

Fuzzy trace theory predicts paramedic diagnostic decisions better than fast and frugal heuristics in simulated patients

Background

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Paramedics make diagnostic decisions under ambiguity. Accurate diagnosis by paramedics has been shown to improve outcomes for patients but little is known about the cognitive processes that facilitate this (Mosley et al., 2007). Fuzzy trace theory (FTT; Corbin, Reyna, Weldon, & Brainerd, 2015) and fast-and-frugal heuristics (FFH; Hafenbrädl, Waeger, Marewski, & Gigerenzer, 2016) offer competing explanations for decision making under ambiguity. Australian paramedics (n=129; median 13 years experience) and undergraduate paramedicine students (n=127) participated in two experiments.

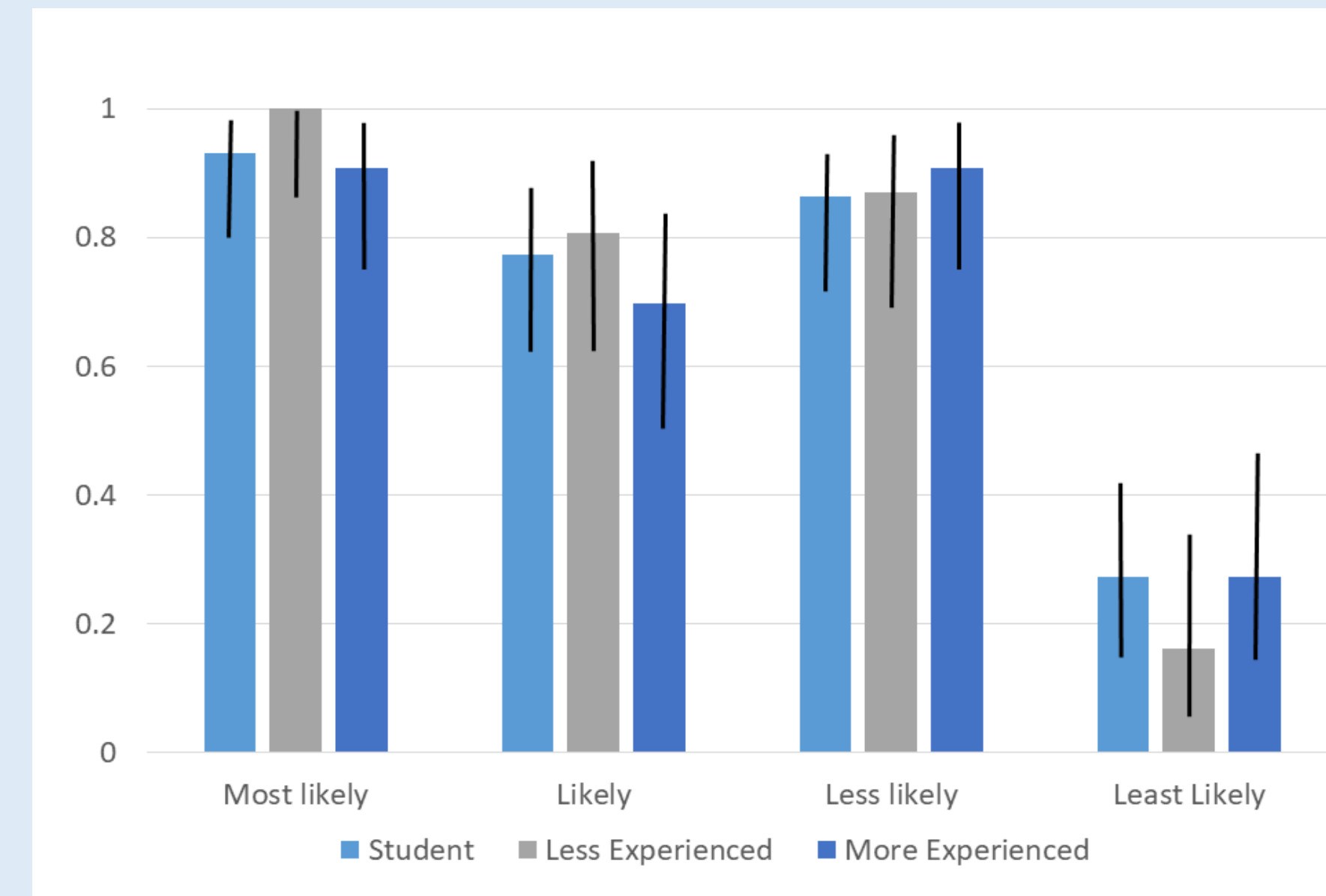
Experiment 1: Method & Results

Participants saw four brief vignettes, with simultaneous completion of an unrelated task under time pressure.

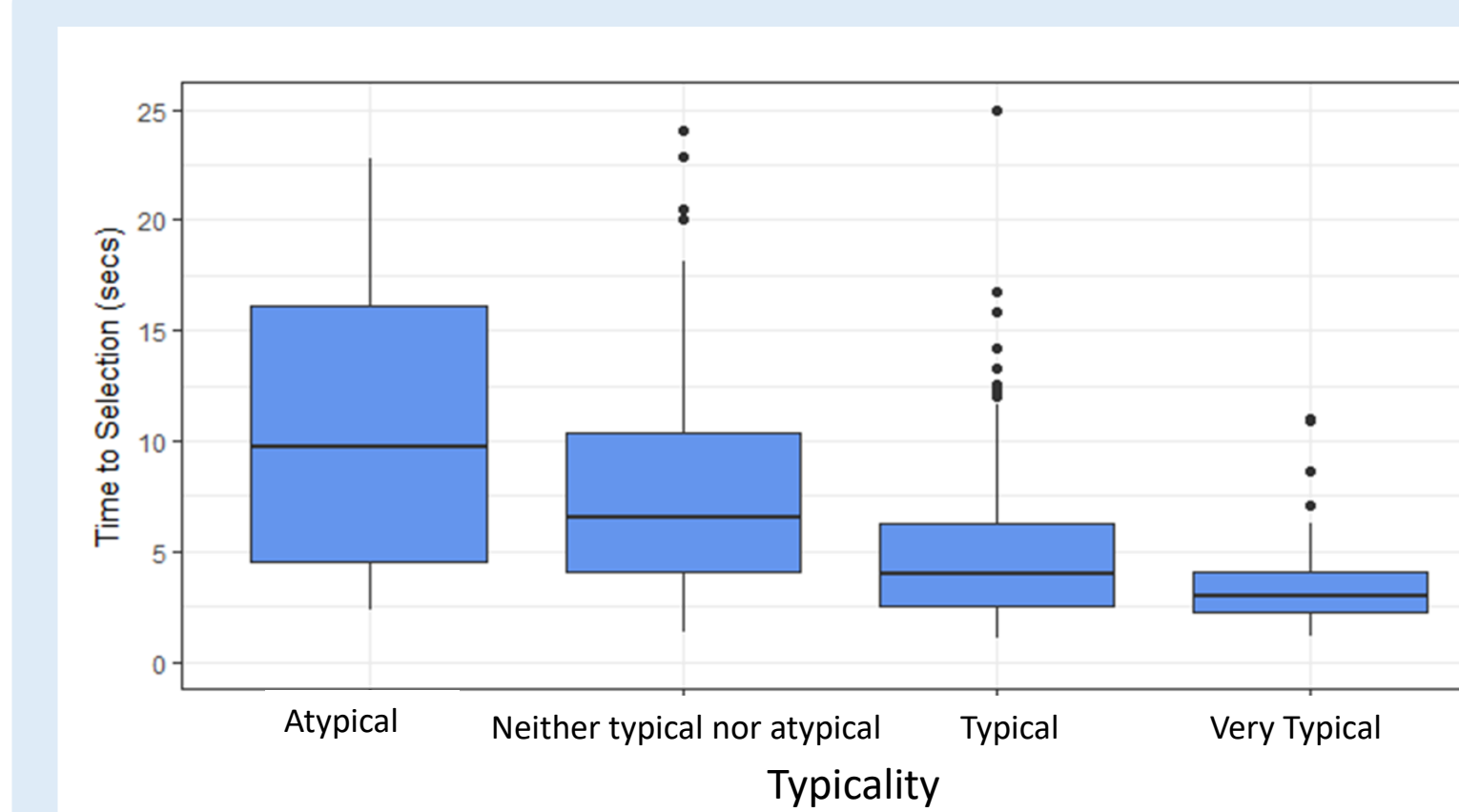
Vignettes varied the statistical likelihood of a diagnosis of Acute Coronary Syndrome (ACS; Colbeck, 2016).

In both experiments, participants recorded their impression (and in Experiment 2, final diagnosis), and rated their confidence and perceived typicality of the vignette using 5-point ordinal scales.

Using linear mixed models, objective likelihood predicted initial impression but there was no effect of experience (Figure 1). Perceived typicality did not predict impression but did predict the time taken to record an impression (Figure 2).



← **Figure 1** Proportion (95%CI) of participants with first impression of ACS by objective likelihood (more experienced had > 13 years experience).



← **Figure 2** Time taken to record first impression by subjective typicality.

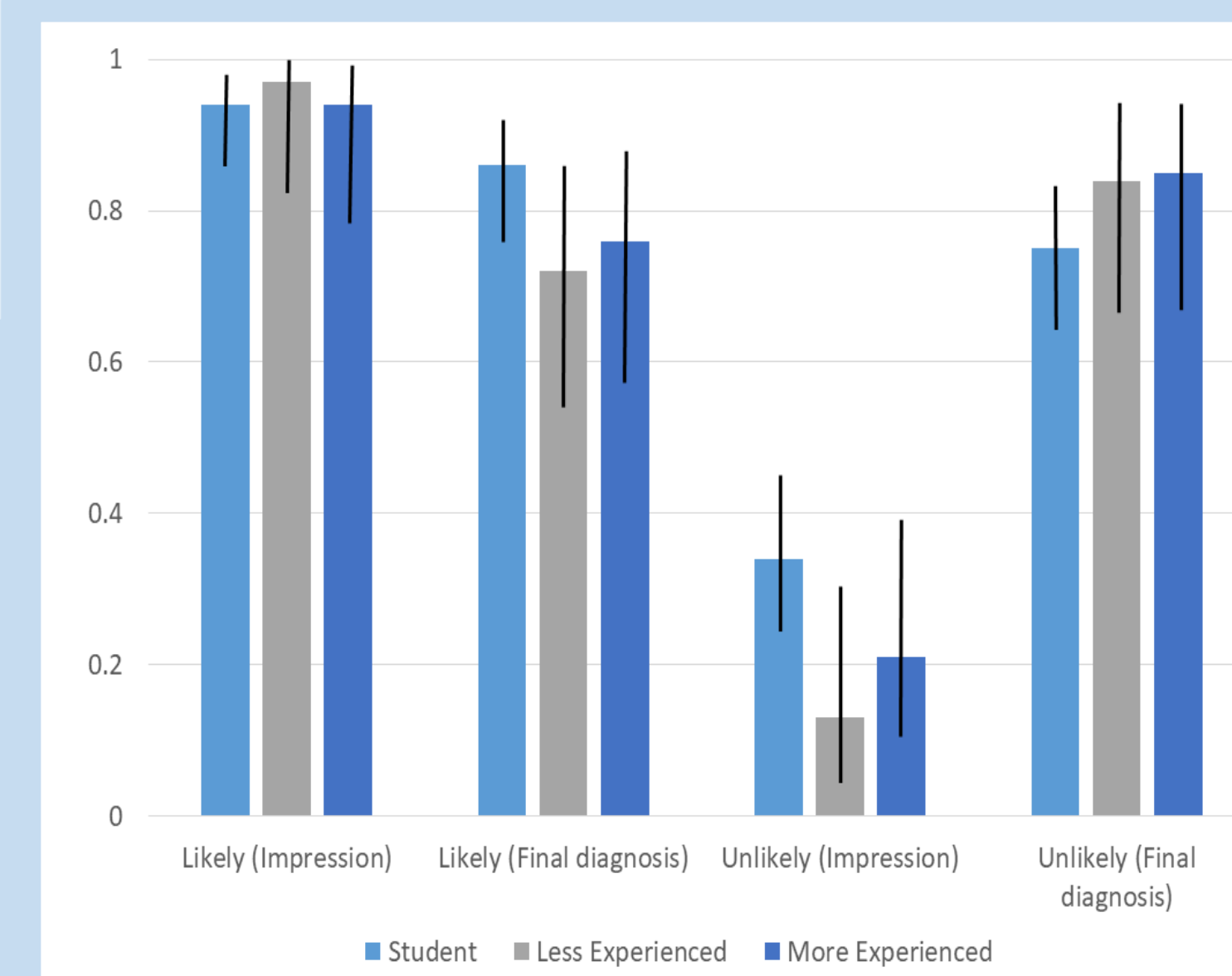
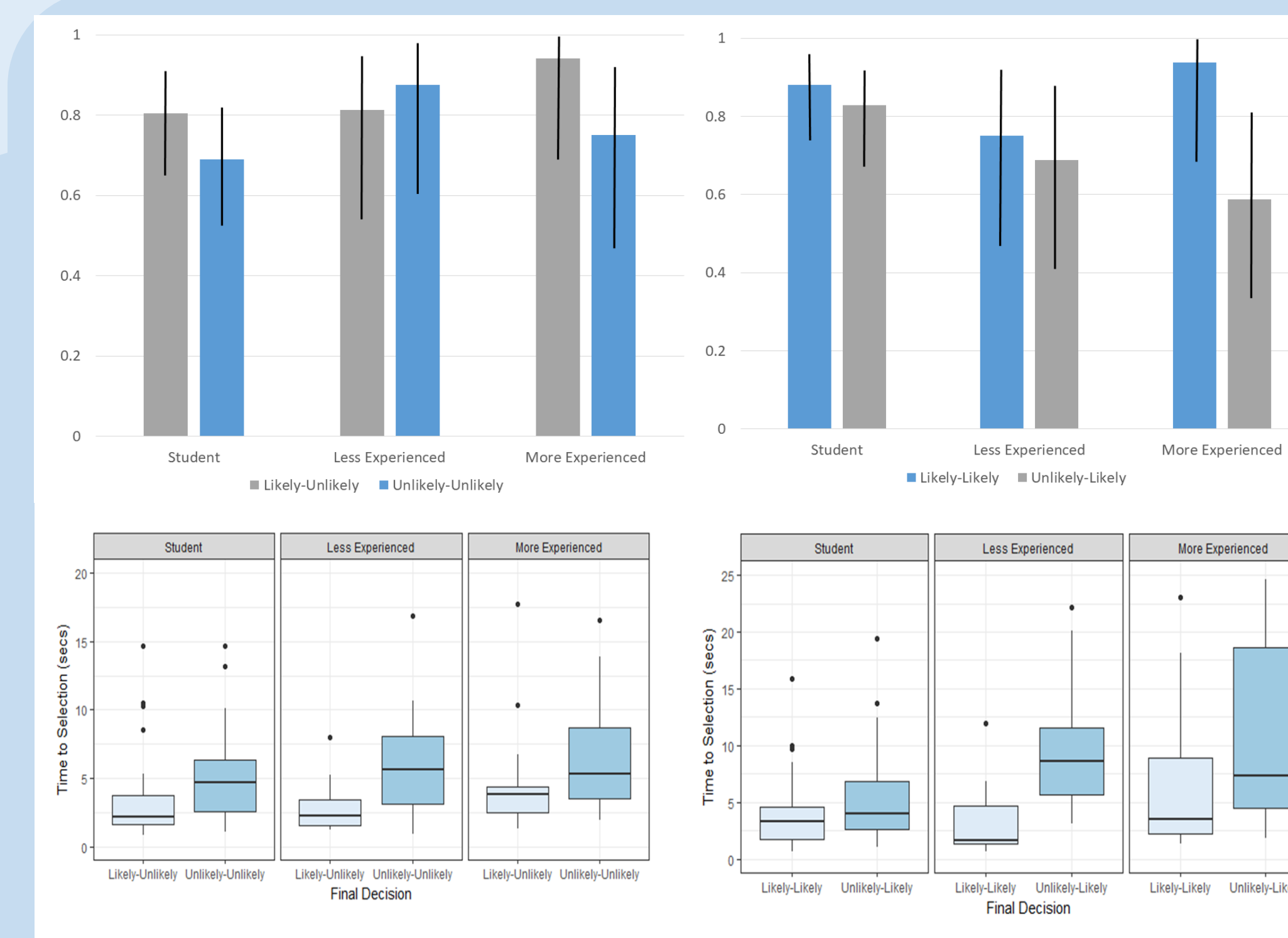


Figure 3→

Proportion (95%CI) of participants with first impression (likely vs unlikely) and final diagnosis (likely vs unlikely) of ACS by objective likelihood.



Experiment 2: Method & Results

Participants saw 2 two-part vignettes to compare impression (time pressure and distractor task) and final diagnosis (no time pressure, no distractor). The likelihood (likely vs unlikely) of ACS for each part of the vignettes was varied, resulting in 4 scenarios (i.e. likely-likely, unlikely-unlikely, likely-unlikely, unlikely-likely).

Using linear mixed models, objective likelihood predicted initial impression but not final diagnosis (Figure 3). Framing effects in which the initial impression altered the final diagnosis were observed in highly experienced paramedics but not for students or less experienced paramedics. Framing effects were also observed on decision time in experienced participants (Figure 4).

← **Figure 4** Proportion (95%CI) of participants with final diagnosis of ACS and time taken to record final diagnosis by whether initial information seen was likely or unlikely to be ACS.

Discussion

The relationship between decision time and perceived typicality but not objective likelihood supports the notion of retrieval of mental representations to reach a decision, consistent with FTT. Highly experienced paramedics' final diagnosis was affected by their initial impression, something not seen in students or less experienced paramedics. FTT argues that as experience increases, paramedics will increasingly use gist to form their decisions, increasing their vulnerability to such framing effects. These studies, the first on paramedics, provide additional evidence for FTT in an applied setting.

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