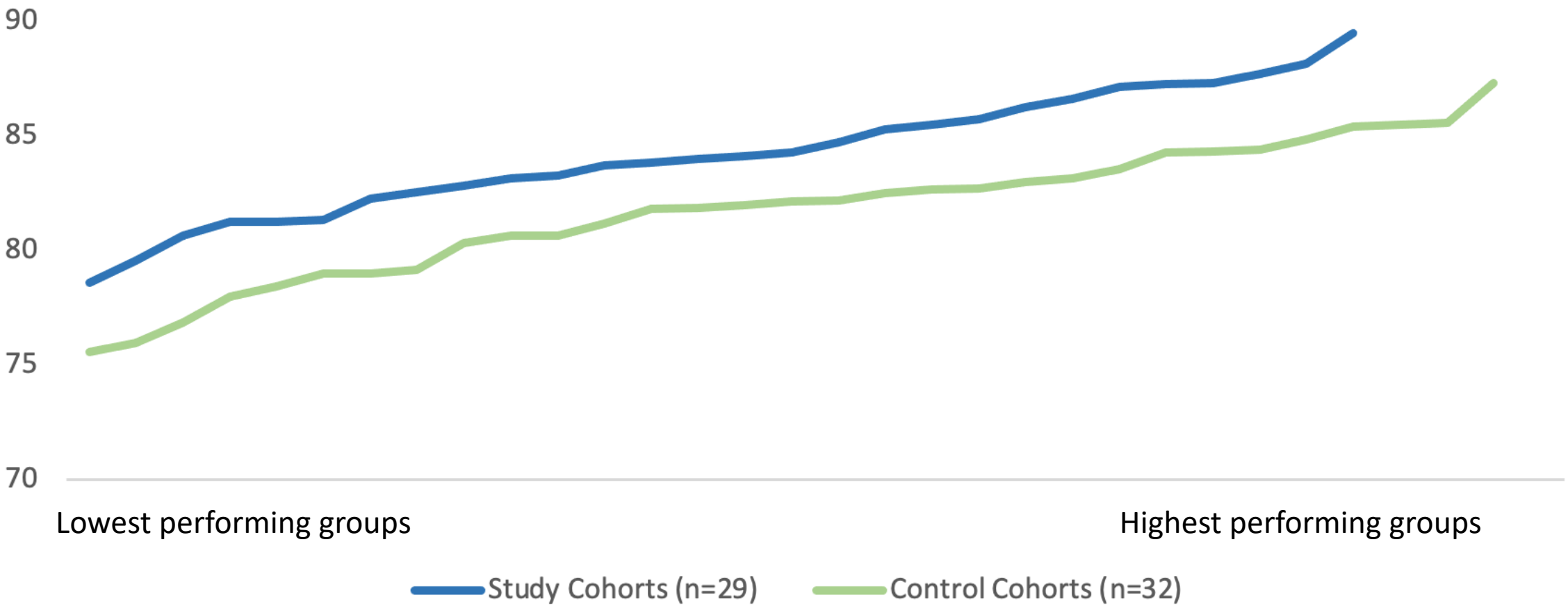
r = 0.56



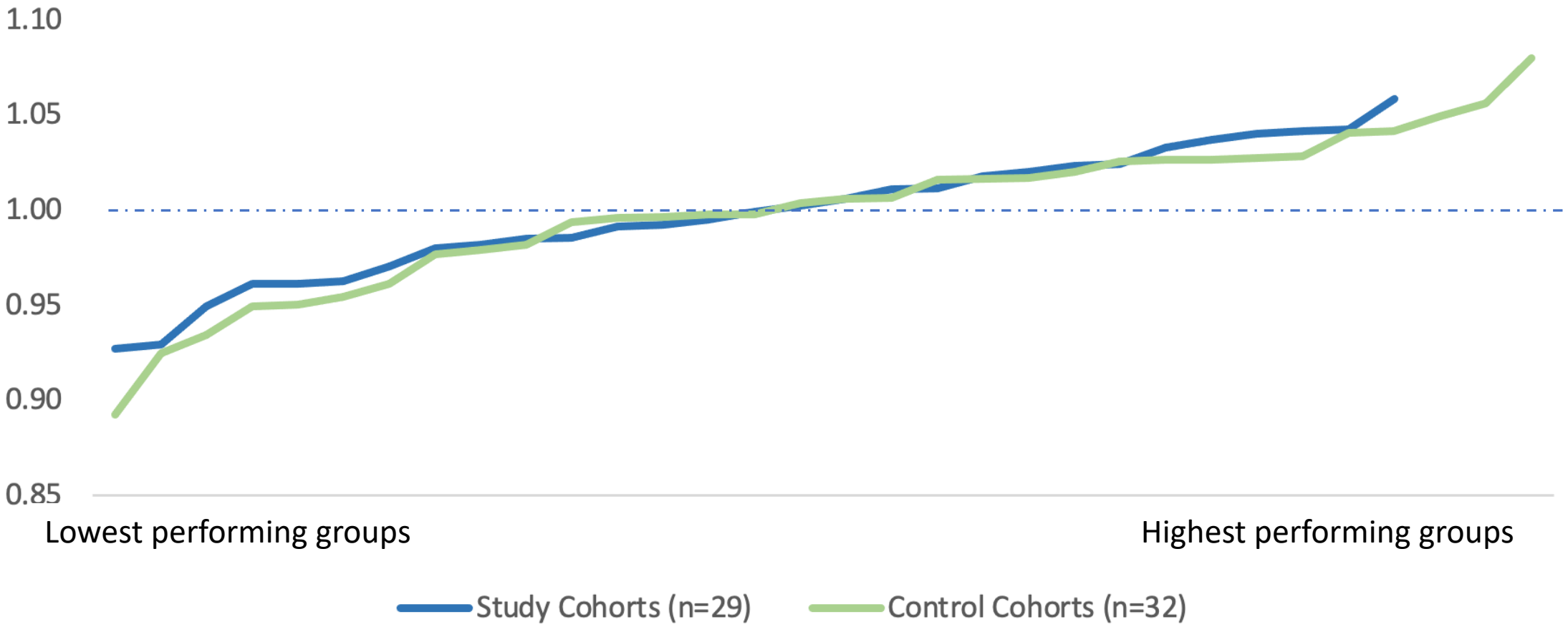
r = 0.49

MCAT with Block Score: r = 0.53

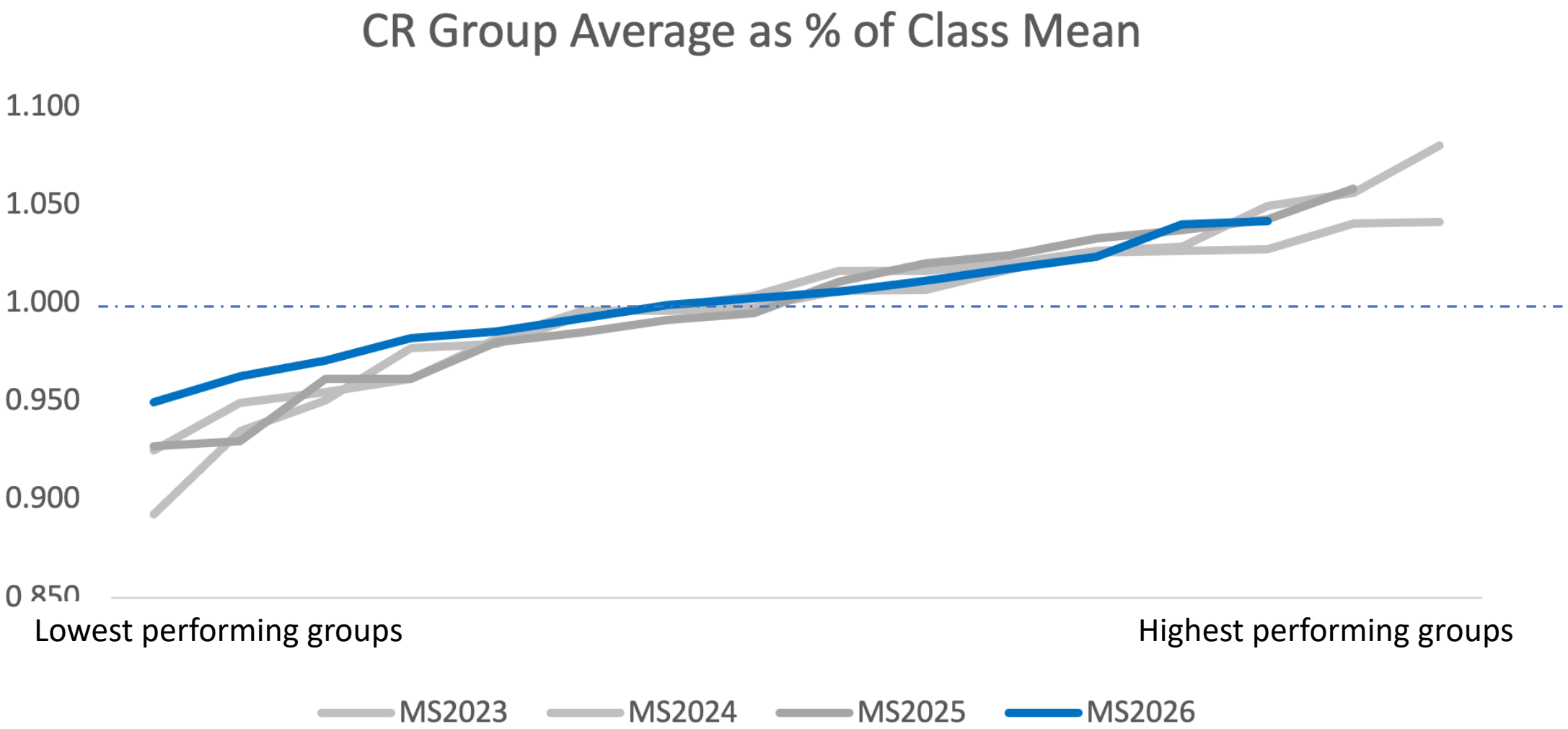
CBH Group Mean NBME Scores in Ascending Order



CBH Group Average NBME as % of Class Mean (Normalized)



Highlight: MS2026



Study Limitations

- Two interventions make it difficult to discern which is impacting outcomes.
- Two different methods for establishing CBH groups.
- MS2024 learned virtually, so content delivery and limited lab exposure for that cohort likely influenced outcomes.
- MS2023 had different instructors than the other 3 cohorts.
- For MS2025 and MS2026, tutors from previous cohorts tutored in the lab, possibly contributing to improved outcomes; however, if this did influence outcomes, it impacted only NBME scores and not lab or quiz scores.

Discussion/Next Steps

- Lowest performing students realized the most gains in NMBE scores. Higher performing students also saw modest gains after adding data from this iteration.
- Initial analyses suggest RPT may have had a stronger influence on outcomes than CBH.
- Self-reported MCAT scores are most predictive of block numeric score, but still not great.
- Follow cohorts to evaluate rates of delaying STEP I.
- Operationalize RPT/CBH for non-lab environments.

References

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