

Portable Measurement of Clinical Decision Making

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INTRODUCTION

- Everyday, clinicians make erroneous decisions that lead to misdiagnoses¹
- These decisions range from confident decisions that are fast and intuitive, to uncertain decisions that are slow and analytical^{1,2}
- Intuitive decisions are often based on pre-existing biases, creating a source of error for clinicians faced with rare cases^{1,2}
- With analytical thinking, cases are approached critically, often leading to increased accuracy of diagnoses^{1,2}
- However, if clinicians fail to recruit analytical thinking, learned biases will lead to incorrect diagnoses of rare cases

METHODS

- 24 undergraduate students with no medical experience learned to diagnose patients with one of two liver diseases while we recorded electroencephalographic data with a portable EEG system.
- Each trial featured a patient and 10 corresponding physiological readings
- Once participants learned to diagnose patients (Phase 1), they were presented with typical and rare cases (Phase 2)
- Whereas intuitive thinking would result in accurate diagnoses for typical cases, it would lead to misdiagnoses for rare cases

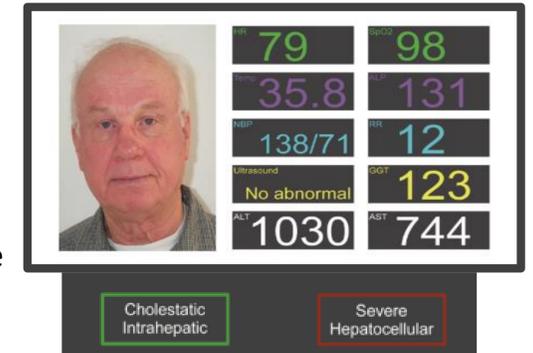


Figure 1. Example of patient card.

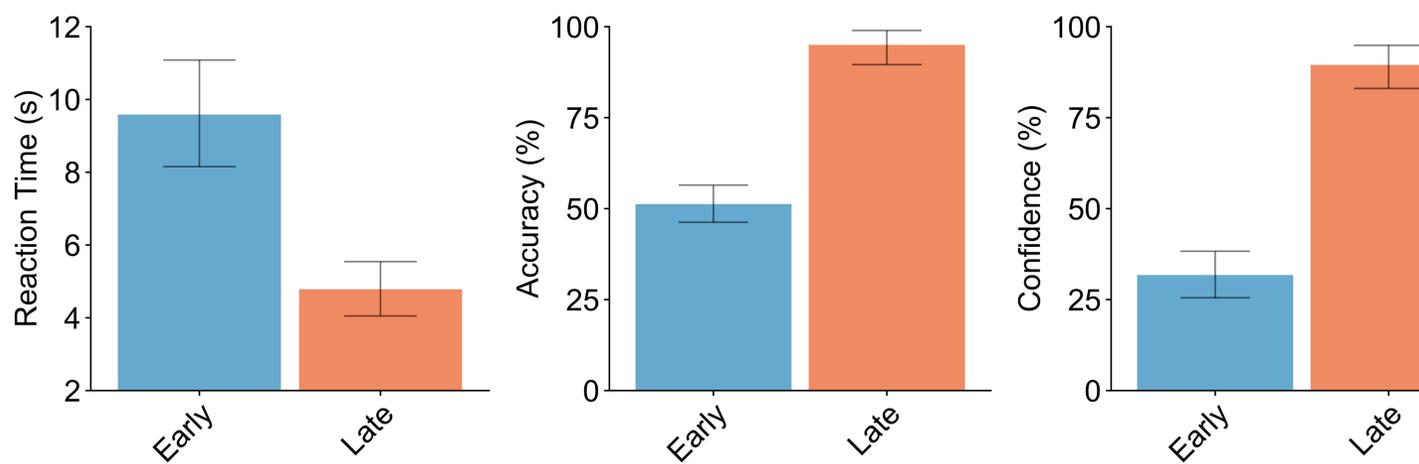


Figure 1. As participants learned, they displayed decreased reaction time and increased accuracy and confidence, demonstrating they were able to learn to diagnose patients

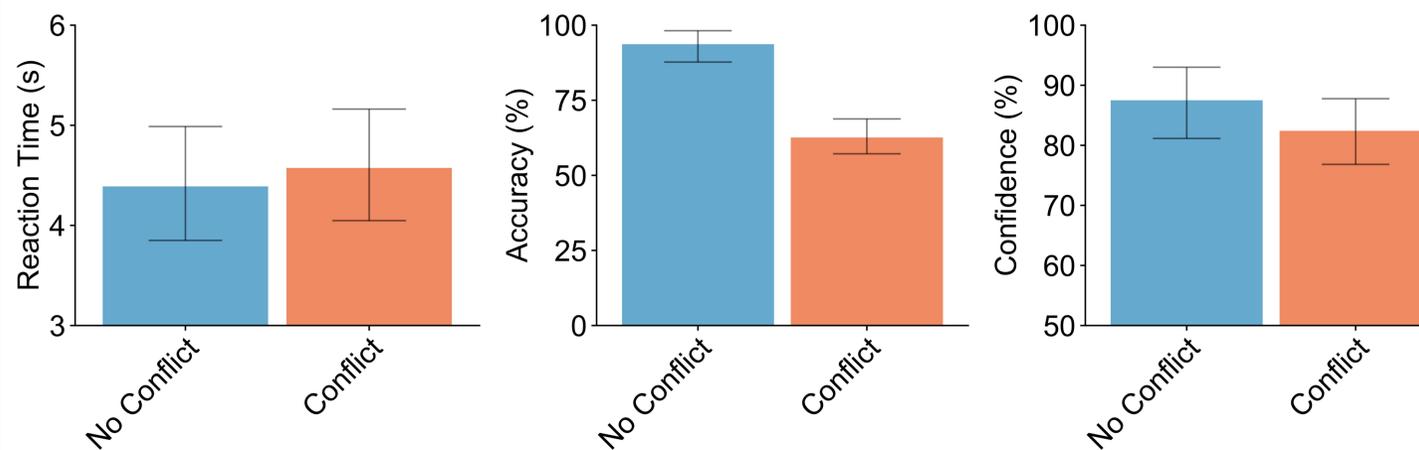


Figure 2. Participants had increased reaction time and decreased accuracy and confidence rating for cases that conflicted with their previously learned values.

RESULTS

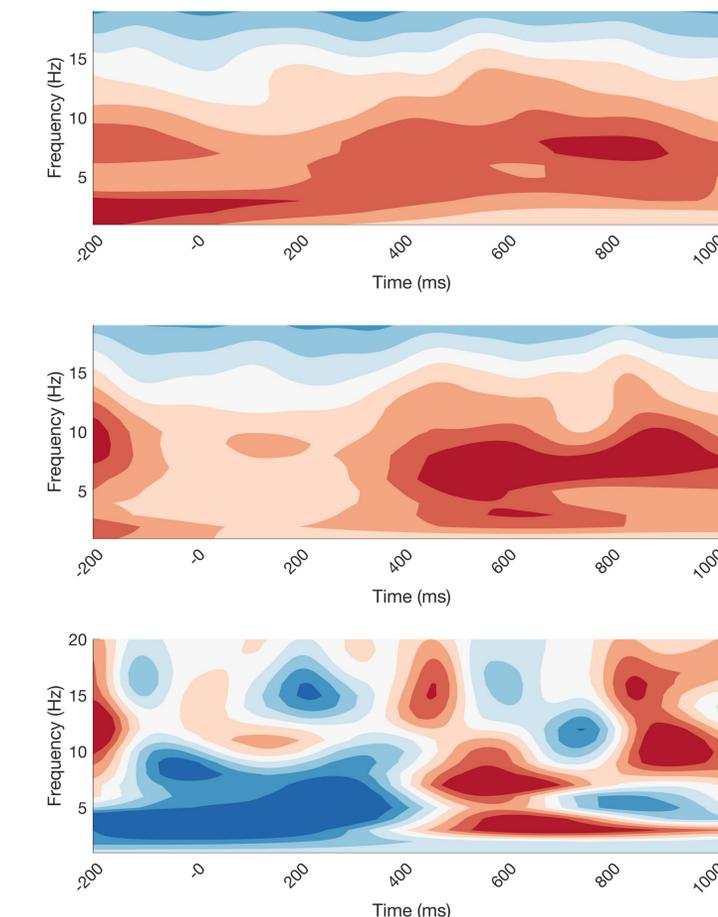


Figure 3. Wavelet data for the non-conflict and conflict conditions, and the difference between the two.

CONCLUSIONS

In Phase 1, participants were able to learn how to diagnose patients which formed biases about what values were important

In Phase 2, when presented with cases that conflicted with their learned values, they had similar reaction times and confidence in their decisions, despite a decrease in accuracy

Our results indicate that after forming biases about liver disease indicators, participants failed to switch to analytical thinking to diagnose rare cases

Decision-making strategies like this can contribute to the persistence of clinical diagnosis errors, and education about biases may help inform medical education

1. Crosskerry, P. (2009). A Universal Model of Diagnostic Reasoning.
 2. Norman, G.R. et al. (2017). The Causes of Errors in Clinical Reasoning: Cognitive Biases, Knowledge Deficits, and Dual Process Thinking