

An Introduction to Mechanical Turk



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Research

CV

Resources

Contact

Mechanical Turk Tutorial

[Amazon Mechanical Turk](#) is a website where you can post short tasks and have workers quickly and easily perform these tasks for small sums of money. It is ideal for running short psychology experiments, since it allows large amounts of data to be collected quickly and easily. While a slightly less controlled environment than running studies in the lab, running studies on Turk has a number of advantages. In particular, it allows experimenters to (1) collect enough data to ensure their studies are not underpowered, as psychology studies chronically are; (2) collect data from a sample that is much more diverse than local college undergraduates and much more representative of the US at large; (3) easily replicate studies before publishing them to ensure that effects are real and effect sizes aren't inflated.

I have personally run many studies on Mechanical Turk (for example, Brady & Alvarez, 2011, *Psychological Science*; Brady & Tenenbaum, 2013, *Psychological Review*). To help others run such studies, I've put together a series of tutorials to help experimental psychologists learn to code Turk studies using HTML, CSS and Javascript (with jQuery). These tutorials were

<https://bradylab.ucsd.edu/ttt>

<https://psyc241.ucsd.edu/>

Some of my work using all or mostly Turk data

Brady, T. F. and Tenenbaum, J.B. (2010). Encoding higher-order structure in visual working memory: A probabilistic model. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society* (pp. 411-416).

Brady, T. F. and Alvarez, G.A. (2011). Hierarchical encoding in visual working memory: ensemble statistics bias memory for individual items. *Psychological Science*, 22(3), 384-392.

Brady, T. F., and Tenenbaum, J.B. (2013). A probabilistic model of visual working memory: Incorporating higher-order regularities into working memory capacity estimates. *Psychological Review*, 120(1), 85-109.

Haberman, J., Brady, T. F. and Alvarez, G.A. (2015). Individual differences in ensemble perception reveal multiple, independent levels of ensemble representation. *Journal of Experimental Psychology: General*, 144(2), 432-446

Brady, T. F. and Alvarez, G.A. (2015). No evidence for a fixed object limit in working memory: Ensemble representations inflate estimates of working memory capacity for complex objects. *Journal of Experimental Psychology: Learning, Memory and Cognition*

Brady, T. F. and Alvarez, G.A. (2015). Contextual effects in visual working memory reveal hierarchically structured memory representations. *Journal of Vision*.

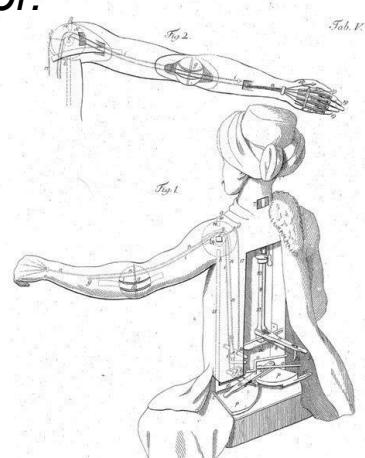
De Brigard, F., Brady, T.F., Ruzic, L. and Schacter, D.L. (2017). Predicting false memories: A simple learning manipulation of higher-order regularities to predict differences in false recognition rates. *Memory and Cognition*, 45(1), 105-120

The name Mechanical Turk comes from '*The Turk*' a chess-playing automaton of the 18th century

It toured Europe for 70 years, beating the likes of Napoleon Bonaparte and Benjamin Franklin.

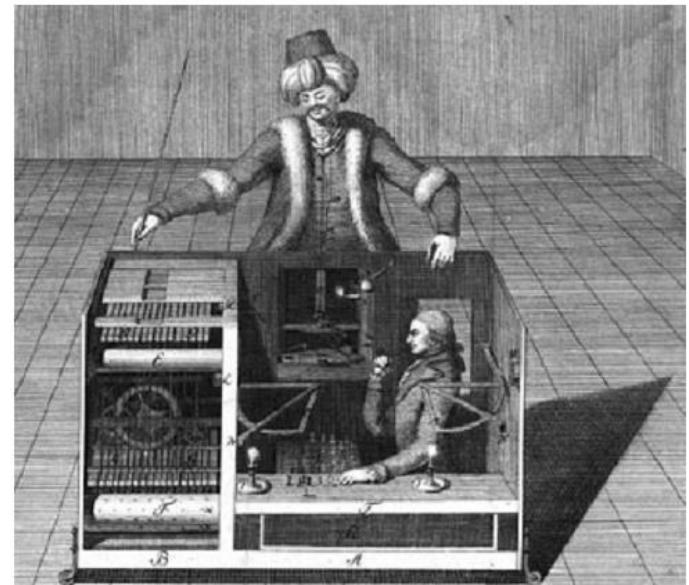
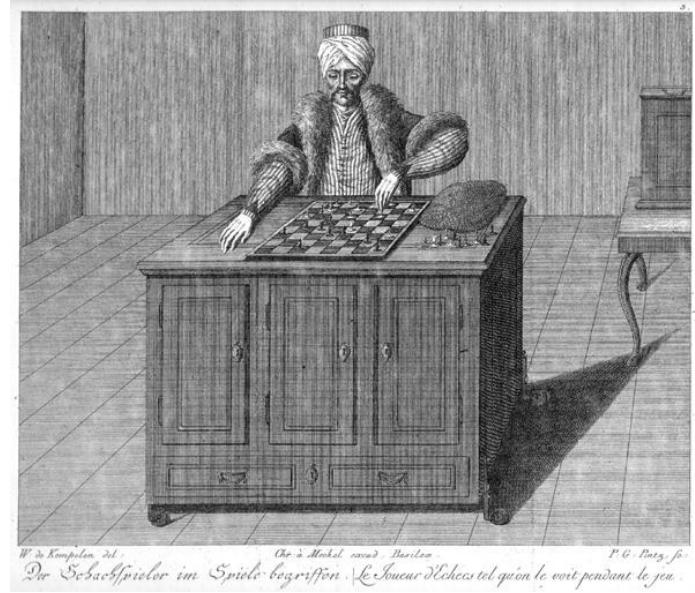
It was later revealed that this 'machine' was not an automaton at all but was in fact a chess master hidden in a special compartment controlling its operations.

"Likewise, the Mechanical Turk web service allows humans to help the machines of today perform tasks they aren't suited for."



http://en.wikipedia.org/wiki/The_Turk

e.g., Hugo



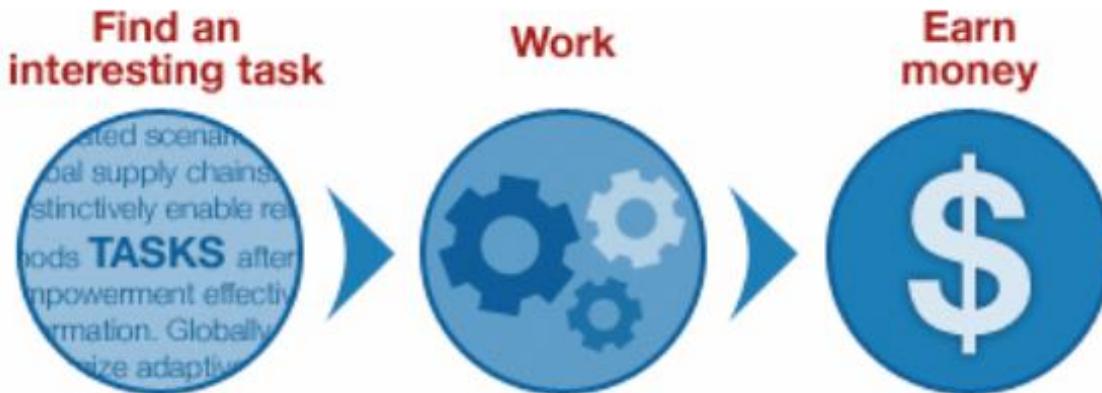
Make Money

by working on HITs

HITs - *Human Intelligence Tasks* - are individual tasks that you work on. [Find HITs now.](#)

As a Mechanical Turk Worker you:

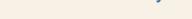
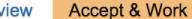
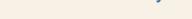
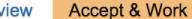
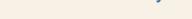
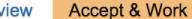
- Can work from home
- Choose your own work hours
- Get paid for doing good work



Basics of Turk

- **Requesters vs. workers**
- **HIT:** A *task*. Any number of workers can do it (you pick).
- **Assignment:** A single worker doing a single HIT.

- **What you learn about workers:** Only a worker ID. No demographics or other information.
- You can limit demographics using qualifications.

Amazon Mechanical Turk							Timothy																																																																																																								
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<h2>HIT Groups (1-20 of 1001)</h2> <table border="1"> <thead> <tr> <th>Requester</th><th>Title</th><th>HITs</th><th>Reward</th><th>Created</th><th>Actions</th></tr> </thead> <tbody> <tr> <td> Briefcam Mechanical Tu</td><td>Tag human attributes in sequences of images</td><td>19,751</td><td>\$0.01</td><td>3h ago</td><td>Preview</td><td> Qualify</td></tr> <tr> <td> Sergey Schmidt</td><td>Evaluate attributes of a YouTube video</td><td>13,434</td><td>\$0.10</td><td>3h ago</td><td>Preview</td><td> Qualify</td></tr> <tr> <td> Matt</td><td>Describe a company using hashtags. 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Timothy Brady - Turk Tutorial x PSYC 241. Programming Web- x a Describe a company using has x Timothy

← → C Secure | https://worker.mturk.com/projects/330XZFCZ7R2ZQ7LJ6X7OEHEGEYCTXT/tasks?ref=w_pl_prvw ☆ :

Worker ID: A2FOG3PS38SNIP [?](#)

Hello, [Timothy Brady](#) | [Sign Out](#)

amazon mturk Worker HITs Dashboard Qualifications Skip Accept

Describe a company using hashtags. For instance, Google ... ([HIT Details](#)) Matt HITs 11586 Reward \$0.01 Time Allotted 1 Min

< Back to results

You must accept this Requester's HIT before working on it. [Learn more](#)

Company Tagging Instructions (Click to collapse)

You must provide 3 hashtags for the company listed below. If you are unfamiliar with the company, please google the company.

- Each tag must be a single word.
- No tag can be longer than 25 characters.
- The tags must describe the company, information related to the company, thoughts or expressions commonly associated with the company, or some relevant context.
- If you are unfamiliar with the company, please google the company name as it appears and use the search results to create appropriate hashtags.
- The intent of this exercise to create hashtags that could actually be used on social media, so please keep that in mind when creating tags.
- Some of the suffixes after the company names are indicating the class of stock. You can ignore that information.

SEMTECH CORP

Tag 1:

Tag 2:

Tag 3:

[Report this HIT](#) | [Why Report](#)

Skip Accept

Timothy Brady - Turk Tutorial × PSYC 241. Programming Web- × a Which Product Type is the mos × Timothy

← → C Secure | https://worker.mturk.com/projects/3OR6S1RAB4THAA1B82WYSO2165RGA0/tasks?ref=w_pl_prvw ☆ :

Worker ID: A2FOG3PS38SNIP [?](#)

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amazon mturk Worker HITs Dashboard Qualifications Skip Accept

Which Product Type is the most relevant? (v3.1D) ([HIT Details](#)) OCMPS5 HITs 6474 Reward \$0.05 Time Allotted 5 Min

< Back to results

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Contact Us

Which Product Type is the most relevant? (v3.1D)

Click to show/hide instructions

Product Name: Detailer's Choice 5 in. - 6 in. Foam Bonnet

Product Description: The Detailer's Choice Foam Bonnet fits 5 in. - 6 in. polishing/buffing machines. The high-density foam material is an excellent option for applying wax to vehicle surfaces. Bonnet is machine washable, allowing for several uses. Remember to keep your bonnet clean. A dirty bonnet will cause scratches and swirl marks.

Please click on Accept button to start this task



Which Product Type is the most relevant? **required**

N/A

Vehicles, Parts & Accessories > Automotive Cleaners, Polishes & Waxes

Home & Garden > Household Appliance Accessories > Floor Polishing Machine Replacement Pads

Home & Garden > Household Cleaning Supplies > Cleaning Sponges & Scrubbing Pads

Comment

Comments are optional

Timothy Brady - Turk Tutorial × PSYC 241. Programming Web- × Locating and Classifying Objec × Timothy

← → C Secure | https://worker.mturk.com/projects/34VKX0JC792MJ6HREKSJ80EQXEZBRJ/tasks/3L55D8AUFB6DLCN7OA6YGYTGN9MC... ☆ :

Worker ID: A2FOG3PS38SNIP 🔍

Hello, Timothy Brady | Sign Out

amazon mturk Worker

Return

Locating and ... (HIT Details) Auto-accept next HIT dvamnr HITs 4401 Reward \$0.05 Time Elapsed 0:22 of 60 Min

car
 pedestrian
 cyclist

Instructions

- Your job is to draw tightly fitting boxes around all the objects in the category list above.
- The box must enclose the entire object but not any more.
- Draw a box only if you can see 50% or more of the object within the red dashed boundary.
- You might be presented multiple images in each hit if the task is simple.
- You will be paid only if you draw tightly fitting boxes around all objects of interest in all the images.
- To start drawing

Timothy Brady - Turk Tutorial × PSYC 241. Programming Web- a Locating and Classifying Objec × Timothy

← → ⌂ Secure | <https://worker.mturk.com/projects/34VKX0JC792MJ6HREKSJ80EQXEZBRJ/tasks/3L55D8AUFB6DLCN7OA6YGYTGN9MC...> ☆ ⋮

Worker ID: A2FOG3PS38SNIP [?](#)

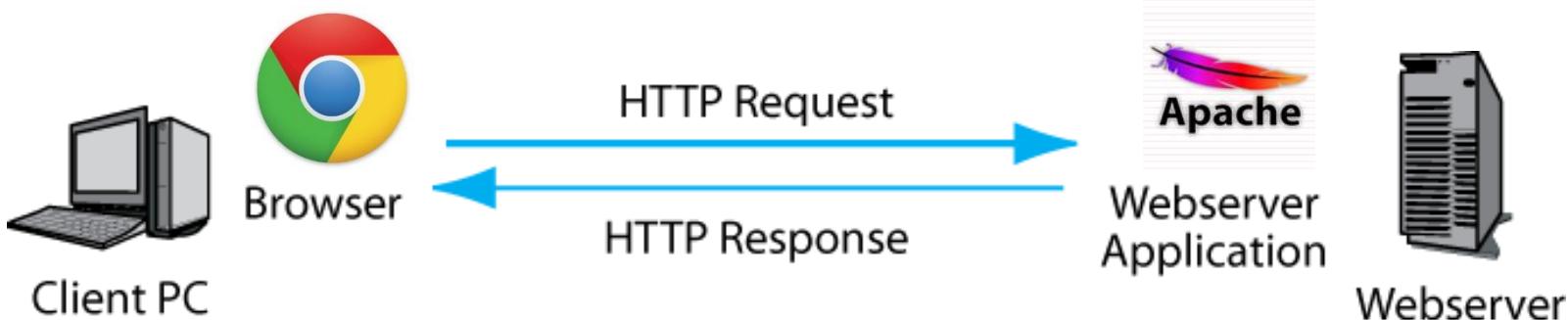
Hello, [Timothy Brady](#) | [Sign Out](#)

amazon mturk beta
Worker

Locating and ... ([HIT Details](#)) Auto-accept next HIT dvamnr HITs 4401 Reward \$0.05 Time Elapsed 0:22 of 60 Min

Any webpage we want can go here

Basics of the web



HTTP requests are just text

```
GET /doc/test.html HTTP/1.1
Host: www.test101.com
Accept: image/gif, image/jpeg, /*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0
Content-Length: 35

bookId=12345&author=Tan+Ah+Teck
```

Many HTTP responses are just text

```
HTTP/1.1 200 OK
Date: Sun, 08 Feb xxxx 01:11:12 GMT
Server: Apache/1.3.29 (Win32)
Last-Modified: Sat, 07 Feb xxxx
ETag: "0-23-4024c3a5"
Accept-Ranges: bytes
Content-Length: 35
Connection: close
Content-Type: text/html

<h1>My Home page</h1>
```

This is the important part (the document itself)

What text does the server send back?

HTML

in <style>
or style="":

CSS

in <script>:

JavaScript

```
1 <script>
2     function NextPage(whichIsNext) {
3         var currentPage = whichIsNext - 1;
4         document.getElementById('page' + currentPage).style.display = "none";
5         document.getElementById('page' + whichIsNext).style.display = "";
6     }
7
7     function CheckButtons() {
8         var isSelected1 = document.getElementById("buttonToCheck1").checked;
9         var isSelected2 = document.getElementById("buttonToCheck2").checked;;
10        if (isSelected1 || isSelected2) {
11            NextPage(2);
12        } else {
13            alert("Please click one of the buttons before moving on.");
14        }
15    }
16
17 </script>
18
19 <style>
20 body {
21     font-size: 14pt;
22     font-family: Helvetica;
23 }
24 #page2 {
25     display: none;
26 }
27 </style>
28
29 <div id="page1">
30     <p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Maecenas enim risus,
31     auctor vel faucibus sit amet, ultrices quis erat. Nulla facilisi. Sed vitae leo ac
32     lorem mollis fringilla at ac lacus. Fusce tristique quam sed arcu placerat euismod
33     dignissim turpis lacinia. Nullam porttitor tempor purus sit amet scelerisque. Nunc
34     ornare sem ac tortor sodales in tincidunt nisi pretium. Integer sagittis eleifend
35     erat, non varius nibh vulputate eu. Sed quis leo urna. Phasellus id massa nisl.
36     Duis turpis leo, fringilla a imperdiet quis, lacinia ac velit. Curabitur blandit
37     risus in erat tristique quis elementum nibh blandit. Etiam ac quam eros. Donec
38     purus turpis, ullamcorper non dictum eu, pharetra et nisl. Donec eu ligula mi, a
39     venenatis mauris. Aliquam sagittis congue eros, nec fermentum est consectetur vel.
40     Proin placerat sem at eros pharetra facilisis. Lorem ipsum dolor sit amet,
41     consectetur adipiscing elit. In aliquet dictum felis, nec condimentum nisi
42     elementum vel.</p>
43     <input id="buttonToCheck1" type="radio" name="q">Value1<br>
44     <input id="buttonToCheck2" type="radio" name="q">Value2<br>
45 </div>
```

Example webpages designed to be run as HITs

Collect RTs from free responses (to words):

<http://timbrady.org/turk/monthnumber/>

Ravens matrices (with timer):

<http://timbrady.org/turk/ensembleravens/>

Multiple object tracking:

<http://timbrady.org/turk/mot/MOT.html>

Full video games:

<http://timbrady.org/turk/wmgames/gaborTask/>

Very briefly flashed images:

http://timbrady.org/turk/ensemblescenes/new_e5/demo.html

Continuous report with colors and faces:

<http://timbrady.org/turk/ensembleindivdiff/e9/>

Videos and audio (courtesy Prof. Adena Schachner, <http://adenaschachner.com>)

http://timbrady.org/turk/adena/IfDanceThenWhatGoal_new.html

http://timbrady.org/turk/adena/OrderlySoundControl_TurkCode.html

Who are the Turk workers?

RECEIVED BY TURK

A361NTFGICM88M
A2N82K0ZK3AQ8V
A3QBLTB8NST8WQ
A38TE493DFRC74
A11MYVCCB4MDB
A3ROFA6CFTKGPG
A1DRSS2H56ZS89
A220117G11 71G2

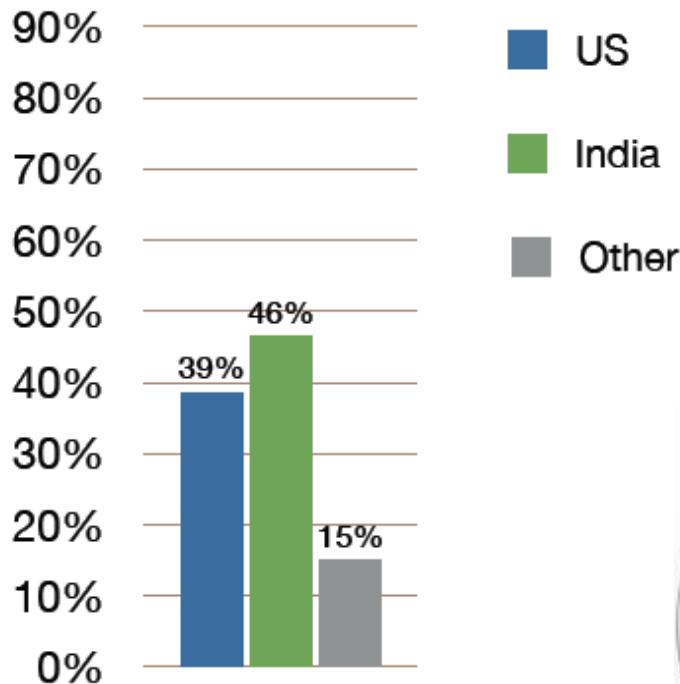
REJECTED ON / 4DF

AW1URPW7KCAYM
A1TKNM0MWPZ73N
A3TK9UOPGR8J9Z
A3CAF7LTD30RSG
A39IIPMXM6EGKZ
A1OPZJBOVBZC6W
A21VDW9G6AN6WL
A6D88Y9C00X14

REVIEWED BY TURK

A2VC4DN2UVDGS6
A3P34V0J7POJYA
A1CJCG7IO9PNKW
A2XSI8BSDC4VC1
A20EBZCL2MEBEU
A3HRFT1NZYC9FN
ATNRQ92C5NN97
ATFYFF1C5524HC

Who are the Turk workers?



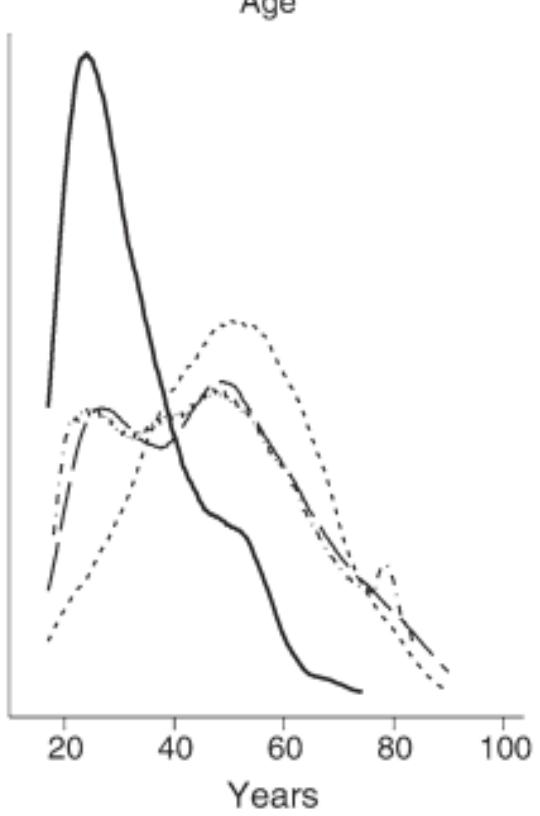
The MTurk workforce is composed of more than 500,000 individuals from 190 countries.



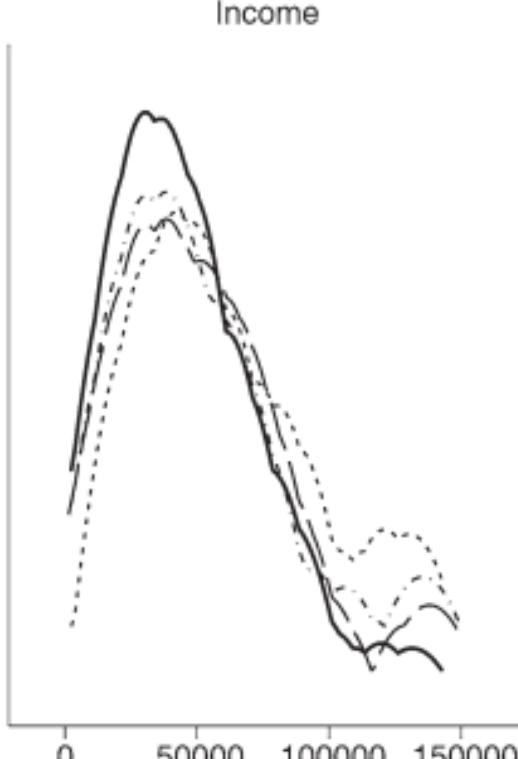
US-only demographics

- Kernel density estimate
- Mechanical Turk
- ANES Panel
- CPS
- ANES Face to Face

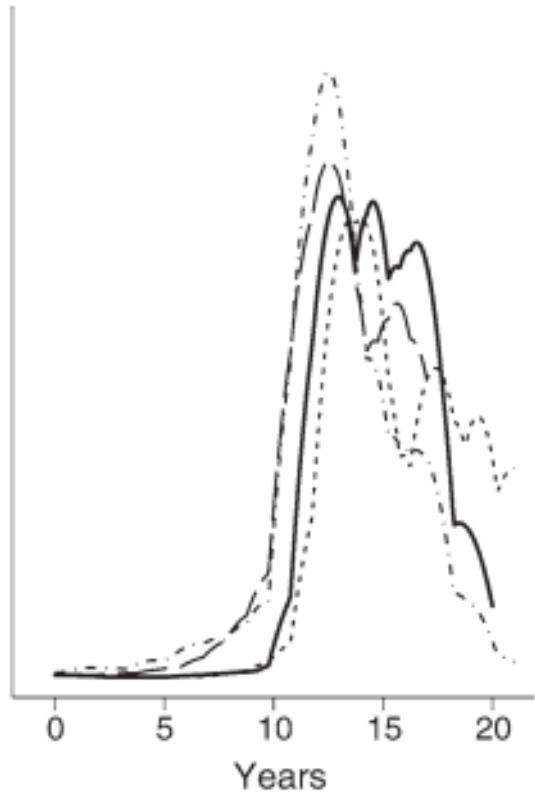
Age



Income

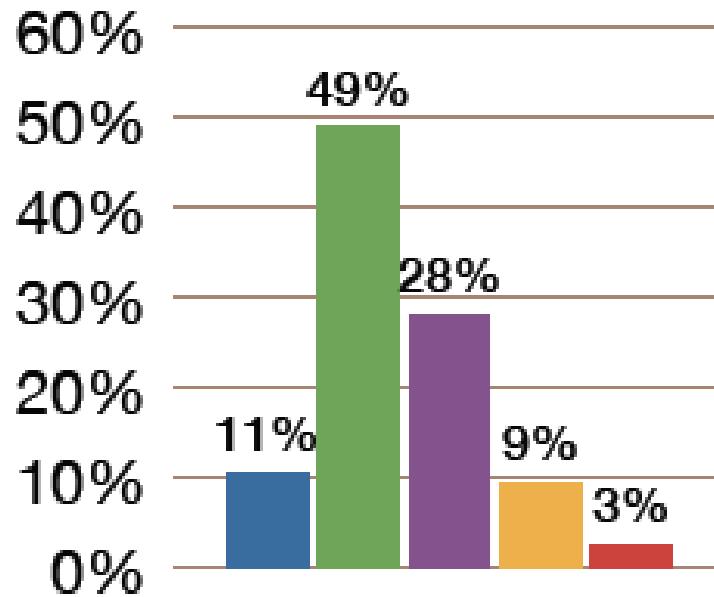


Education



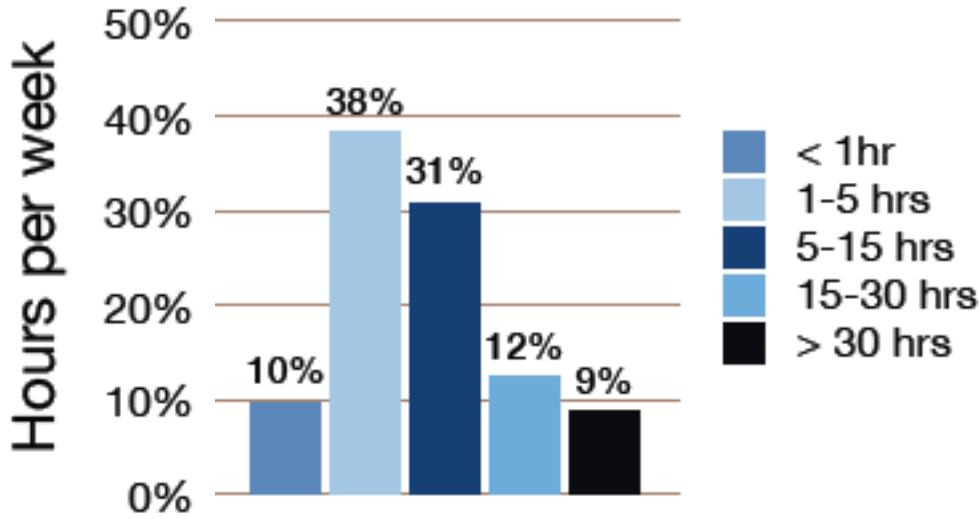
Workers tend to be younger (most <30 years old), overeducated, underemployed, less religious, and more liberal than the general population

US-only demographics

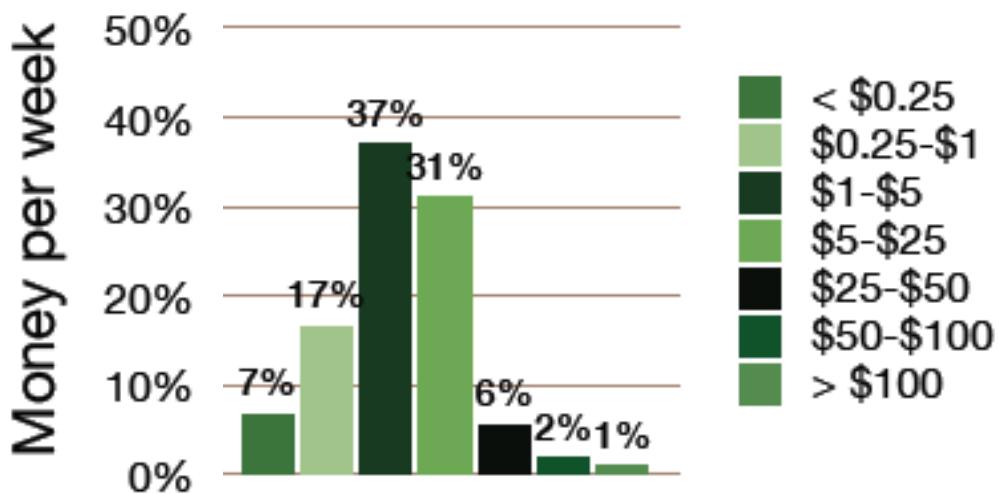


- [Blue square] 'MTurk money is irrelevant to me.'
- [Green square] 'MTurk money is nice, but doesn't materially change my circumstances.'
- [Purple square] 'MTurk money is a way for me to pay for nice extras.'
- [Orange square] 'MTurk money is sometimes necessary to make basic ends meet.'
- [Red square] 'MTurk money is always necessary to make basic ends meet.'

US-only demographics



60% make less than \$5/week from Turk and spend less than 15 hours a week working on it.



Payment on Turk

Most HITs offer very small payments and last less than 3 minutes.



25 percent of the HITs created on Mechanical Turk have a price tag of just US\$0.01, 70 percent have a reward of \$0.05 or less, and 90 percent pay less than \$0.10.

In general, HITs tend to be seen by the worker community as high reward if they pay >\$0.10 cents/minute (\$6/hr), assuming they are short (<10 min).

Longer hits need to pay more (in total and as a rate)

Payment on Turk

Must put money in Turk account **in advance**, before posting any HITs.
Means you need to figure out how reimbursements will work.

System at Harvard/UCSD:

- Figure out how many participants you'll run and how much this costs after Turk fees
- Charge the lab credit card for this amount
- Use all the money on participants/fees within a few days
- Submit proof from Turk to account for charge when next bill is due

How good are Turk workers?

(1) A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball.

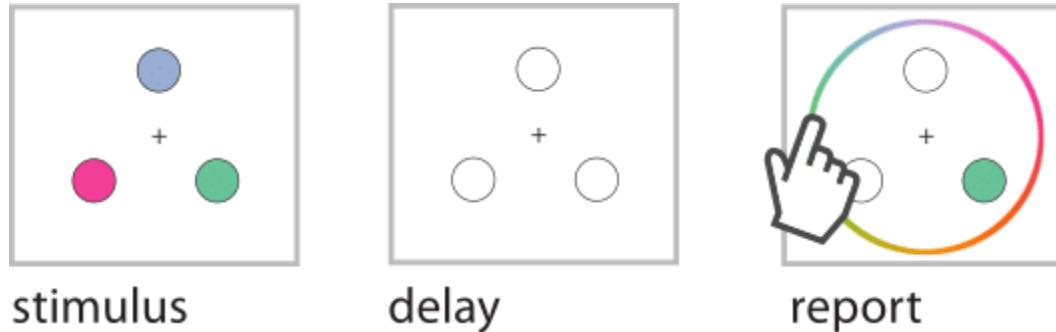
How much does the ball cost? ____ cents

(2) If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ minutes

(3) In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days

Cognitive reflection test		Mean	SE
MTurk		1.17	0.12
Community		0.96	0.16

How good are Turk workers?



With 6 colors to remember (this is very hard!):

K = 2.46 – Zhang & Luck, 2008, *Nature*

K = 2.52 - Brady & Alvarez, 2015, *JoV* (done on Turk)

How good are Turk workers?

- Many studies show the Turk sample is in many ways better than a similar lab based sample (e.g., Brady & Alvarez, 2011)
- Why?
- **Speculations:** shorter experiments, fear of rejection is high, HITs varied and fun, can quit easily at any time (*Note selection bias - be wary of doing hard vs. easy tasks across subjects!*)

How good are Turk workers?

- It totally depends on your task

Behav Res (2014) 46:112–130
DOI 10.3758/s13428-013-0365-7

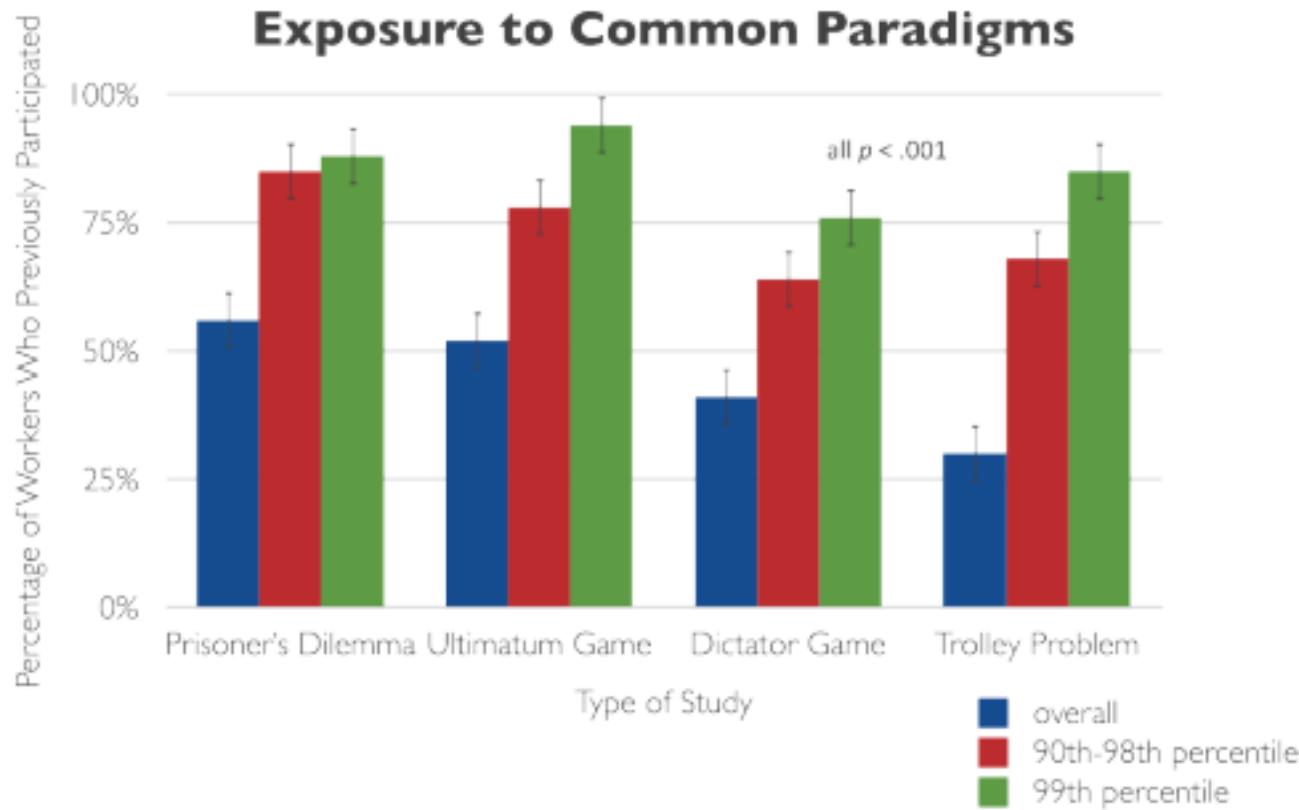
Nonnaïveté among Amazon Mechanical Turk workers: Consequences and solutions for behavioral researchers

Jesse Chandler · Pam Mueller · Gabriele Paolacci

Published online: 9 July 2013
© Psychonomic Society Inc. 2013

How good are Turk workers?

- It totally depends on your task



Getting good data

- The best studies make all manipulations within-subject or similar difficulty/annoyance to avoid strong selection biases
- Make it the same amount of time to actually answer the questions vs. skip or don't take seriously
- Limit to participants who have few rejections
- Don't run tasks at 11pm on Saturday night
- Make your task “fun” and short! (less than 15 min)

Getting good data – catch trials!

- Do you have a fraternal twin? YES NO

4% Yes. *Pretty close to truth*

- Do you have an identical twin? YES NO

8% Yes. *Pretty far from truth, but funnier to lie about?*

- Is $8+4$ less than 3? YES NO

11% Yes. *Profound innumeracy, confusion, or just messing with me?*

- Were you born on the planet Neptune? YES NO

17% Yes. *Perhaps using it metaphorically, as in
“My friends say I’m a weird guy”?*

RTs

“The response times measured by JavaScript were approximately 25 ms longer than those measured by PTB [PsychToolBox]. However, we found no reliable difference in the variability of the distributions related to the software, and both software packages were equally sensitive to changes in the response times as a result of the experimental manipulations. We concluded that JavaScript is a suitable tool for measuring response times in behavioral research.”

de Leeuw, J. R., & Motz, B. A. (2016). Psychophysics in a Web browser? Comparing response times collected with JavaScript and Psychophysics Toolbox in a visual search task. *Behavior Research Methods*, 48(1), 1-12.

Basics of Turk

- **Requesters vs. workers**
- **HIT:** A *task*. Any number of workers can do it (you pick).
- **Assignment:** A single worker doing a single HIT.
- **HIT group:** By default, the way to change anything about a HIT (e.g., change the image that is shown) is to have Turk automatically create a HIT group, with one HIT for each image or each word (or whatever)
- The same worker can do any number from 1 to all of those HITs.

Things that are harder than you'd expect

- Counterbalancing across-participant experiments as opposed to randomizing. HIT vs HIT group problem.
- Disallowing users who have previously participated in a related study of yours
 - Easiest way is to assign all users who complete a study a *qualification* and then **disallow** any users with that qualification from participating in the new study. Requires serial running of different experiments. Alternatively, use TurkPrime / psiTurk / etc.
- Running participants in multiple sessions.

More about Turk for psychology

- <https://experimentalturk.wordpress.com/> - Blog on Turk research
- <http://bradylab.ucsd.edu/ttt/> - my Turk tutorials
- <https://psyc241.ucsd.edu/Stewart2017.pdf> - TiCs 2017: Crowdsourcing Samples in Cognitive Science, Stewart et al.

Libraries and toolkits

- From most complicated to least complicated:
- PsiTurk – runs a custom server on your computer (like we saw earlier)
 - has infrastructure for blocking repeat participants, etc.
- JsPsych – for making experiments more easily (with code)
- PsyToolkit - up next!
- Testable.org, Qualtrics, SurveyMonkey
- TurkPrime

HTML / CSS /Javascript cheatsheets

- <http://www.codecademy.com/tracks/web>
- <https://www.codecademy.com/tracks/htmlcss>
- <https://www.codecademy.com/en/tracks/jquery>

Also useful:

- Udacity class on web development
- ... any introduction to Javascript or jQuery

<https://bradylab.ucsd.edu/ttt>

<https://psyc241.ucsd.edu/>