iatgen: A Free, User-Friendly Package for Implicit Association Tests (IATs) in Qualtrics

Background

The Implicit Association Test (IAT; Greenwald et al., 1998) allows researchers to assess the strength of associations between pairs of targets (e.g., Black vs. White) and attributes (e.g., Good vs. Bad). The IAT has seen widespread use, for example, to study brand preference, social attitudes, morality, self-esteem, and many other social and cognitive concepts (e.g., Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Although web-based research is gaining popularity (e.g., Qualtrics, MTurk, etc.; Paolacci & Chandler, 2014), there is no easy way to run IATs in web surveys. Commercial IAT software is expensive, cumbersome, and does not integrate well with mainstream survey software. In response, we created iatgen, a free, easy-to-use tool for building and analyzing IATs via common survey software. It provides full integration with Qualtrics, automatic data cleaning and export, and is ideal for fast and online use.

iatgen

IATgen consists of IAT building and analysis tools in two R package and web applet format (https://apilabs.shinyapps.io/iatgen). How iatgen works: iatgen creates HTML and JavaScript files that are added into a special Qualtrics template to make a functional IAT. All stimuli are pre-loaded, so internet speed does not influence response time. By default, iatgen counterbalances left/right starting configurations of targets and attributes and uses a 40-trial washout block to avoid any order effects within the IAT (Nosek, Greenwald, & Banaji, 2005).

Building IATs:

• In R: The R interface offers more advanced features (e.g., custom number of trials per block and multi-IAT designs). Users simply run a script which generates HTML and JavaScript files, these are then manually copied into one of several sample templates. Although more work intensive, this provides greater flexibility in design and includes all the design advantages of the shiny applet.

Analyzing IATs:

IATgen processes the data via data-cleaning scripts, providing diagnostics such as reliability, error rates, drop counts, data reduction and Z-scoring (Greenwald et al., 2003), and data export. This can be done automatically via the web applet or manually in R. The R package offers greater flexibility (e.g., full counts, data reduction and D-score processes) and can be integrated into the survey flow. As IATgen creates HTML and JavaScript files that are added into a special Qualtrics template, it can be fully integrated into Qualtrics.

Reliability / Validity Samples

Data from studies using iatgen are included to demonstrate psychometrics. By default, iatgen cleans all data according to Greenwald et al. (2003) guidelines.

• Study 1: 2002

• Study 2: 2005

• Study 3: 2009

• Study 4: 2014

Results

• Data were analyzed for 3,629 separate IATs, generated using iatgen and run in Qualtrics.

• Key psychometrics are shown in Table 1. IATs exhibited acceptable psychometrics:

  - Reliability was acceptable, n-weighted average = .78.
  - Drop rates (dropped if critical block(s) > 10% of responses < 350 ms) were low at 2.3%.
  - Error rates (% of trials answered incorrectly) were low, n-weighted average = 5.1%.
  - Timeout rates (% of trials > 10,000 ms latency) were low, n-weighted average = 0.03%.
  - Most IATs correlated in theoretically predicted directions with explicit measures at predicted levels.

• Sample 3 was used to test iatgen’s multi-IAT tools and included two IATs (pleasure and preference) across 3 product replicates. IATgen scored the IAT separately for odd and even trials by product. CAEs were analyzed using the fear of for R. The two-factor model was supported across products (similar results were obtained for Samples 4–7.5).

• Mouthwash: Δ2(1)(c) = 1.18, p < .001, ΔABC = 74.50, ΔABC = 71.23.

• Batteries: Δ2(1)(c) = 61.89, p < .001, ΔABC = 59.89, ΔABC = 56.73.

• Ice cream: Δ2(1)(c) = 49.32, p < .001, ΔABC = 48.32, ΔABC = 44.02.

Conclusions

• IATs built using iatgen ran successfully in Qualtrics and exhibit appropriate psychometrics and correlations for explicit measures comparable with results of Hofmann et al. (2003). This explicit correspondence was also comparable to that reported in existing research (Hofmann et al., 2005). IATs in Qualtrics.

• IAT offers advantages over other IAT tools: it is free, flexible, and can be fully integrated into Qualtrics.

• For example, it was possible to randomize IAT content in Study 3 and to counterbalance the order of IATs / explicit measures in multiple samples.

• The ability to deploy multiple IATs and conduct CFA analysis on IATs is desirable, given the proliferation of IATs in the literature.

• Note: iatgen is still in development. Interested users should contact the first author at tcarpenter@spu.edu prior to use.

Figure 1. Left: an insect-flower IAT running in Qualtrics built using iatgen. Center: a same IAT being generated within the web applet. Right: the same IAT generated via an R build script.

Figure 2. An image-based IAT running in Qualtrics.

Table 1. Psychometric Properties of IATs Generated in IATgen in 5 Samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Target</th>
<th>Antigen</th>
<th>Positive</th>
<th>Negative</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
<th>(D)</th>
<th>(A – B)</th>
<th>(A – C)</th>
<th>(B – C)</th>
<th>(A – B – C)</th>
<th>(D – A)</th>
<th>(D – B)</th>
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<th>(D – A – C)</th>
<th>(D – B – C)</th>
<th>(D – A – B – C)</th>
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<tbody>
<tr>
<td>Sample 1</td>
<td>Dana Ice Cream / Personal Care</td>
<td>201.68</td>
<td>182.40</td>
<td>182.40</td>
<td>0.360</td>
<td>0.380</td>
<td>0.360</td>
<td>0.380</td>
<td>1.030</td>
<td>0.700</td>
<td>0.330</td>
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<td>0.120</td>
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<tr>
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<td>Dana Ice Cream / Personal Care</td>
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<td>182.40</td>
<td>182.40</td>
<td>0.360</td>
<td>0.380</td>
<td>0.360</td>
<td>0.380</td>
<td>1.030</td>
<td>0.700</td>
<td>0.330</td>
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<td>0.300</td>
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<tr>
<td>Sample 3</td>
<td>Dana Ice Cream / Personal Care</td>
<td>182.68</td>
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<td>182.40</td>
<td>0.360</td>
<td>0.380</td>
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</tr>
<tr>
<td>Sample 4</td>
<td>Dana Ice Cream / Personal Care</td>
<td>182.68</td>
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<td>0.360</td>
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<td>0.360</td>
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</tbody>
</table>

Note: *p < .05, **p < .005, ***p < .001. Reliability = estimate (split-half) based on even-odd trials with square-root corrected. Explicit measures by sample: Sample 1 = pro–attitude items (r) and anti-attitude items (n), Sample 2 = pro–attitude items (r) and anti-attitude items (n), Sample 3 = product preference and pleasure scales (reweighted as appropriate), Sample 4 = additional, reliable, and explicit health IAT stimuli focused on ice cream.

References


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