



Scale of Confidence: Reflecting on our Time Together

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Background

Research strongly suggests that student self-confidence plays a key role in determining student academic success, performance, achievement, and persistence within STEM-related disciplines.

- Studies indicate that students' confidence levels are linked to their ability to succeed academically, including achieving higher grades (Moakler et al. 2014) and improving critical thinking skills (Cheng et al. 2020).
- Research by McMahan et al. (2014) shows that helping students become aware of "what they do not know" contributes to students' self-assessment skills and directly contributes to their academic success.
- Research has also found that students with lower academic confidence levels are more likely to avoid academic challenges and are less likely to gain academic achievement (Hedge, 2024).
- To measure student self-confidence levels, prior studies utilized numerical scales that provided students with the opportunity to access and rank their self-confidence levels. (Walsh et al. 2021) To measure student self-confidence levels, prior

These findings emphasize the importance of improving student self-confidence by integrating opportunities for students to self-assess confidence levels within academic settings.

Methodology

Participants:

- Students (n=59), enrolled in PAL courses for BIO 131 (Systemic Physiology) and BIO 26 (Anatomy and Physiology II)
- Within each subject, students were further divided into experimental and control groups
 - Control (n=29): no written reflection after completing scale worksheet
 - Experimental (n=30): additional written reflection after completing scale worksheet

Materials:

- Scale of Confidence worksheets (Figure 1)
 - Included an identifying number for anonymous tracking, their course (either BIO 26/131), their daily worksheets' topic, their academic year, and if they had taken another PAL class before this one

Procedure:

- On their own, students took 1-2 minutes to preview the day's PAL worksheet.
- Students then recorded their 'before' confidence rating.
- Students completed their assigned worksheet with their peers.
- Students recorded their 'after' confidence at the end of PAL class.
 - Students in the experimental group completed an additional written reflection (see Confidence Questions section).
- Students' forms are collected and their results are uploaded into an Excel file and statistical analysis was conducted on R

Reflection: Why do you think your confidence level changed or did not change since the beginning of class?

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Before

0 1 2 3 4 5 6 7 8 9 10

After

0 1 2 3 4 5 6 7 8 9 10

Date Class Topic Year Taken a PAL?

Figure 1. The scale sheet is given to students to fill out during the class period. One entry before starting their daily PAL worksheet and one entry after the daily worksheet has been completed.

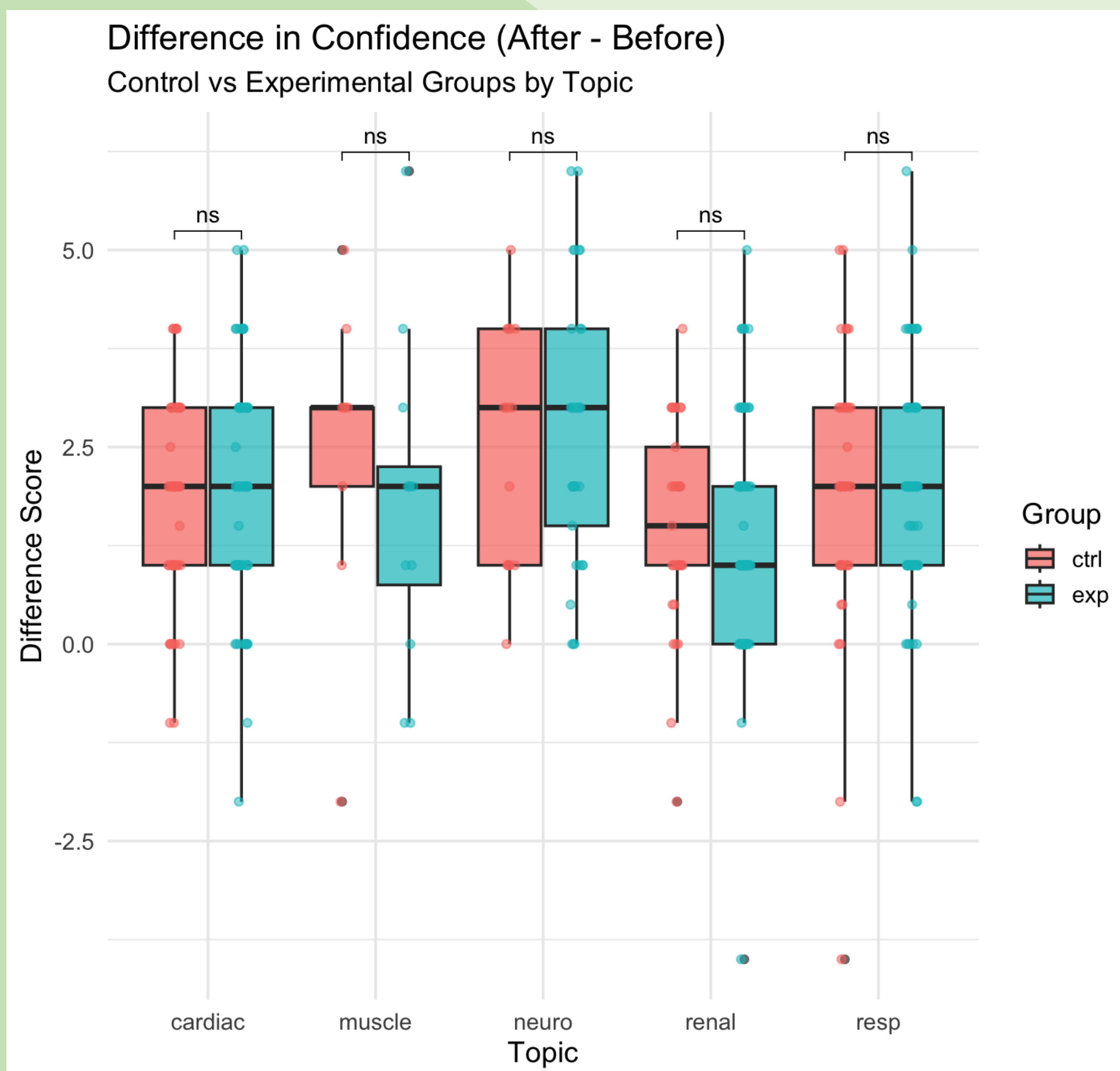


Figure 2. Figure 1. Box plots showing the difference in confidence scores (after - before) between control (ctrl) and experimental (exp) groups across the cardiac, muscle, neuro, renal, and respiratory (resp) topics. Individual data points are overlaid for each participant. Statistical comparisons between control and experimental groups within each topic were performed using independent t-tests; all comparisons were not statistically significant (ns, $p > 0.05$).

Summary of Reflections

There were **common themes** noted in the reflections, with a mix of increased and decreased confidence levels in students. The majority of findings behind an **increase in confidence** levels were: enhanced engagement between one another, asking questions with peers/facilitator, a respectful PAL environment, and studying outside of PAL. These reflections indicated a **positive influence** on their overall understanding of the course content. Students who reported a **decreased confidence level** reasoned that this was due to a **combination of disengagement with the material and peers**, as well as their **personal understanding** of the course content outside of PAL. A student having their lecture after their PAL section also played a role in their confidence level.

Increased confidence example:

"My confidence level increased because I was able to talk problems out with my classmates & ultimately strengthen each other's knowledge."

Decreased confidence example:

"My confidence level didn't change because I'm a bit behind on the lecture due to some personal stuff going on but I'm going to catch up on everything by the end of spring break."

Discussion

Confidence scores **increased** from before to after across all topics in both the control and experimental groups, as shown by the **predominantly positive difference scores**. Although the experimental group showed slightly greater median improvements in some topics, there was substantial overlap and variability between groups, and **no significant** differences were found within individual topics. Repeated measures ANOVA supported these findings. As expected, there was a highly significant main effect of time ($p < 0.001$, $ges = 0.209$), indicating that participants experienced increased confidence from before to after the intervention period overall. A significant main effect of group suggested that the control and experimental groups differed in overall confidence levels ($p < 0.001$, $ges = 0.043$); however, the **non-significant time \times group interaction** indicated that the magnitude of improvement over time did not significantly differ between groups ($p = 0.831$, $ges < 0.001$). Together, these results suggest that confidence improved regardless of group assignment, but the experimental condition did not produce greater gains than the control condition.

Several limitations may have influenced these findings. **Differences** in course level, student engagement, attendance, and outside studying could have affected confidence outcomes. Additionally, because confidence was self-reported, participants may have **response bias** or a desire to perceive themselves as more accomplished following the PAL sessions.

Acknowledgements

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References

