The Effect of Feedback on Multimedia Learning with Adjunct Questions

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Background

- Multimedia learning has already been a very popular learning tool in our daily life, and is getting more popular every year. [1]
- Multimedia learning, different from traditional learning methods, requires students to process information from both picture and words simultaneously. [2]
- Adding adjunct questions (i.e. pre-/post-questions) in materials can facilitate learning. [3]
- Feedback also effectively facilitate learning by correcting the previously wrong answers. [4]

Research Question & Hypothesis

Research Question: How would the various types of feedback and the different placements of adjunct questions impact the learning performance of video lessons?

Hypothesis:

1. Feedback that contains more details is more helpful than less detailed feedback (i.e. correctness: right/wrong) or no feedback.
2. The post-question may be generally more beneficial for learning performance than pre-question.
3. The effect of feedback may depend on the placement of adjunct questions (i.e. pre- or post-questions).

Method

Participants:
- N=361 undergraduate students from UCSD.

Design:

7 Conditions:		Feedback		
		No Feedback	**Correctness**	**Detailed**
Adjunct Question	**Pre-**	No Feedback, Pre-	Right/Wrong, Pre-	Detailed, Pre-
	Post-	No Feedback, Post-	Right/Wrong, Post-	Detailed, Post-
Control Condition		Video lesson without both adjunct questions and feedback		

Procedure:

Prior Knowledge Check → Video Lesson → Distractor: Tetris

Cognitive Load Check → Test: Short Ans & MC → Demographics & Debriefing

Materials

Prior Knowledge Vocabulary Rating: Check all of the following terms that you are confident you know and could explain (Before video)
Prior Knowledge Self-Rating: How much of the information in this lesson and on the test did you know <u>before</u> completing this study? (After video)

Video Lesson: TED. *How blood pressure works* (4:30):

Control | No feedback
Correctness | Detailed
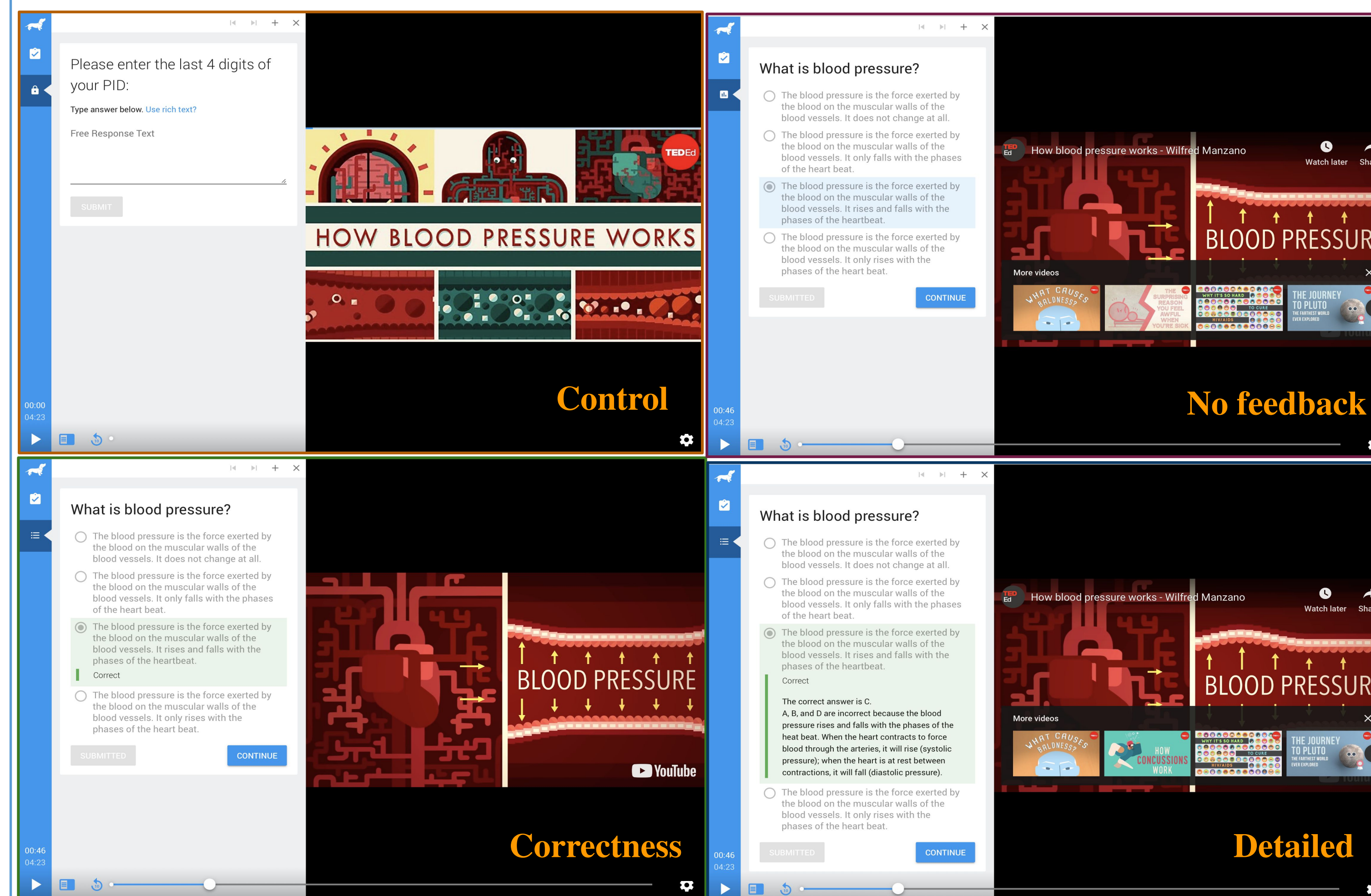
Short Answer test (5 Questions)
- Example #1: What is hypertension and how does it affect the body?
- Example #2: What is atherosclerosis? How does it form and why is it dangerous?

Multiple Choice test (15 Questions)
- Example #1: What is the healthy range of diastolic blood pressure?
  - 90-120 mm Hg
  - 60-80 mm Hg
  - 120/80 mm Hg
  - 140/90 mm Hg

Cognitive Load (7 items, 0-10 scale)
- **Intrinsic Load:** perceived complexity
  - *The topics covered in the lesson were overall very complex.*
- **Extraneous Load:** perceived clarity
  - *The explanations during the lesson were very unclear.*
- **Germane Load:** perceived effectiveness
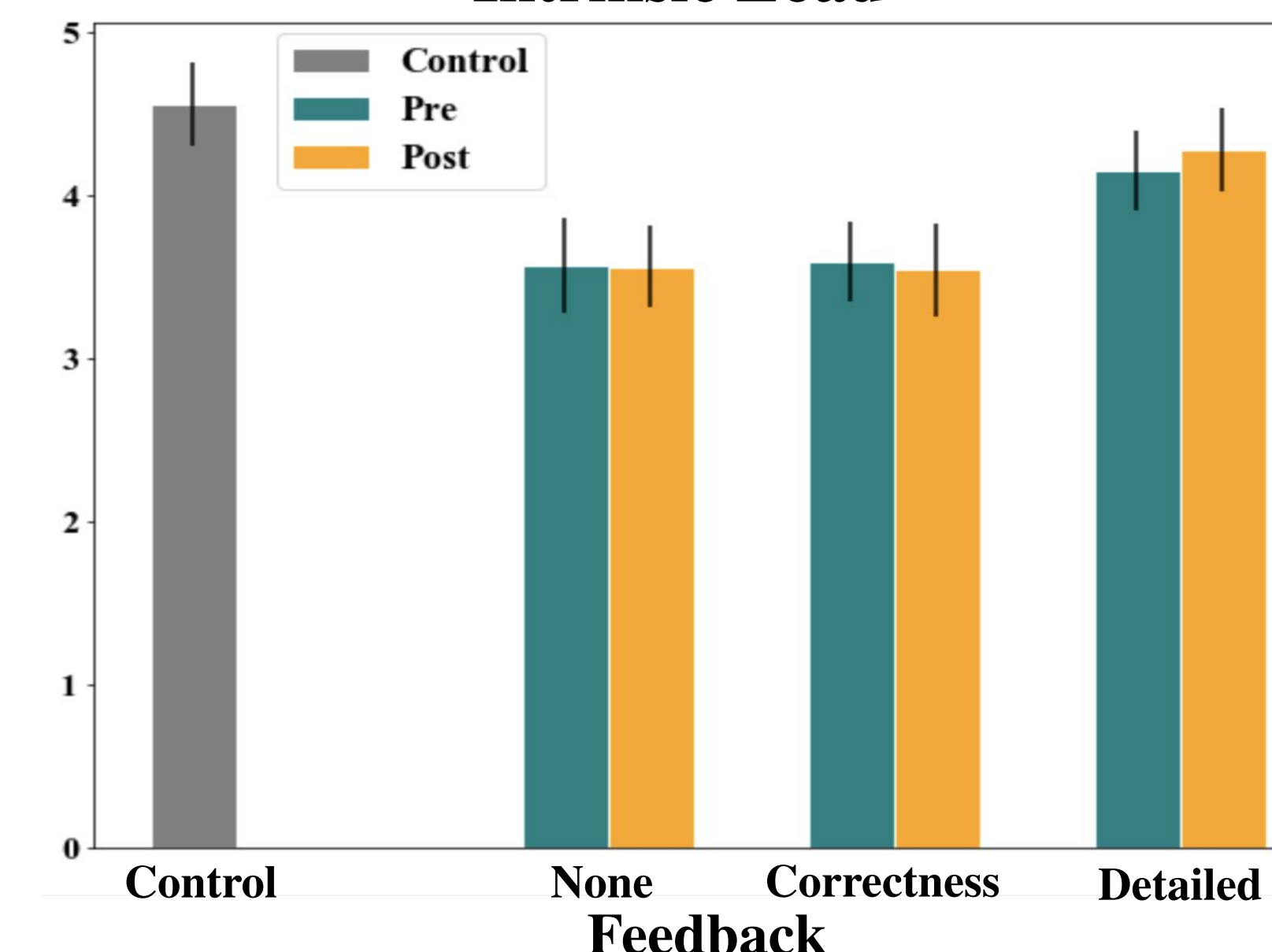 - *The lesson really enhanced my overall understanding of the topics covered.*

Results

Short Answer Score by Condition
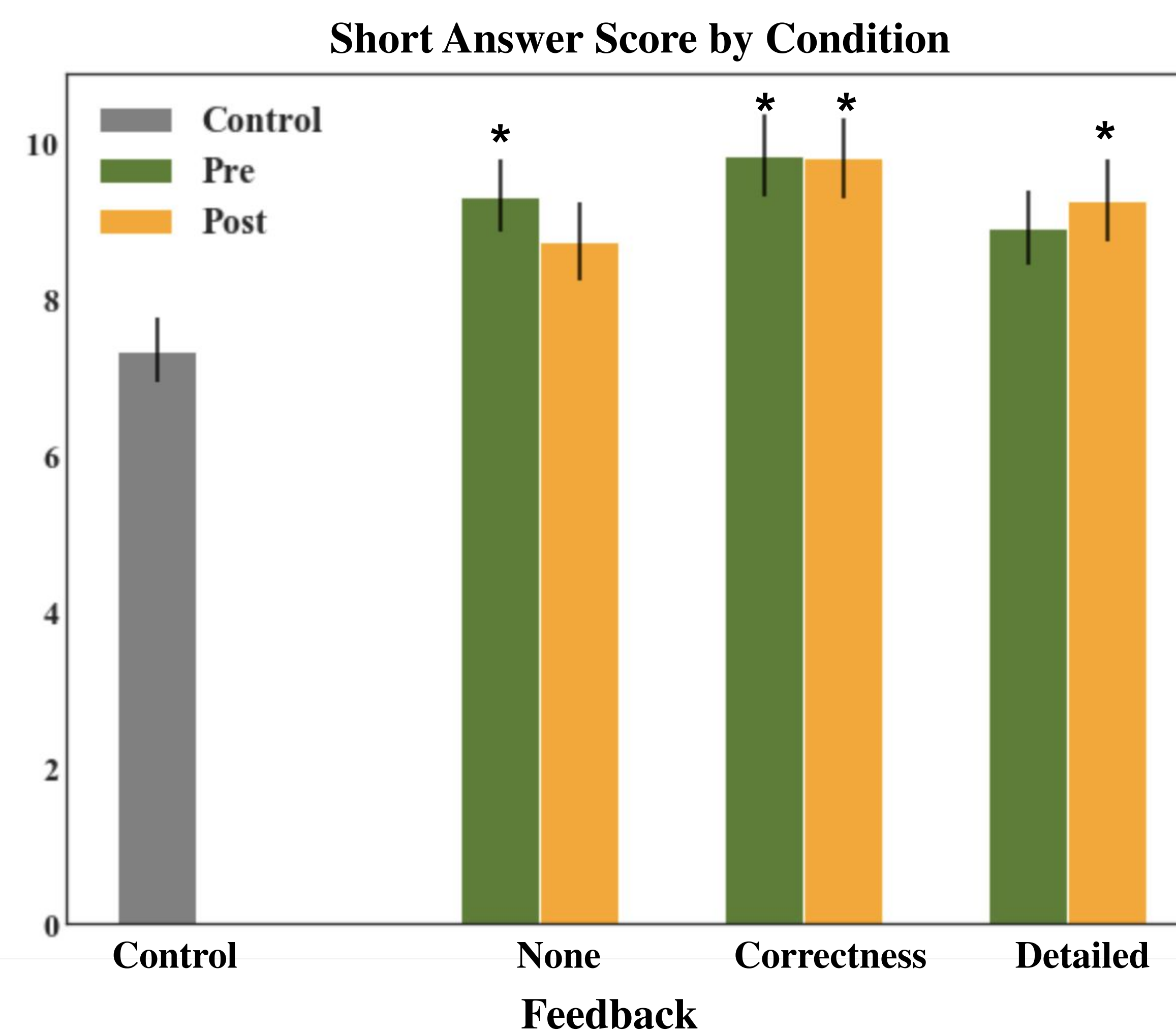
One way ANOVA: $F_{(6,354)}=2.980$, p=0.075*
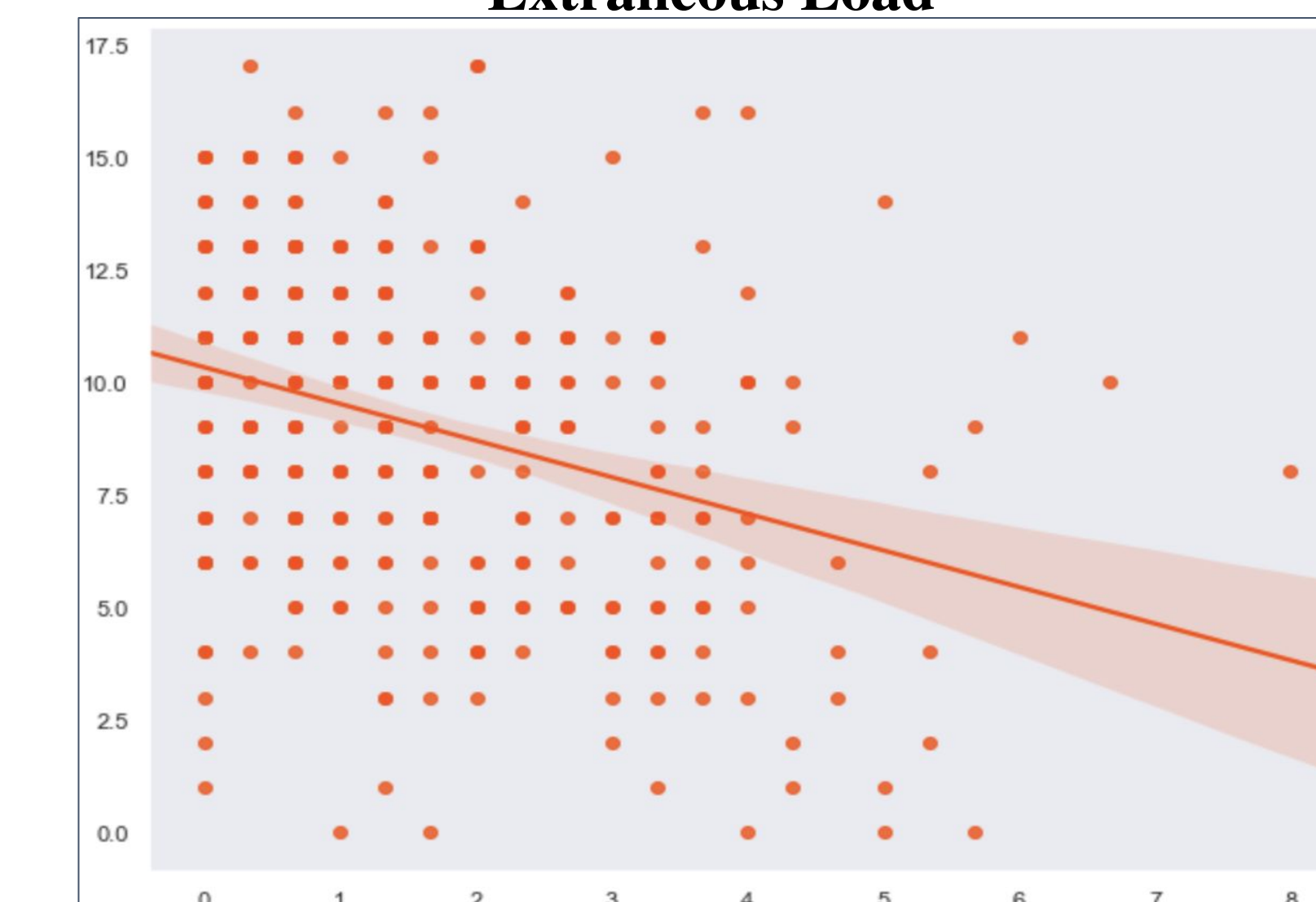Stars indicate significantly different from Control
Two way ANOVA is not significant

Intrinsic Load
Main effect of Feedback: $F_{(2, 2)}=4.178$, p=0.016*

Extraneous Load
Main effect of Extraneous Load: $F_{(1,357)}=21.68$, p<0.0001*

Discussion

Conclusion

In General:
- Adding adjunct questions can effectively facilitate learning.
- Types of feedback and question placement does not show any significant effect on learning.

For Short Answer Posttest:
- **Correctness feedback** condition was generally significantly better than that of the Control.
- **Pre-question+Detailed feedback** & **Post-question+None feedback** were not significantly better than Control.

For Cognitive Load:
- The only type of load that significantly different between conditions is **the Intrinsic Load**.
- **The Extraneous Load** is significantly correlate with the learning performance (i.e. short answer posttest score).

Limitation

- The detailed feedbacks are too long, and not adaptive to students' answer.
- The coding of the short response questions might be relatively subjective.
- Not standardized measurement of intrinsic, germane and extraneous load.

Future Direction

- Replace the cognitive load questionnaire to be one standardized version.
- Shorten the detailed feedback after each adjunct questions, try to provide more adaptive feedbacks (i.e. feedback based on individual's specific performance).
- Explore the delayed tests or delayed feedback.

Reference

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3. Hamaker, C. (1986). The effects of adjunct questions on prose learning. *Review of educational research, 56*(2), 212-242.
4. Huelser, B. J., & Metcalfe, J. (2012). Making related errors facilitates learning, but learners do not know it. *Memory & cognition, 40*(4), 514-527.
5. TED. (2015, Jul 23). *How blood pressure works* [Video file]. Retrieval from https://www.youtube.com/watch?v=Ab9OZsDECZw

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