Everyone On Mechanical Turk is Above a Threshold of Digital Literacy: Sampling Strategies for Studying Digital Media Effects*

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Abstract

The use of online convenience samples for conducting experiments has rapidly become commonplace. Many experimental findings from lab experiments have been replicated using these samples, but we call attention to a set of research questions for which these samples are theoretically inappropriate: the study of online political behaviors moderated by digital literacy. Amazon's Mechanical Turk is the most prominent source of subjects for these experiments, but 100% of subjects recruited via this platform are above a threshold of digital literacy below which there are many internet users. We argue for the use of Facebook advertisements to recruit subjects which vary along this dimension.

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1 The generalizability of online survey experiments

There have been hundreds of experimental studies conducted using subjects recruited via Amazon's Mechanical Turk (MTurk). These studies are valid insofar as treatment effects estimated on this population generalize to a population of interest; although the subject pool is not representative of the US population, the way they respond to experimental stimuli is informative when covariate reweighting is employed.

Mullinix et al. (2015) provides theoretical and empirical justification for this practice, but the authors are careful to maintain the continued importance of nationally representative samples, particularly when a given treatment has heterogeneous effects. If researchers have insufficiently theorized the dimensions of effect heterogeneity, data from nationally representative samples can help reveal them : "If one has a well-developed theory about heterogeneous treatment effects, then convenience samples only become problematic when there is a lack of variance on the predicted moderator...[eg] MTurk when a moderator is religion (i.e. MTurk samples tend to be substantially less religious than the general population)" (Mullinix et al, p123).

As the internet and social media become increasingly integrated into politics, more scholarly attention has been dedicated to the study of online political behaviors: how do people engage with politics online? Of particular interest are online behaviors which have no offline analogues.

We argue that subjects recruited from MTurk may be inappropriate to study these behaviors. The sociologist Eszter Hargittai has advanced the theory of *digital inequality* to argue that—even among individuals who use the internet frequently and persistently—inequality in their levels of online skills ("digital literacy") has important implications for *how* they use the internet (DiMaggio, Hargittai et al., 2001; Hargittai, 2001).

This issue has become increasingly relevant as the population of internet and social media users has expanded beyond tech-savvy early adopters to encompass the majority of the US population. The fastest growing population of Facebook users are adults over 65 years old (Smith and Anderson, 2018); these individuals also tend to have much lower digital literacy (Hargittai, Piper, and Morris, 2018).[1] The study of digital literacy with survey instruments is a difficult task because the underlying technology

[1]Even more dramatic has been the experience of Facebook use by people in developing countries for whom Facebook is their first and only means of using the internet. In several Asian nations, the problem of racial violence inspired by false information spread via Facebook has become widespread Beech and Nang (2018).

is rapidly changing and needs to be validated against behavioral data. In the current paper, we make the assumption that age is a useful proxy for digital literacy.

This assumption (which we discuss further below) corroborates the finding from web tracking data that age strongly predicted the propensity to spread Fake News during the 2016 campaign (Guess, Nagler, and Tucker, 2018). Age does not sufficiently vary within the MTurk population, making this population inappropriate to study online treatment effects for which age/digital literacy is a moderator.

Next, we provide qualitative evidence of the depth of the problem and discuss the use of Facebook ads to recruit samples which do not suffer from this problem.

2 MTurk Requires Digital Literacy

The age skew of the MTurk population is well-known (Huff and Tingley, 2015); if this were the only issue with the population, it would be possible to selectively recruit older MTurkers or reweight the data. However, as Mullinix et al. (2015) argues, reweighting fails when the joint distribution properties of a sample do not match the population: "[MTurk] may have similar percentages of older individuals and racial minorities, but may not match the population based sample with respect to older minorities" (p123). This is also the case with age and digital literacy: the older people on MTurk are more digitally literate than the older people not on MTurk, meaning that there is *zero support* in this population for exactly the demographic of people most likely to have shared Fake News during the 2016 election (Guess, Nagler, and Tucker, 2018).

Our confidence in this claim comes from Brewer, Morris, and Piper (2016), who conduct a survey of older Americans and discover that the largest barrier to participation in MTurk is that they are unaware of it. Their "survey data confirm that even among online older adults, those who have tried crowd work are (relatively) younger and more tech savvy than those who have not" (p8).

Brewer, Morris, and Piper (2016) recruit a small sample of older adults who have not used MTurk and encourage them to perform example tasks on the platform.

The vast majority of this sample of adults over 65 reported having used the internet for more than 15 years and being comfortable using computers (p2250). However, the MTurk interface proved an insurmountable:

Many participants were not familiar or comfortable with opening content in new tabs/windows, resulting in questions such as, "How do I get back to the instructions?"

(P7) after a new tab was opened. Also, participants often forgot the instructions immediately upon opening the new window, particularly long and detailed instructions. (p2251)

Because of the reputation system around which MTurk operates, even if low digital literacy individuals sign up, they are likely to be excluded from future samples that require MTurkers to have maintained a certain rating.

Qualitative study of the way that different populations engage with the internet and social media is increasingly essential. It is nearly impossible for a proficient internet user to appreciate the extent of the challenge posed by "opening content in new tabs/windows" for someone much less internet proficient. It is tempting to look to our own experiences to begin to study the experiences of others, but in the case of a technology as inherently heterogeneous as social media, this introspection will necessarily lead scholars astray.

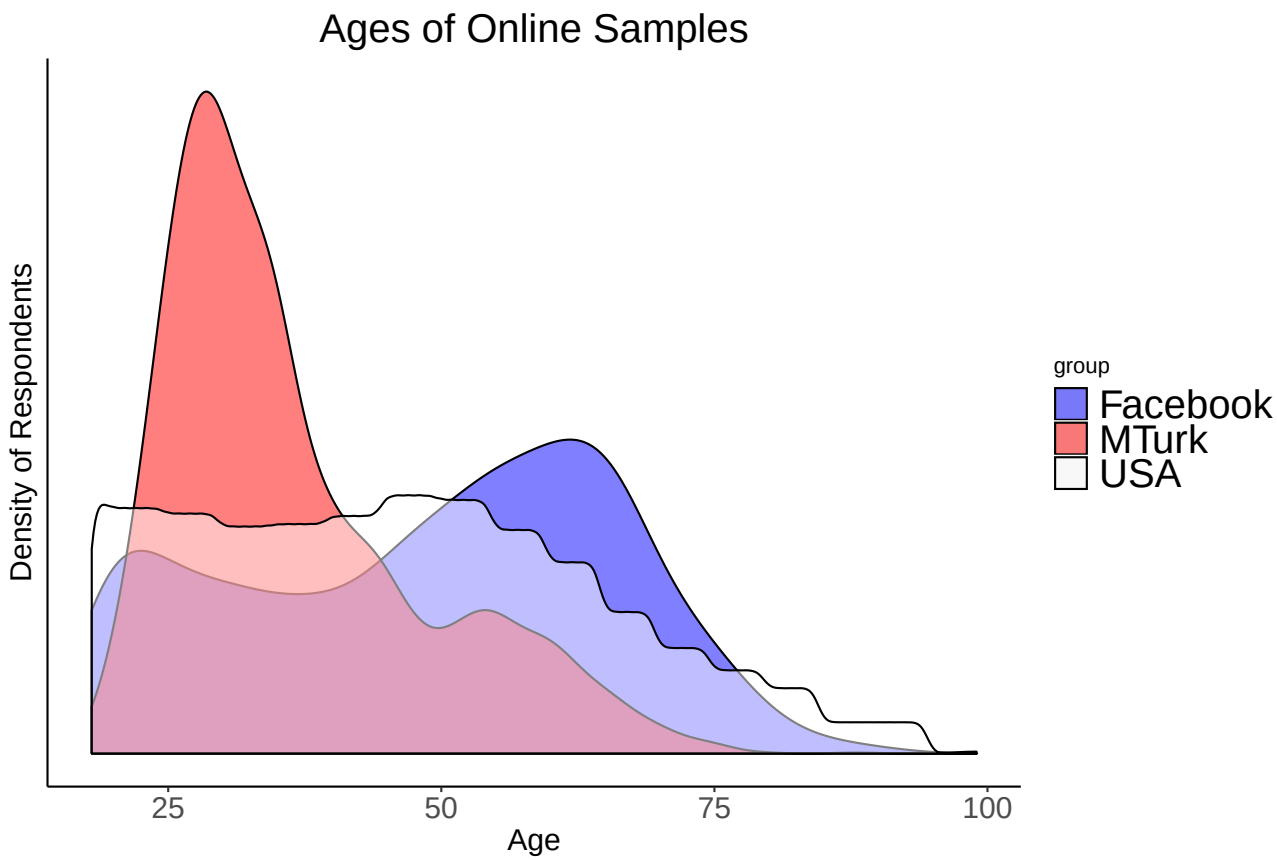
3 Using Facebook Ads to Reach Low Digital Literacy Populations

We used Facebook advertisements to recruit low digital literacy subjects to study the dynamics of online "clickbait." Facebook ads with quota sampling have recently been shown to generate valid measures of public opinion (Zhang et al., 2018), but we were interested in sampling low digital literacy individuals: people who clicked on our eye-catching advertisement. We conducted this experiment to complement a series of experiments on MTurk.

Figure 1 displays the age distributions of the two samples, relative to the 2010 census. The MTurk sample dramatically oversamples adults 24 to 35, and contains exactly 5 people over 75 years old; 2 of these claim to be 99, evidence of unserious responses. In contrast, Facebook oversamples adults between the ages of 50 and 75, and contains a non-trivial number of adults in their 80s.[2] Because the Facebook population is large and the ad targeting well-developed, it is possible to use quota sampling to generate a sample that corresponds to the general population on one or more demographics—and even specific demographic crosstabs—of interest.

[2]We cannot be sure whether the age distribution reflects the true rate at which people clicked on ads because there is some uncertainty about the way that the Facebook advertising software operates (Zhang et al., 2018).The rank ordering of propensity to opt into this sample is legitimate, but the true ratio of propensities is opaque.

Figure 1: Age Distributions of Samples: MTurk v Facebook Ads



Although our initial sample of Facebook users had excellent coverage at all ages, attrition from our survey was non-random. This is evidence that we have encountered an appropriately low digital literacy sample—to such an extent our survey was too difficult for many of them to complete.

This interpretation is supported by Brewer, Morris, and Piper (2016)'s finding that some "barriers, which may seem trivial from a requester's perspective, *significantly* affected older adults' abilities and time required to complete the tasks" (emphasis in original).

We have three pieces of "forensic" evidence from our survey that this took place. First, we inspect the answers entered into an open response text box asking the respondent's age. Out of 2,803 respondents recruited from MTurk, there were three responses more than two characters long: 999, 999, and 566. Out of 2,467 respondents recruited from Facebook, there were thirty-nine such responses.

Many of these appear to have been due to typos of some kind (eg ",64"), suggesting a lack of digital dexterity. Others, though, indicated the same kind of misunderstanding of the purpose of online surveys described by Brewer, Morris, and Piper (2016), such as "68 yrs. Old. Live. Chicago. With. My. Sister. And. Her. Husband. I am. Wildow".

The mean age of the respondents who entered a two-digit age was 48.8; for those who entered a non-numeric age,[3] it was 62.7, significant at $p < .00001$.

Second, we look at relative attrition rates at different points in the survey. Figure 2 plots attrition at four stages; there is dramatic attrition for the Facebook sample (but not the MTurk sample) at the stage where the survey required clicking on a hyperlinked headline that opened up the news story in a separate tab. At this point in the survey, 6% of the MTurk sample dropped out, compared to 31% of the Facebook sample.

Figure 3 plots the age distributions of subjects based on how much of the survey they completed. The top panel indicates that age is entirely unrelated to attrition stage for the MTurk sample. The bottom panel, however, indicates that the Facebook subjects who completed the entire survey were *much* younger those who did not; those who stopped at the new tab were the oldest of the three.

Our third piece of "forensic" evidence comes from the attention check we embedded in the survey. Attention checks are designed to weed out unserious respondents, but they can also prove confusing to more digitally naive respondents. Our attention check replaced one option in a media choice task with the phrase "Survey taker: always select

[3]Neither sample had anyone over 100 years old.

Figure 2: Relative Attrition Rates

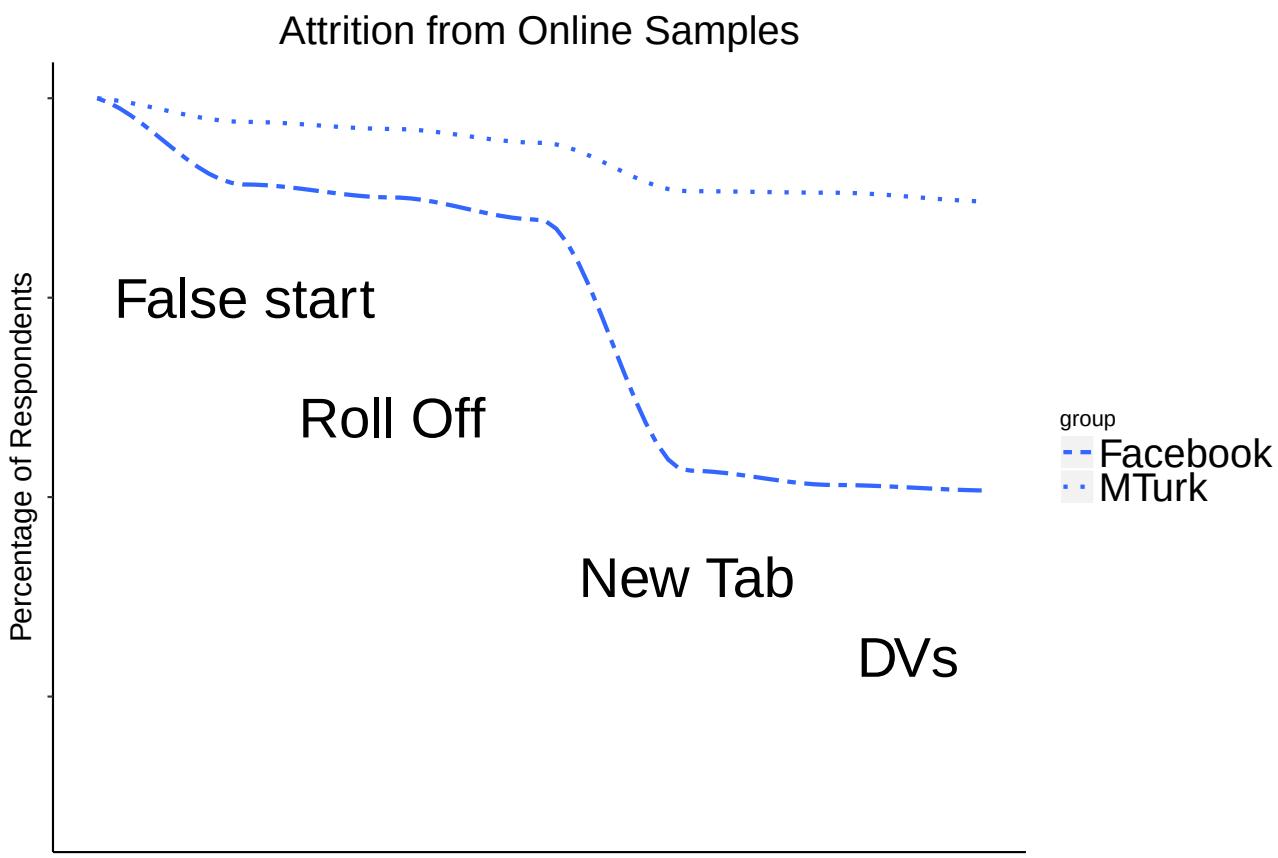
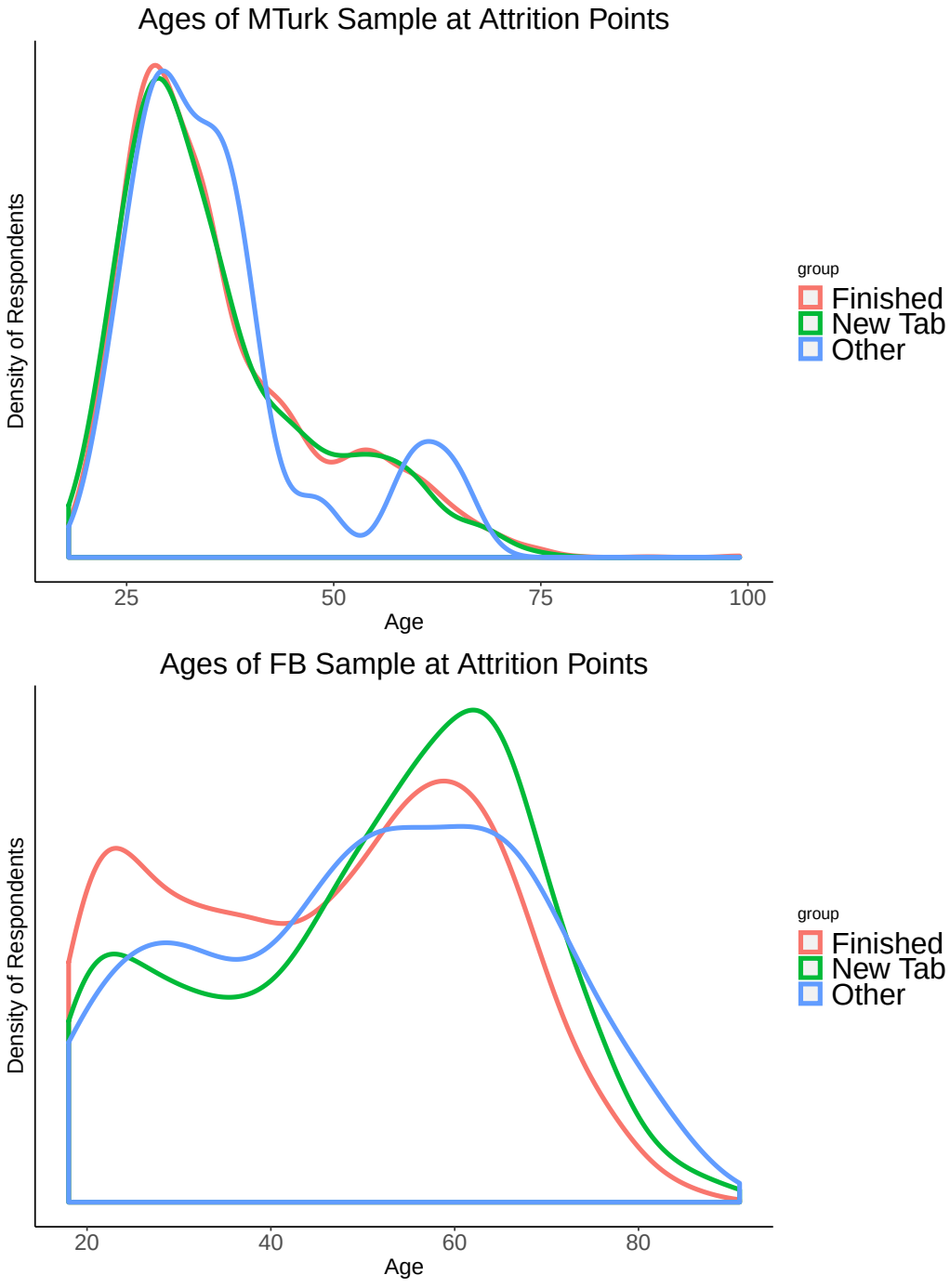


Figure 3: Age Distributions By Attrition Status



this option."

Overall, 82% of the MTurk sample "passed" the attention check, compared to just 52% of the Facebook sample. However, some Facebook subjects may have been confused, rather than intentionally providing low-quality responses. Table 1 presents the results of a regression in which the dependent variable is a dummy for whether the respondent stopped when taken to a new tab. The coefficient on the interaction term between the time spent on the attention check question and a dummy for whether the respondent was in the Facebook sample is positive and highly significant. On the other hand, the time subjects spent on a non-attention check media choice question is unrelated to whether they stopped at the new tab.

Table 1: Facebook Sample Confused by Attention Check Also Confused by New Tab

	Stopped at New Tab
Seconds Spent on Attention Check	-0.002^{*}
	(0.001)
Facebook Sample	0.267^{***}
	(0.028)
Seconds Spent on Standard Choice Question	0.0002
	(0.0003)
Seconds Spent on Attention Check X Facebook Sample	0.004^{***}
	(0.001)
Seconds Spent on Standard Choice Question X Facebook Sample	-0.0001
	(0.0004)
Constant	0.222^{***}
	(0.023)
Observations	3,184
R^2	0.093
Adjusted R^2	0.091

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

In the Facebook sample, both the attention check and the new tab confused subjects. The coefficient on the uninteracted variable for time spent on the attention check

indicates that the *opposite* is true for the MTurk sample: those who spent more time on the attention check were *less* likely to stop at the new tab. The attention check worked as intended on the MTurk sample.

4 Conclusion

The immediate argument advanced in this note is that there exists a class of research questions (moderated by age or digital literacy) for which MTurk is an inappropriate source of research subjects. We recommend the continued exploration of Facebook ads as a tool for recruiting subjects from otherwise hard-to-reach populations, of which low digital literacy internet users is the most relevant for the study of digital media effects.

However, this population presents novel challenges for researchers; the experience of taking a "standard" online survey may be confusing and overwhelming for digitally naive subjects.

Practically, we encourage researchers using online survey instruments to make them shorter and less technically challenging to use. This is not a novel point, but it is increasingly urgent when studying populations with low digital literacy. Another important step is the implementation of small scale, qualitative, pilot studies to ensure that survey instruments are functioning as intended.

On a more theoretical level, we argue that the effects of digital media are far more heterogeneous than any previous form of media. The internet offers an essentially unlimited choice of information sources; these choices *and* their effects are endogenous to an individuals' level of digital literacy. The "average effect" of digital media is a potentially misleading quantity; based on our study of low digital literacy populations, we encourage researchers to focus on theoretically interesting sub-populations of internet users when studying digital media effects.

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