

# QRTEngine: An easy solution for running online reaction time experiments using Qualtrics.

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- Performing **online behavioral research** is gaining increased popularity.

## The QRTEngine

- Does **not require specialized software or browser plugins**, making it suitable for use with Amazon Mechanical Turk.
- More **precise presentation timing** than regular JavaScript methods through the use of an HTML5 feature called “requestAnimationFrame” (rAF) to synchronize the onset of stimuli with the refresh rate of the monitor.
- Can be used by researchers who are not experienced programmers (Figure 1 & 2).
- Published **open-source**.

## Timing validation using external chronometry

- Stimuli were presented under different CPU and RAM load conditions and durations measured by a **photosensitive diode**.
- Across low-, medium-, and high-load conditions, a **timing accuracy** of the intended duration within the range of  $\pm 1$  **frame deviation was present in 97 % of the trials** (Table 1).

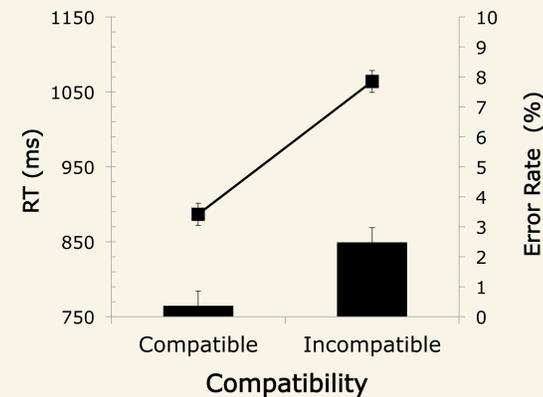
	Field 1	Field 2	Field 3	Field 4
1	red	red	r	congruent
2	blue	red	r	incongruent
95	green	green	g	congruent
96	yellow	yellow	y	congruent

Randomize loop order

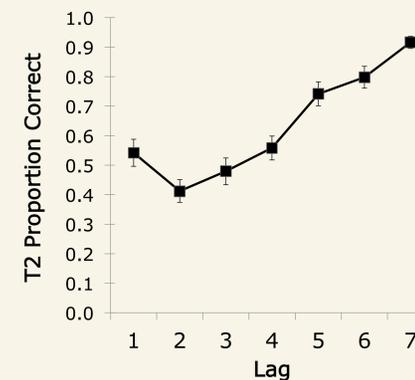
**Figure 1** ▶ Screenshot of a Qualtrics question block along with the JavaScript for each question. Each question represents a screen in the task.

**Figure 2** ▶ Screenshot of the Loop&Merge list.

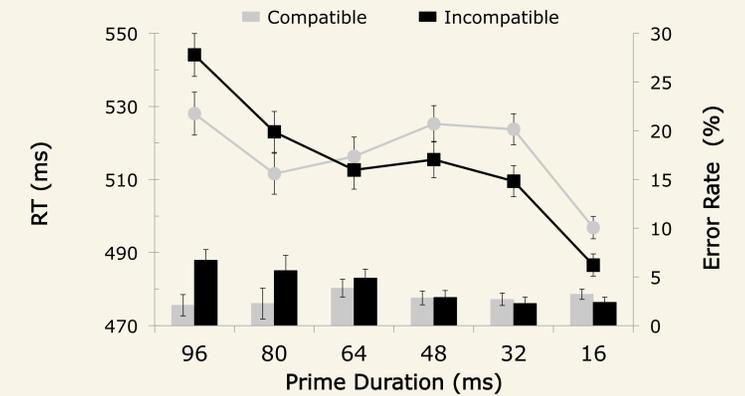
## Validation by reproducing classic Stroop-, attentional blink-, and masked priming effects.



**Figure 3** Reproduction of a classic Stroop effect.



**Figure 4** Lag 1 sparing indicating an attentional blink effect.



**Figure 5** Typical reversal of the compatibility effect for shorter prime durations.

**Table 1** ▶ Differences between intended, actual, and logged durations in the timing validation study.

System 1 = BTO laptop running Windows 7  
System 2 = Old MacBook Pro running OSX 10.5.8

	System 1				System 2			
Frames deviation	0	1	2	>2	0	1	2	>2
Low load	93.0 %	6.6 %	0.2 %	0.0 %	46.1 %	50.5 %	2.2 %	1.1 %
Med load	87.2 %	12.2 %	0.5 %	0.0 %	45.8 %	45.8 %	6.9 %	1.3 %
High load	91.9 %	7.2 %	0.8 %	0.0 %	49.1 %	46.3 %	3.8 %	0.5 %
Max load	59.1 %	32.7 %	3.6 %	4.4 %	48.6 %	42.2 %	7.7 %	1.3 %

```

1 QRTE.Init ({
2   // should correspond with Embedded Data field names
3   blockData: '${e://Field/QRTE_blockData}',
4   idData: '${e://Field/QRTE_idData}',
5   columnData: '${e://Field/QRTE_columns}',
6   exitQuestions: '${e://Field/QRTE_exitQuestions}',
7   exitItemTag: 'ExitQ', // equal to question-tag last question
8   blockId: "SimpleStroopRTBlock", // saved for analysis
9   onLoadFn: function () {
10    // set trial configurations for the screens
11    QRTE.setConfig("BlankInterval", "duration", 500);
12    QRTE.setConfig("StroopItem", "allowable", "rgyb");
13    QRTE.setConfig("StroopItem", "cresp", "${lm://Field/3}");
14    QRTE.setConfig("StroopItem", "EndAction", "TERMINATE");
15    // save trial configurations for later analysis
16    QRTE.setTrialData("StimulusWord", "${lm://Field/1}");
17    QRTE.setTrialData("StimulusColor", "${lm://Field/2}");
18    QRTE.setTrialData("CorrectResponse", "${lm://Field/3}");
19    QRTE.setTrialData("Congruency", "${lm://Field/4}");
20  },
21  interTrialDelay: [1000] // set interTrialDelay
22 });
          
```

## Results & discussion

- The QRTEngine can help researchers in **conducting online behavioral research in an accessible and efficient way**.
- Timing is partly dependent on the participant's web-browser: for older browsers, the timing is less precise.
- Exact control over Inter-Trial-Intervals is partly dependent on Qualtrics servers and the connection of the participant.

## Using QRTEngine

- [www.qrteengine.com](http://www.qrteengine.com)
- 60 Minutes is often sufficient for a novice to follow the tutorial in the supplementary material to build a Stroop task.
- Barnhoorn, J. S., Haasnoot, E., Bocanegra, B. R., & van Steenbergen, H. (2014). QRTEngine: An easy solution for running online reaction time experiments using Qualtrics. *Behavior Research Methods*.