# Thinking Deep, Thinking Shallow:
# The Role of Emotions and Cognitive Load on Decision Processes

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## Abstract

The rise of misinformation highlights the urgency of elucidating cognitive/emotional mechanisms driving deep versus shallow thought. The present experiments asked:

- **Will performance on the Applying Decision Rules task (ADR; Bruine de Bruin et al., 2007) decrease under cognitive load?**

- **Will the emotional state of decision makers influence performance on the ADR?**

Results revealed that decision makers under cognitive load made fewer accurate choices on the ADR than participants under no load (Study 1) and decision makers in an anger condition made fewer accurate choices than did participants in a neutral condition (Study 2).

### *Applying Decision Rules (ADR)* as a measure of Systematicity of Thought

**Original Scale:** Adult Decision-Making Competence Scale (ADMC; Bruine de Bruin, Parker, & Fischhoff, 2007)

**Measures:** 10-questions testing how well individuals are able to use different described decision rules.

### Example question

| Very Low | Low | Medium | High | Very High |
|----------|-----|--------|------|-----------|
| 1 | 2 | 3 | 4 | 5 |

|  |  | Picture Quality | Sound Quality | Programming Options | Reliability of Brand | Price |
|---|---|---|---|---|---|---|
|  |  | Features |  |  |  |  |
| DVD | A | 5 | 4 | 2 | 1 | $369 |
|  | B | 5 | 5 | 3 | 3 | $369 |
|  | C | 5 | 2 | 4 | 4 | $369 |
|  | D | 1 | 5 | 5 | 3 | $369 |
|  | E | 4 | 5 | 1 | 1 | $369 |

Brian selects the DVD player with the highest number of ratings greater than "Medium"

Which **one** of the presented DVD players would Brian prefer?

## Studies

### Study 1

#### Main Hypothesis
Individuals under cognitive load will show reduced accuracy in solving the Applying Decision Rules (ADR) questions compared to individuals under no cognitive load.

#### Method
**80 participants** were recruited on Amazon Mechanical Turk. 1-factor (cognitive load), 2 levels (no load vs. load) between-subjects design

**Cognitive Load manipulation** (Gilbert, Tafarodi, & Malone, 1993): A list of animal names scrolled across the screen while participants solved the ADR questions.
- **No Load condition**: Participants were told to ignore the string of names.
- **Load condition**: Participants were asked to click a button whenever the word "owl" appeared in the string of animal names.

#### Results
Participants in the cognitive load condition were *significantly less accurate on the* ADR task than participants in the no load control condition ($M_{load}$ = 5.13 vs. $M_{no\ load}$ = 6.36, $t(78)$ = 2.17, $p$ = .02).

**Accuracy on the ADR task by condition**
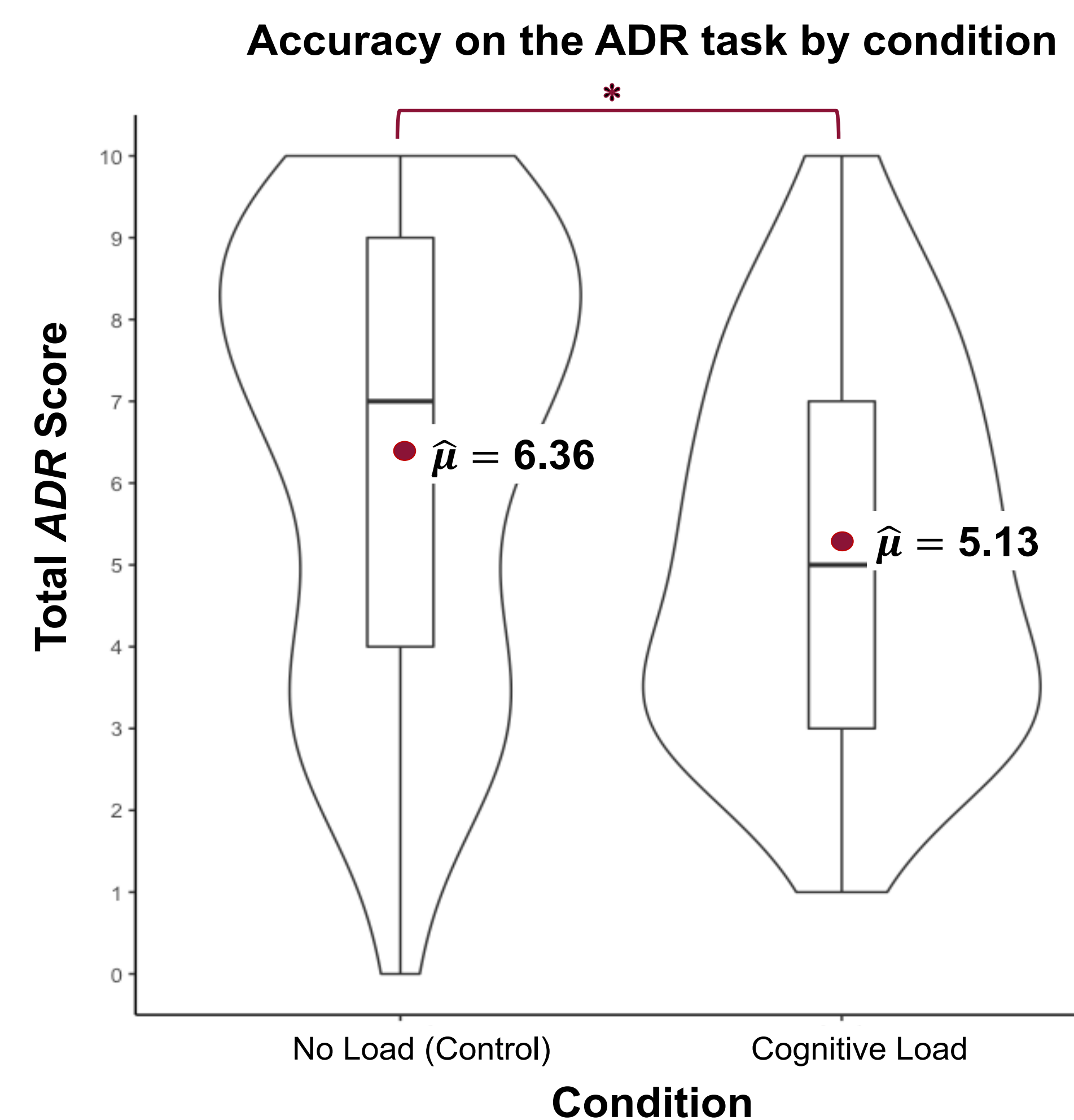


### Study 2

#### Main Hypotheses
- Individuals in the anger condition will show reduced accuracy in solving the ADR questions, compared to individuals in the neutral and sadness conditions.

- Individuals in the sadness condition will show improved accuracy in solving the ADR questions, compared to individuals in the neutral condition.

#### Method
**577 participants** were recruited on Amazon Mechanical Turk. 1-factor (emotion), 3 levels (neutral, anger, sadness) between-subjects design

**Emotion manipulation** (Small & Lerner, 2008; Dorison et al., 2020): Participants watched an approx. 2-min clip that elicits the target emotion. Then, participants wrote about a similar emotional experience.

#### Results
- Angry individuals performed worse on the ADR task compared to neutral-mood individuals ($M_{anger}$ = 3.20 vs. $M_{neutral}$ = 3.51, $t(574)$ = 2.30, $p$ = .01).

- Sad individuals showed reduced accuracy in the ADR task compared to neutral-mood ($M_{sadness}$ = 3.30 vs. $M_{neutral}$ = 3.51, $t(574)$ = 1.64, $p$ = .05).

**Accuracy on the ADR task by condition**
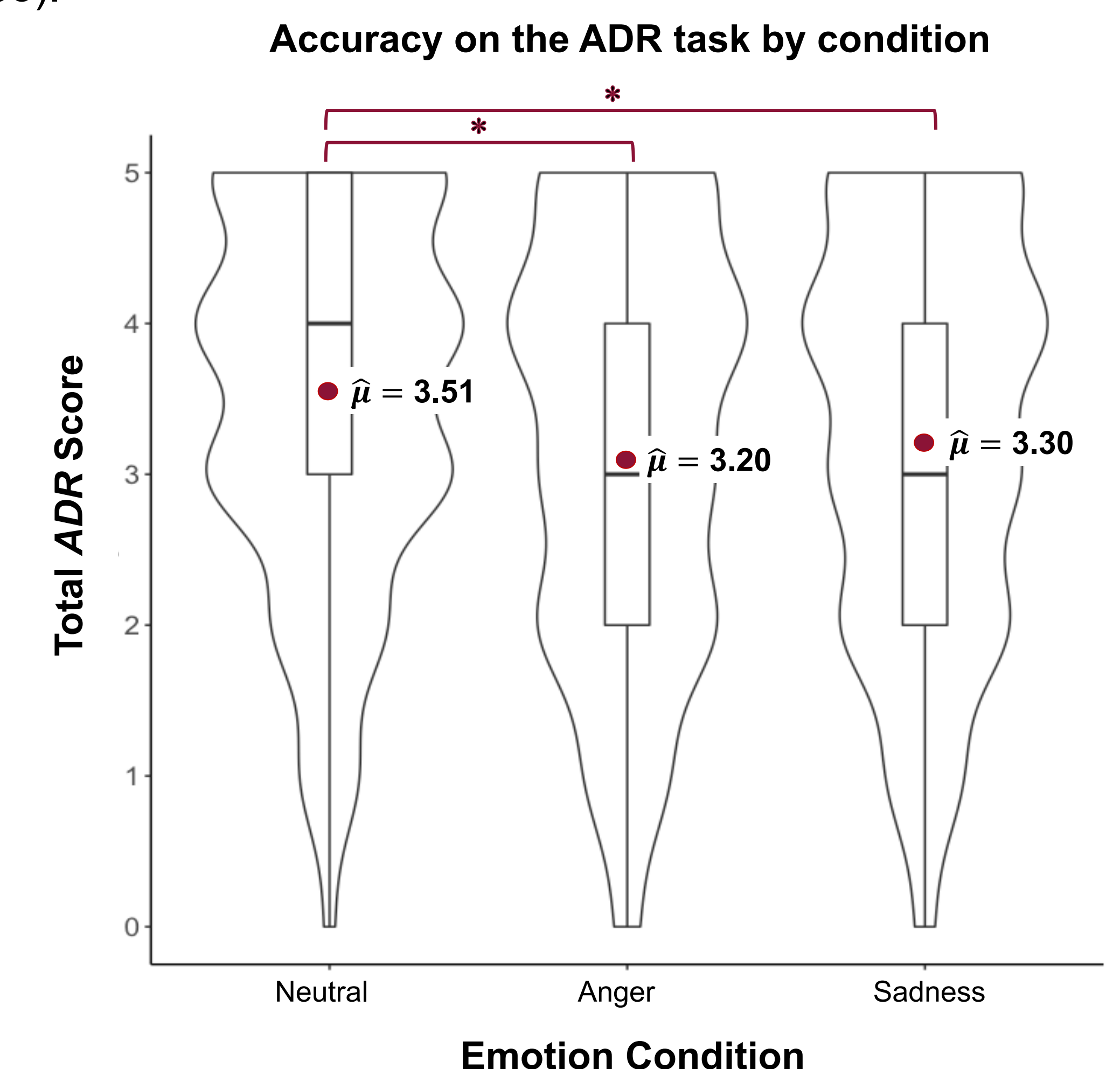


## Main Takeaways

- **Cognitive load** reduces performance on the Applying Decision Rules task, rendering it a potential paradigm for assessing depth of thought.

- **The emotional state** of decision makers can influence performance on the ADR task.

- **Angry decision-makers** are less accurate on the ADR task than neutral-mood decision-makers. (Study 2)

- **Contrary to our predictions,** sadness reduced performance on the ADR task in Study 2, though previous studies found sadness to trigger more systematic thought. Using an appraisal theory approach, one explanation for these findings may be that appraisals can have important implications for cognitive processing. For instance, sadness (and other emotions that fall towards the middle of the certainty/uncertainty appraisal dimension) may promote systematic processing only when accompanied by an uncertainty appraisal. When accompanied by a sense of certainty, sadness may instead promote heuristic processing (Tiedens & Linton, 2001, *Study 4 findings*).

## References

Bruine de Bruin, W., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of personality and social psychology*, 92(5), 938.

Dorison, C. A., Wang, K., Rees, V. W., Kawachi, I., Ericson, K. M., & Lerner, J. S. (2020). Sadness, but not all negative emotions, heightens addictive substance use. *Proceedings of the National Academy of Sciences*, 117(2), 943-949.

Gilbert, D. T., Tafarodi, R. W., & Malone, P. S. (1993). You can't believe everything you read. *Journal of personality and social psychology*, 65(2), 221.

Small, D. A., & Lerner, J. S. (2008). Emotional policy: Personal sadness and anger shape judgments about a welfare case. *Political Psychology*, 29(2), 149-168.

Tiedens, L. Z., & Linton, S. (2001). Judgment under emotional certainty and uncertainty: the effects of specific emotions on information processing. *Journal of personality and social psychology*, 81(6), 973.