Dramatization of Starling Forces: An Interactive Learning Approach

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Introduction

VTCSOM is a modern hybrid medical school where student learning is facilitated through Active Learning approaches. When students are actively engaged during the teaching/learning process it promotes long-term learning (1). Furthermore, in regard to physiology courses, low retention of material can, in part, be attributed to passive lecturing (2).

Goal

To create a novel kinetic teaching approach to promote long-term learning and retention by engaging students as they physically mimic the movement of fluid in response to Starling Forces (Fig 1).

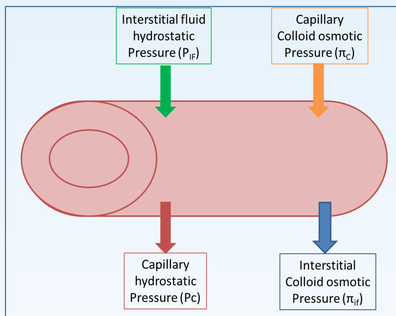

Figure 1: Starling Forces of the microcirculation

Net driving force = $K[(P_C - P_{IF}) - \sigma(\pi_C - \pi_{IF})]$
K = filtration coefficient (fluid)
σ = reflection coefficient (particles)

Case 2: Peripheral Edema

Ethyl Jones is a 80 year-old Caucasian female presenting with the "worst swollen legs of her life." She also complains of general fatigue which she attributes primarily to her age. Upon doing a pulmonary exam, her lungs are clear to auscultation bilaterally. Bilateral pitting edema is noticed in both legs as well as a jugular venous pulse with her head elevated 30 degrees. At the level of the microcirculation in her leg, in which direction is fluid pathologically moving to cause these symptoms.

Figure 2: Example of a clinical scenario

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Methods

- 26 students volunteered to participated and filled out a pre-activity survey.
- Several scenarios, ranging from simply evaluating numerical changes in Starling Forces to clinically-based vignettes, were used to illustrate the concepts of filtration and reabsorption within the microcirculation (Fig 1).
- Students were instructed to represent the movement of fluid in response to the different scenarios presented (e.g. edema, Fig 2) as they physically moved to mimic reabsorption into the capillary or filtration into the interstitium.
- A post-activity survey to assess knowledge acquisition and activity efficacy was administered.
- The surveys contained a combination of 11 short answer, multiple choice, and T/F questions regarding basic physiology, pathology, and higher level application of the effects of Starling forces on the microcirculation. The question order was randomized between pre and post activity surveys (Fig 3 and 4).

Results

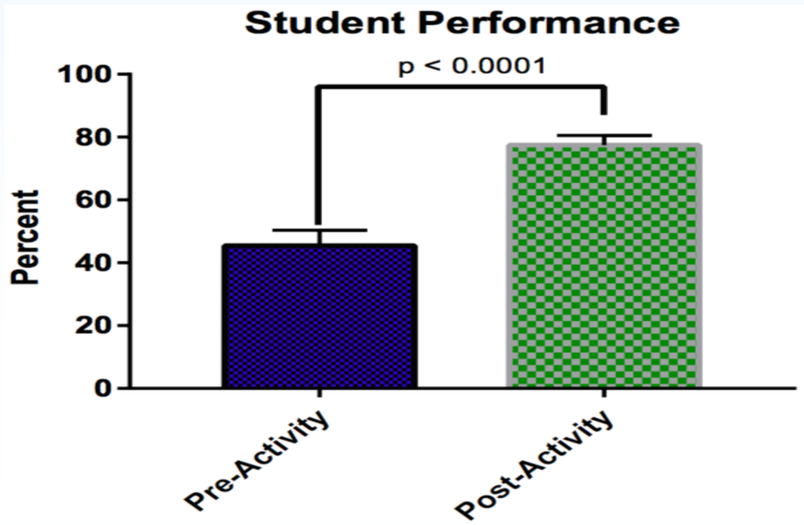

Figure 3: Overall Student Performance

Performance by Question

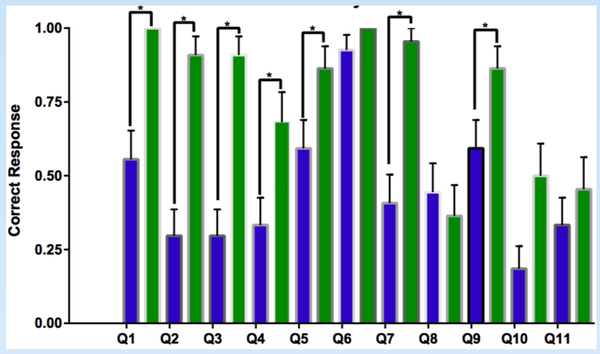

Figure 4: Pre and Post activity performance by question, including internal control (Q8) that was not covered in the activity

Discussion/Conclusion

Our preliminary data shows that this dramatization is effective in teaching an important concept, Starling Forces, to first year medical students, showing a statistically significant improvement.

Limitations and Future Directions

Due to the small sample size, the activity needs to be tested with larger group to better evaluate activity effectiveness. Next, we will compare performance outcomes between two groups: Control Group in which students are taught via a traditional lecture and the Activity Group in which this kinetic learning approach is used. Results will be compared to determine if this approach is superior to traditional teaching methods.

References

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2. Richardson, DR. Comparison of naïve and experienced students of elementary physiology on performance in an advanced course. *Advances in Physiology Education* 23:91-95, 2000.

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