



Decreasing participants' cognitive load while taking surveys under IRT

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Introduction

- Item Response Theory (IRT) was developed to enhance the amount of information researchers obtain from the construct of interest. One of the most common methods for increasing the amount of information provided by each item is to eliminate or collapse unused response options.
- In order to maximize survey information, the final survey will contain only relevant categories, and therefore will have different item response options (3-point, 4-point, etc.) within one survey.
- From the participants perspective, the new survey may increase cognitive load, which in turn can confuse participants, alter participants responses, and possibly even decrease the information provided by each item.
- The present study investigates various strategies for reducing participants cognitive load while taking surveys reconstructed under IRT. Specifically, the present study investigates how variations in item order influence participants' cognitive load and by extension, their responses on items for scales.
- Hypotheses:** We hypothesize that scales with unorganized response options will be more cognitively demanding than scales that are organized in sets.

Methods

- Participants:** 317 participants were collected ($M_{age} = 25.14$, 70% female) in order to run the IRT analyses. Following analyses were based on a sample of 117 participants. Participants either received participation credit or monetary compensation for completing the experiment.
- Materials:**
 - Cognitive load:** Participants completed the Stroop task (Stroop, 1935) using the colors red, blue, green, and yellow.
 - Measures:** The following scales were used: the satisfaction with life scale (Diener et al., 1985); the scale of psychological well-being (SPWB; Ryff, 1995); the multi-dimensional emotion empathy scale (Caruso & Mayer, 1998); the emotion regulation questionnaire (ERQ; Gross & John, 2003); the emotional self-awareness scale (ESAS); and the emotional intelligence scale (Schutte et al., 1998).
- Procedures:**
 - Participants completed the the aforementioned survey and completed a pre- and post- cognitive load assessment with the Stroop task varying words and colors (see above).
 - The nominal response model (NRM) of IRT was applied to these scales using FlexMIRT 3.0.
 - After IRT analysis the experiment were conducted again with alterations to survey organization. Items were either presented in the original scale's presentation order thus mixing response formats or organized in sets based on the number of category response options (Figure 1).

Figure 1. Survey organization after IRT analysis

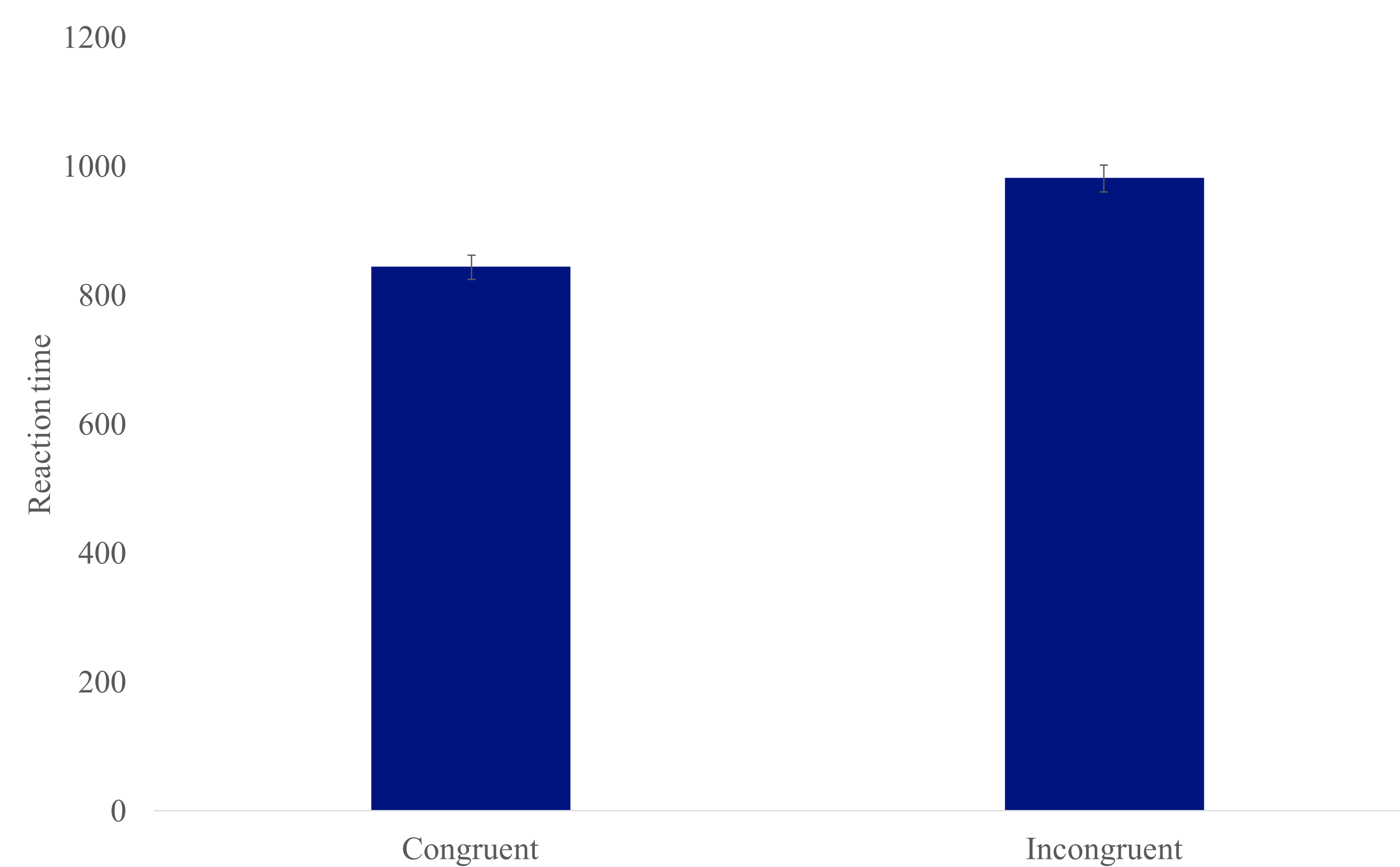


Figure 2. Mean reaction time between congruent and incongruent sets

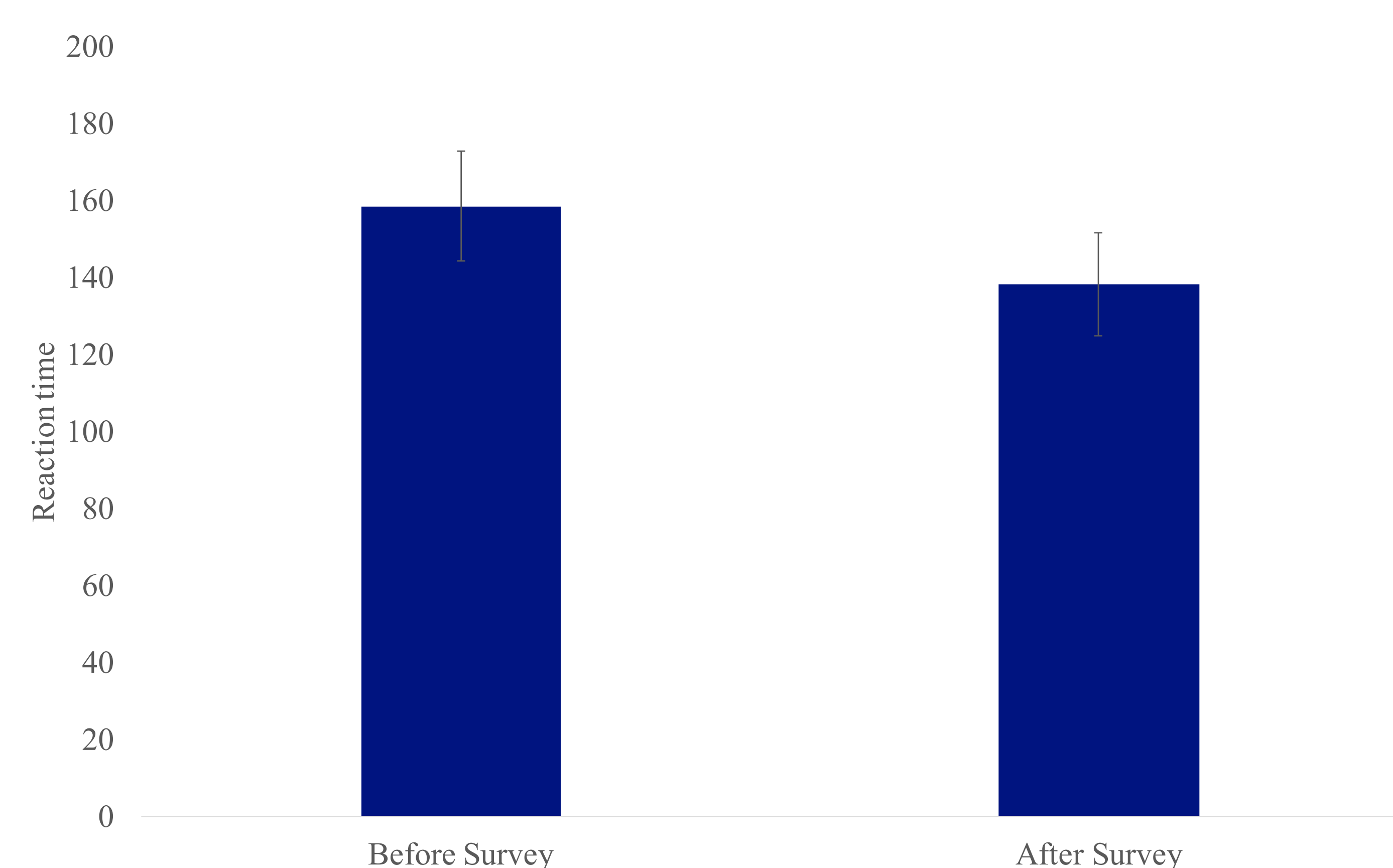


Figure 3. Mean reaction time between pre- vs. post- survey completion

Results

- Participants mean response time comparison between congruent and incongruent sets were significantly different, , $t(73) = 11.19$, $p < .001$.
- There were no differences between reaction time before and after IRT was implemented, $t(57) = .24$, $p > .05$ (see Figure 2).
- There were no differences on reaction time before and after taking the survey, $t(46) = .24$, $p > .05$ (see Figure 3).
- There no differences in mean accuracy, $t(57) = .16$, $p > .05$ (see Figure 4).

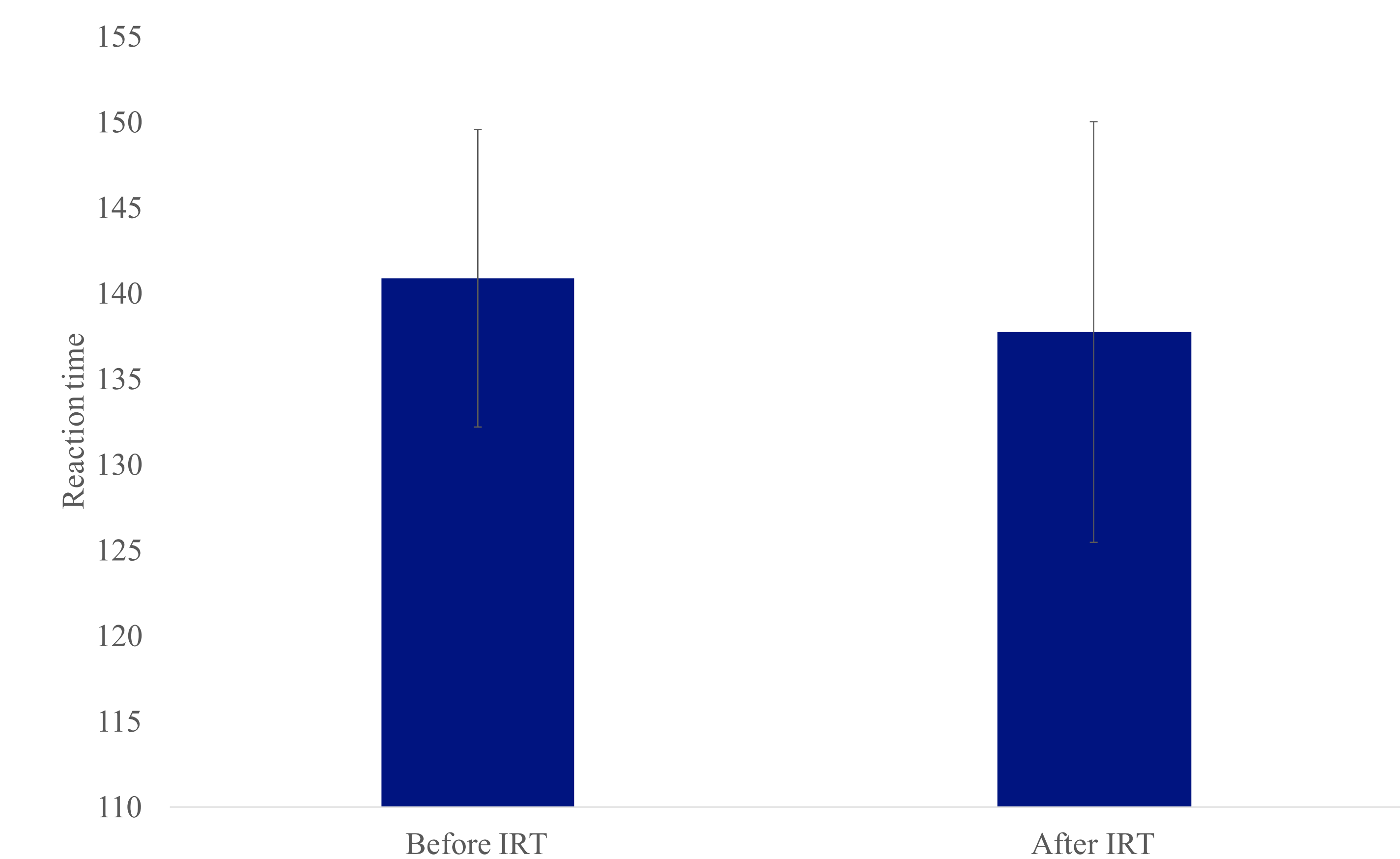


Figure 4 Mean reaction time between pre- vs. post- IRT created survey

Discussion

- Participants are generally resilient to changes in survey structure and organization.
- This finding suggests that survey creators need not worry about the order and structure of their surveys because it has little to no effect on participants.

Limitations

- This was a between subjects design, which may not have been able to capture the nuances in the effect. Further, it did not allow us to compare individual responses across conditions.
- Our original study had several difference item types which could have increased cognitive load in the first place.

Future Directions

- Researchers should investigate other ways in which their surveys are affecting participants (i.e.g., response labels)