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EXHIBIT L

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DEPRECATED: Facebook's Impact on Well-Being: A Deactivation Study [Pilot]

QUIP: <https://fb.quip.com/PU4xAUxokb9r#RcCACARp5TE>

tl;dr

In an effort to understand Facebook's impact on people's lives, we ran two 1-week experiments in which some people stopped using Facebook and others used Facebook as normal.

We found that those who stopped using Facebook for a week:

- Reported lower feelings of depression, anxiety, loneliness, and social comparison
- Reported fewer interactions with community members
- Reported more time watching tv/movies and spent less time on social media
- Had lower news knowledge

Expectations appear to play a strong role in this study: the effects found are mostly linked to people's prior beliefs on whether or not Facebook is good or bad for them. For example, the reduction in feelings of depression, anxiety, and loneliness appeared only among participants who believed Facebook is bad for them.

We explored other areas like political polarization, time spent on other activities, and social interaction quality, and detected no major differences between those who used Facebook and those who didn't.

Research Design

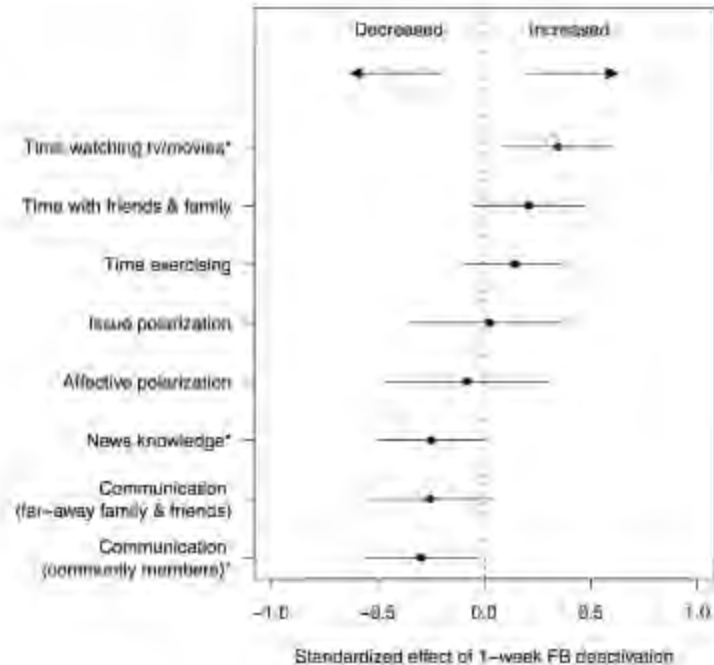
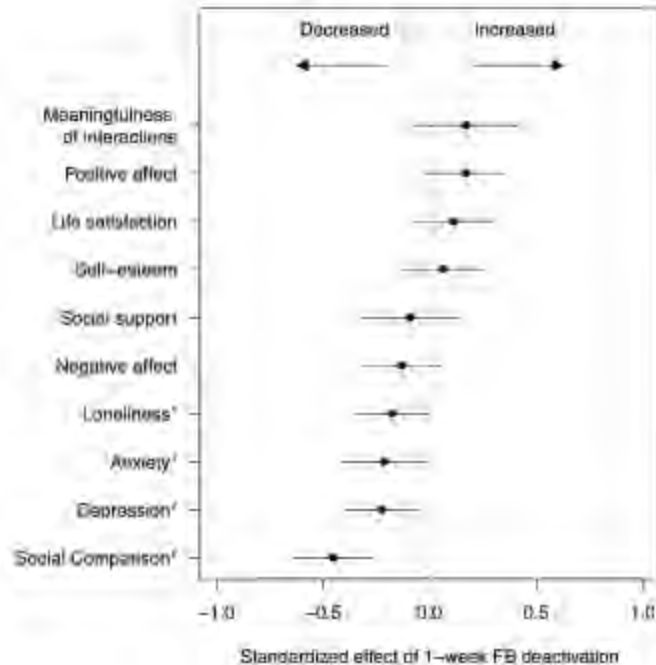
- We ran **two independent deactivation studies** and combined the samples for our analysis. Slightly more than half of participants were invited to **deactivate FB for 1 week** (N= 3067); the rest continued to use FB as normal. (N= 2487). All participants double-consented to participate in this study. The goal of this study was to provide a framework for a longer and larger study involving both FB and IG.
 - Participants could [receive](#) up to **\$35 dollars to deactivate** and up to **\$11 to complete 3 surveys**.
 - The first study was run Oct/Nov 2019 and the second study was run Feb/Mar 2020.
- We collected **survey data, mobile sensor data, and FB/IG log data**:
 - Survey data on emotional health (e.g., loneliness, depression, affect, etc.), political health (e.g., affective polarization, issue polarization, news knowledge, etc.), and social health (e.g., time talking to friend, meaningful interactions, etc.)
 - Mobile sensor data (e.g., times spent on news, video, social apps, etc.)
 - FB/IG log data (e.g., Time spent on FB, graph size, etc.)
- Because this study could not be conducted double-blinded, we attempted a study that could take **into account potential expectation effects**. We had three conditions in our experiment:
 - **Neutral prime** (participants were not given information on the purpose of the study)
 - **Well-being prime** (participants told the study was about well-being; so we explored the political-related outcomes in this condition, but not the social/emotional ones)
 - **Polarization prime** (participants told the study was about polarization; so we explored the emotional- and social-related outcomes in this condition, but not the political ones)
- **Nielsen ran the study on our behalf and FB branding was revealed at the end**; people had the opportunity to pull their data prior to sharing back with Facebook.

Phase 1	Phase 2	Phase 3	Phase 4
Screener Survey	Baseline Survey	1 week deactivation from FB	Endline Survey
		Use FB as normal	

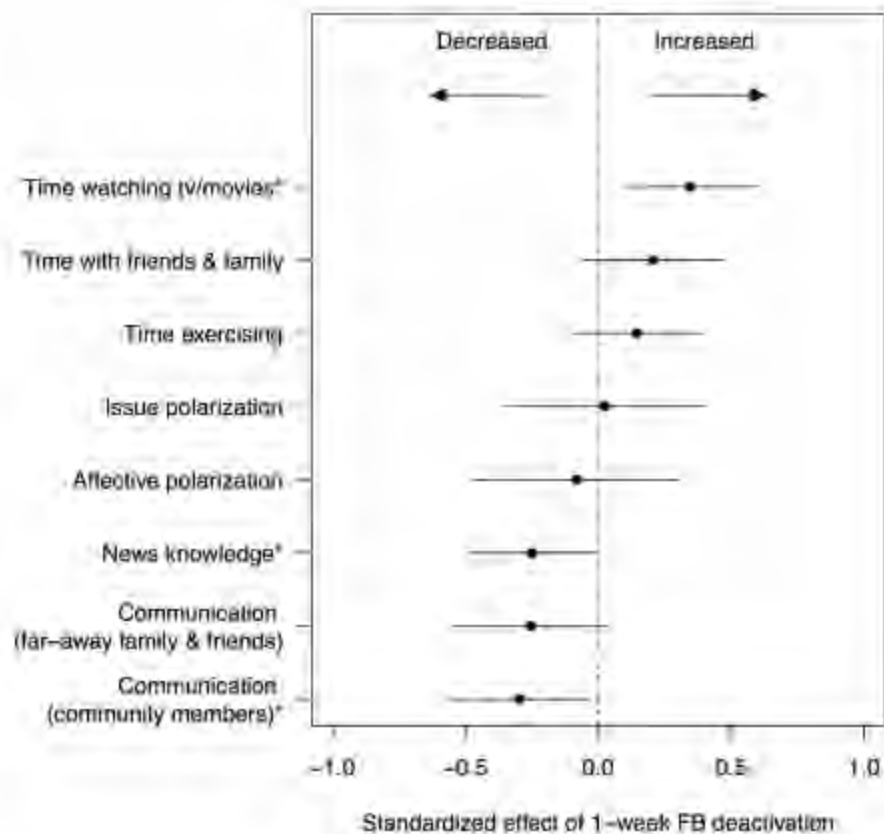
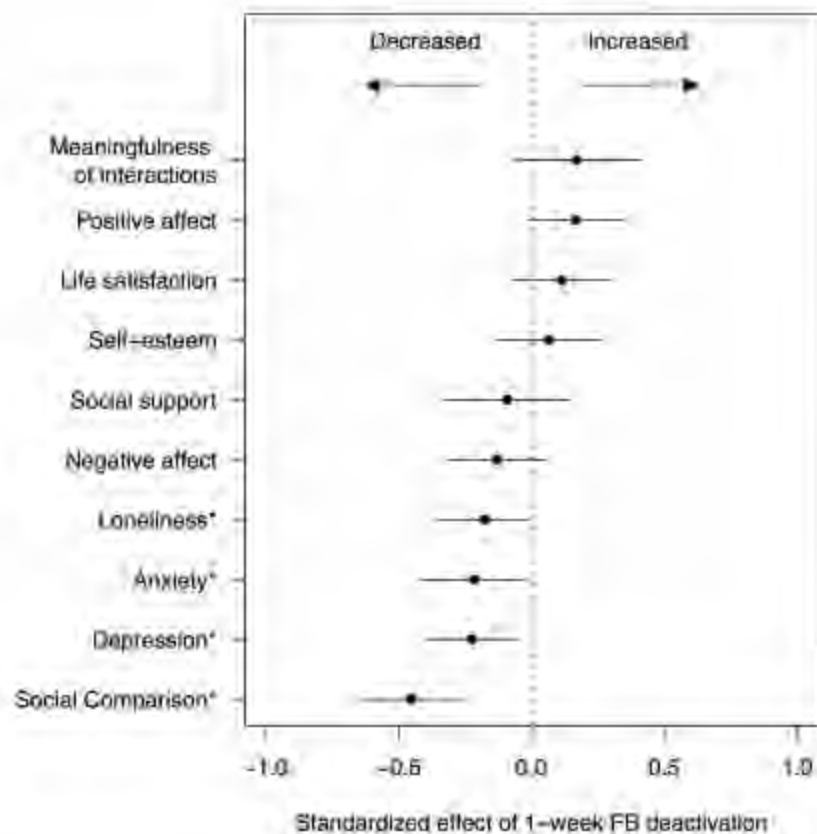
For background on external research already conducted in this space, see [here](#). We received advisory from external experts on the design.

What happens when people stop
using Facebook?

People who stopped using Facebook for a week reported **lower feelings of depression, anxiety, loneliness, and social comparison**. They also had **lower news knowledge scores, reported fewer interactions with community members and more time watching TV and movies**. No statistically effects detected on other areas explored including political polarization.



*Effect size is scaled by the standard deviation of the outcome under control in the endline period.



*Effect size is scaled by the standard deviation of the outcome under control in the endline period.

What role do expectations play
in these findings?

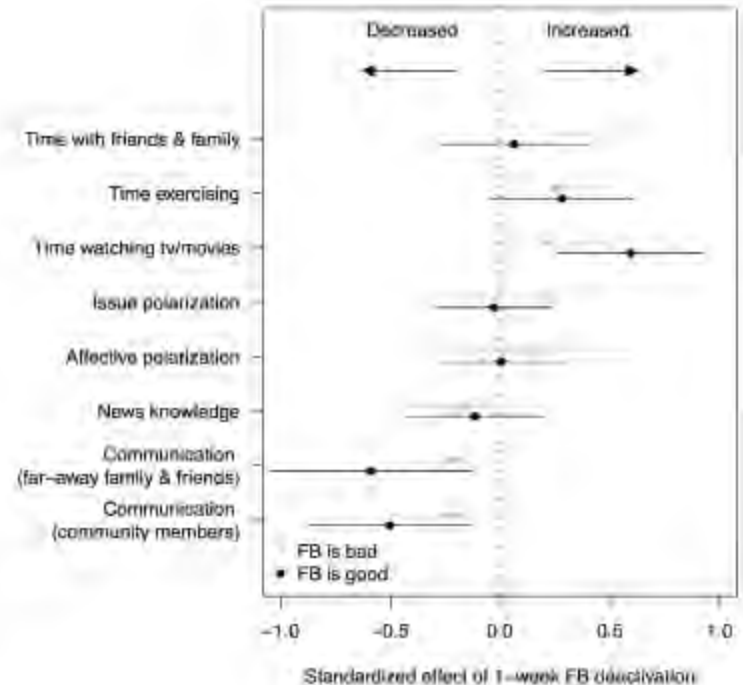
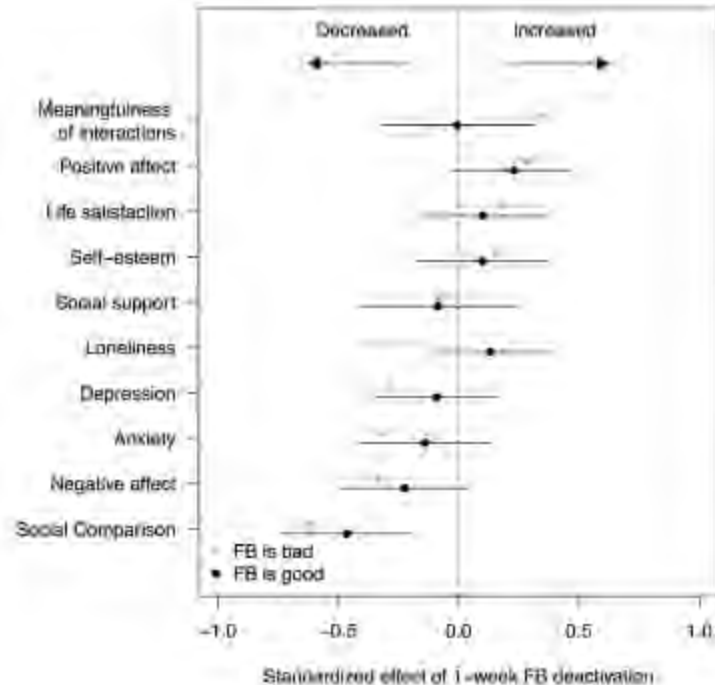
We knew going into this study that the expectations and beliefs people have about Facebook would be a challenge we needed to consider. In an ideal world when studying impact, people are not able to guess the study's objective as this can directly/indirectly influence their thoughts and behaviors, and thus the findings. In a deactivation study like this, people may consciously/unconsciously garner what the study is trying to get at based on media coverage, prior academic research, etc. As a result, when deactivating their accounts, people may *think* they should feel more happy, and report so in a survey, even when in actuality their levels of happiness remain the same after they stopped using Facebook.

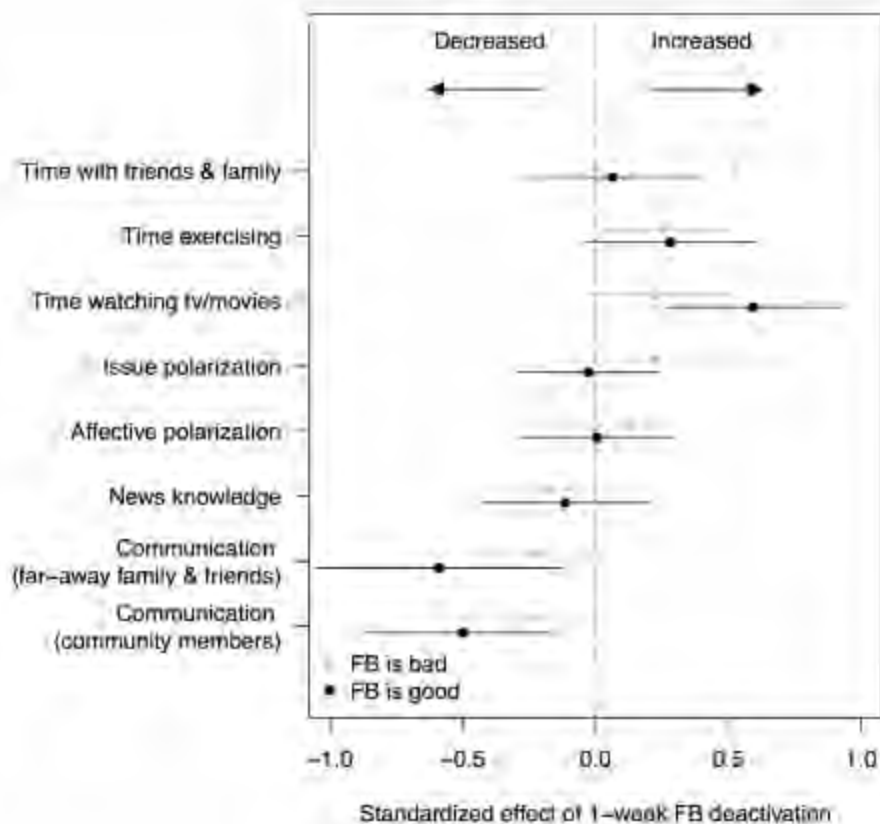
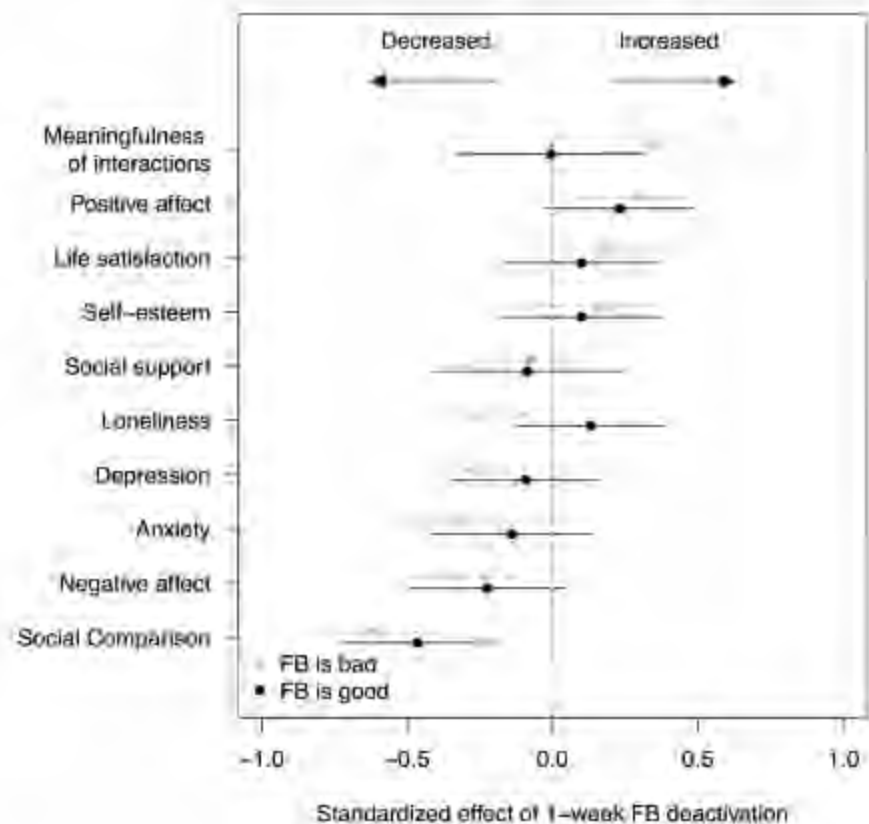
Thus, in this study, to get signal on people's expectations, we asked people about their beliefs about Facebook's impact on their lives. **To assess the role of beliefs, we compare the effect of stopping using Facebook across the following groups:**

- People who think **FB make them more polarized vs. people who think FB makes them less polarized** when examining the impact of FB deactivation on political outcomes.
- People who think **FB worsens their well-being vs. people who think FB improves their well-being** when examining the impact of FB deactivation on social and emotional outcomes.

The effects we've identified appear to be linked with people's a priori beliefs. For example, we find that the reduction of feeling of depression, anxiety, loneliness, and affect associated with FB happened only among people who thought FB is bad for them prior to participating in the experiment. Similarly, only people who thought Facebook was good for them reported a reduction in communication with community members. **Social comparison was the only factor that remained for both groups.**

The effects we've identified so far are linked with people's beliefs about how good or bad Facebook is for them. For example, the **reduction in feelings of depression, anxiety, and loneliness appeared only among participants who believed Facebook is bad for them** prior to participating in the experiment.





Can we overcome the role that expectations play in a deactivation study?

account for this.

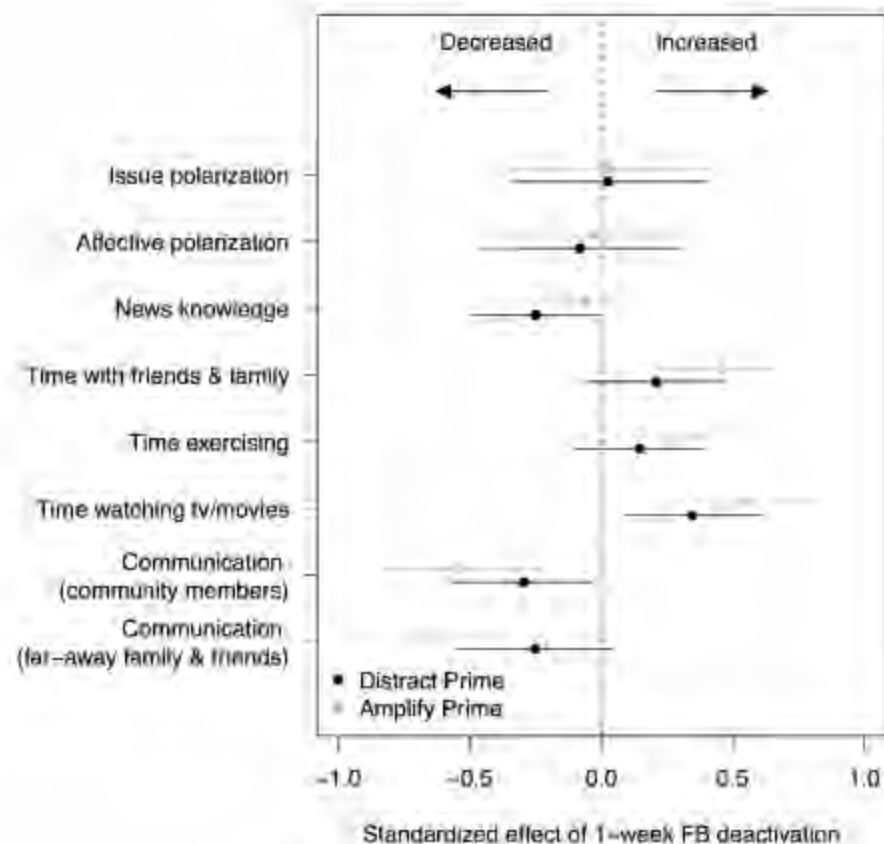
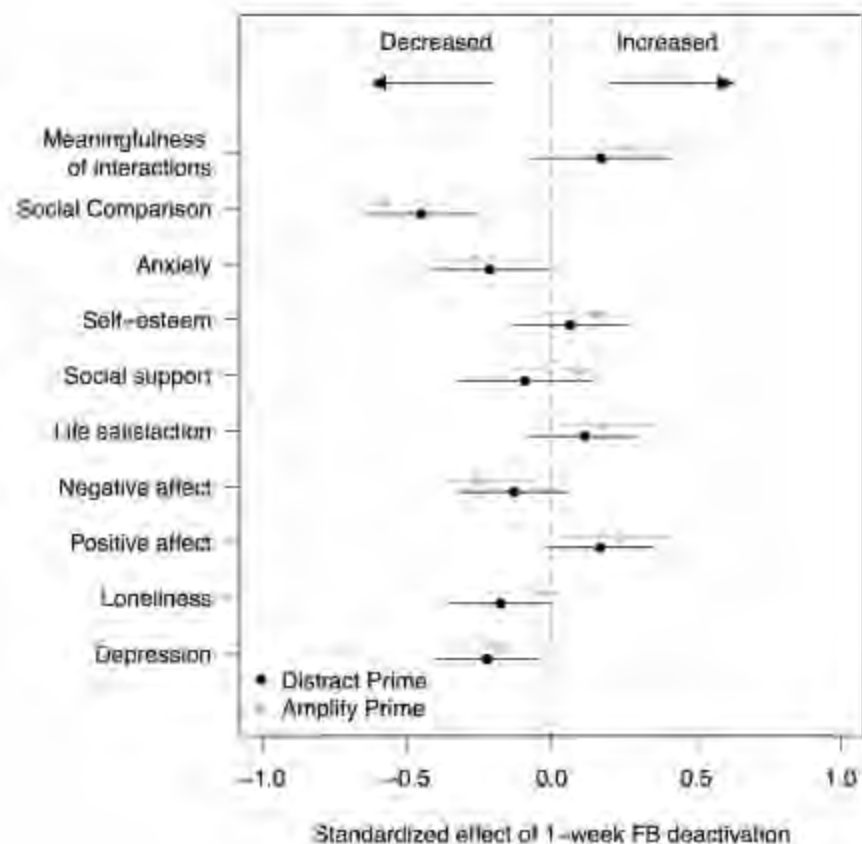
We used prompts to distract respondents about the goal of the study in effort to prevent expectation effects from biasing people's responses on a particular topic. Two-thirds of respondents were shown a prompt summarizing research on FB's impact on "well-being" or political polarization before starting the endline survey.

- **Distract Prime.** When participants were told the study was about "well-being," we actually analyzed the questions about political outcomes (and vice versa).
- **Amplify Prime.** When participants were told the study was about "polarization," we actually studied the questions about social and emotional outcomes.

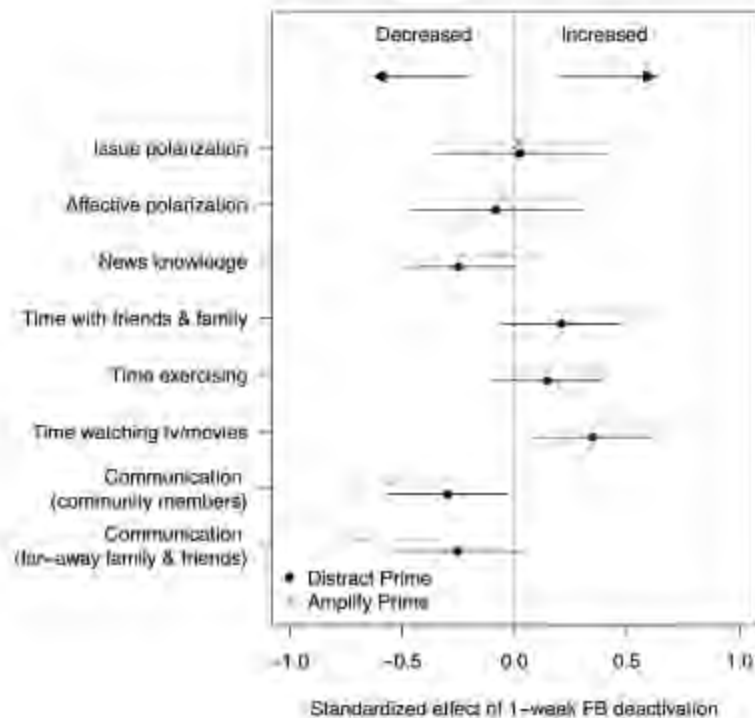
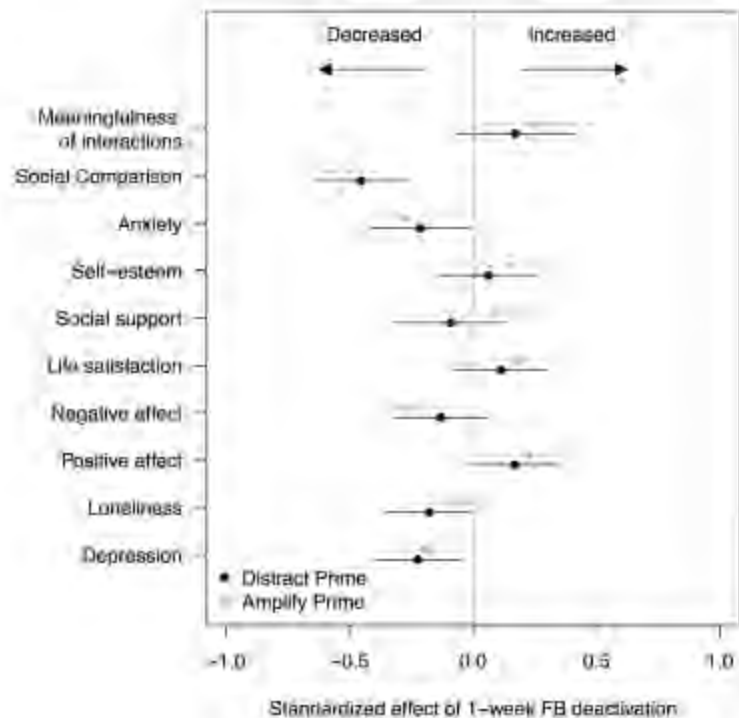
The premise here was that we hoped these primes would bury the lead further on the study and help overcome expectation effects.

However, the **primes did not have an impact on the effect of FB deactivation**. The treatment effects were on average the same across all prime groups.

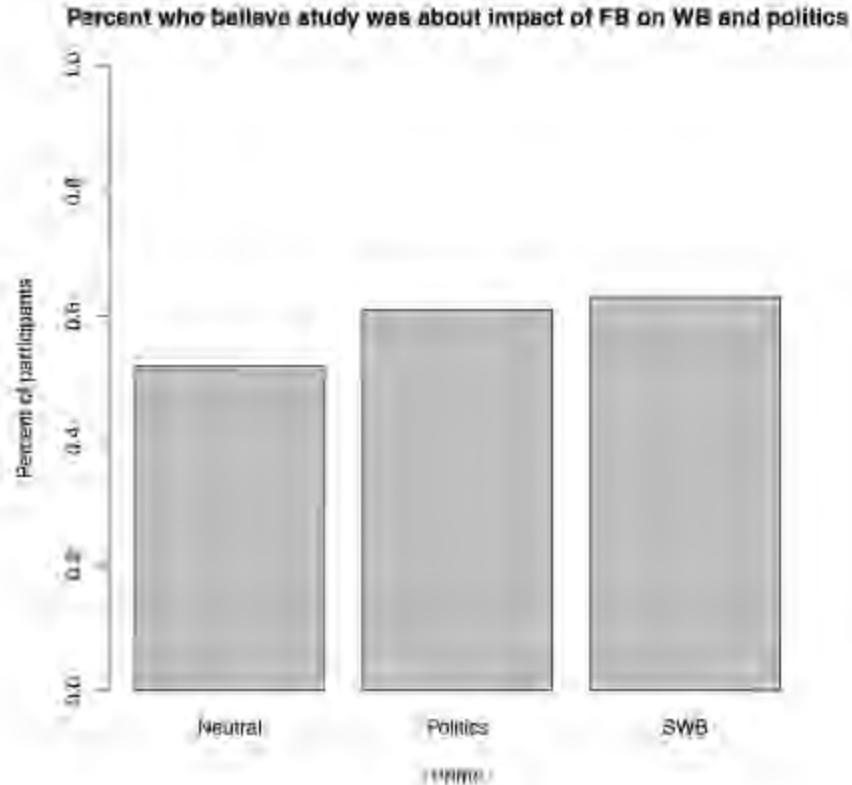
Why were the primes ineffective? Two main hypotheses: (1) People are able to judge what is good or bad for them or (2) primes were not very strong. The analysis of mobile data provides suggestive evidence consistent with the second hypothesis: people do not change overall time spent on mobile, but report higher amount time spent with friends following deactivation.



These charts highlight the effects of each factor broken down by primes. Overall, we do not see indication that the primes had an effect.

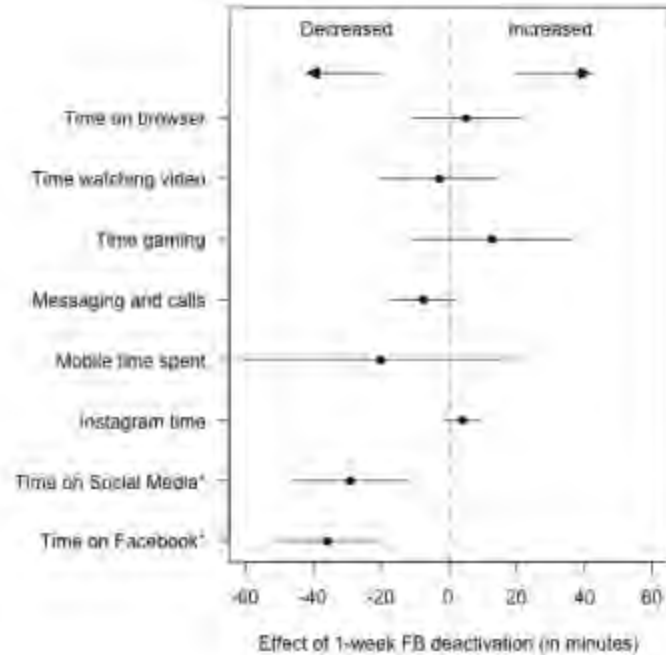


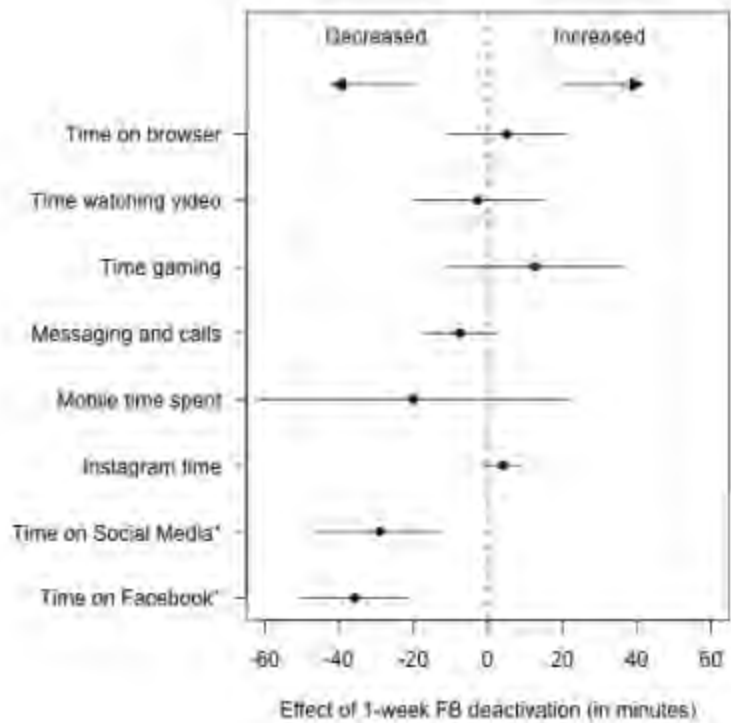
The majority of respondents think the study is about the impact of FB on well-being and political polarization, even after being exposed to a prime.



What are people doing on their
phones when they stop using
Facebook?

People who stop using Facebook, unsurprisingly end up **spending less time on Facebook, but also spend less time on social media overall**. We don't see evidence that people are using their phones any more or less overall.





Main takeaways

- Similar to external studies, we find evidence of both positive and negative impacts Facebook may have on people's lives.
- The most robust finding in our study is that Facebook increases feelings of social comparison (regardless of beliefs).
- People's perceptions of Facebook seem to impact the findings -- and this is important to note for our future research, and interpretation of others' findings. We haven't cracked a way to account for this yet or understand it fully.
- Deactivation studies are a promising direction to invest in further.

Proposed next steps

- Explore FB data and mobile sensor data alongside survey outcomes. We have been blocked because of COVID WFH (since the data must remain on campus). Analyses we'd prioritize:
 - How people spend their time on FB in relationship to beliefs
 - A deeper understanding of how people spent their time when they stopped using Facebook
- Additional studies [w/ academics?] (addressing limitations of the current study) and exploring a longer timeframe

Discussion questions

- Immediate thoughts and reactions? Open questions we can answer with the current data set?
- Is it worth getting permission to finish the data match and analyses on campus? If so, what is the priority level of this?
- Are we allowed to share this more widely? Do we want to get this to a place where we'd share this more widely?

Appendix

This needs cleaning...

Limitations

1. Panel Survey

- a. Sample is composed of members one of Nielsen's survey panel
- b. Critics may claim that "professional" respondents answer to surveys differently

2. Combining Survey Responses with FB Data

- a. The strict protocol to combine survey and log data has bugs
- b. To this date we are able to successfully link record for about 50% of respondents on the sample

3. Generalizability

- a. Given the nature of the design (impact of deactivation among people who value the app by a certain monetary amount) one cannot generalize effects to FB MAP.

4. Credibility

- a. While we brought Nielsen on for this very reason, some may still not trust the findings because Facebook was involved.

Links to surveys

- We estimate the impact of FB deactivation on **18 different survey-based outcomes** grouped in three broad categories: **(1) Well-Being; (2) Social Interactions and; (3) Political Polarization.**

Well-Being	Social Interactions	Political Polarization
Depression, Anxiety, Loneliness, Positive and Negative Affective, Life Satisfaction, Self-Esteem, Social Comparisons, Social Support	Meaningful Social Interactions, Time with Family and Friends, Time Exercising, Time Watching TV, Communication with Community, Friends, and Family Members	News Knowledge, Issue, and Affective Polarization

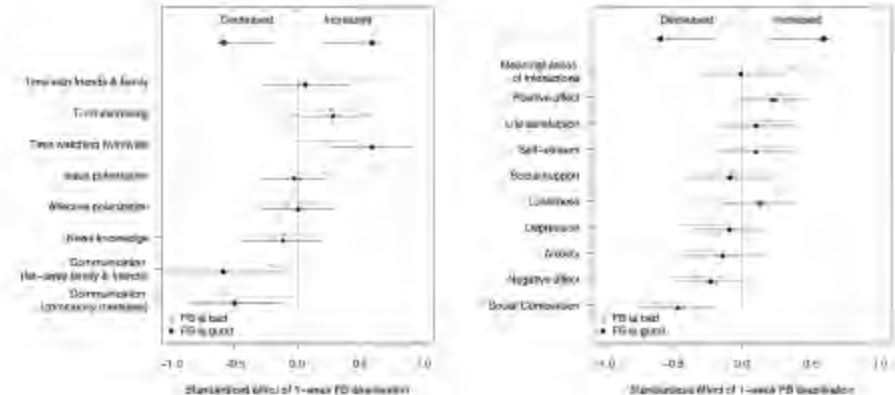
- We estimate the effect of FB deactivation for the people who deactivated FB because they were encouraged to do so. In our context, this corresponds to the difference in means between treatment and control groups in a given outcomes divided by the proportion of people who deactivated FB in the treatment group.
- **We find FB deactivation led to a decrease in depression, anxiety, and social comparisons.** The magnitude of the effect ranged from X to Y standard deviation of the outcome in the control group.

To the extent there are effects, these are driven by beliefs people have about FB prior to deactivation

FB is bad (good) defined as bottom (top) two responses to:

In your opinion, to what extent does using Facebook make you more or less extreme in your political views?

In your opinion, to what extent does using Facebook improve or hurt your well-being?



Data*

Survey data	Mobile sensor data	FB/IG log data
Emotional health (e.g., loneliness, positive affect) Polarization (e.g., affective, issue) Self-reported activities and interactions(e.g., news consumption, time with friends and family, advice received)	News apps Video apps Photo apps Games apps Messaging & call apps Email apps Social apps other Search apps Shopping apps Reading apps Music/Podcasts apps Other (search engines, docs, etc.)	Time spent on FB Time spent on messenger Time spent on IG Time spent watching video Graph size Times spent in Groups Interactions on FB Interactions on IG

Variables & Operationalization - Emotions

1. Depression

- a. Below are some ways you might have felt during the last 7 days. Please tell us how often during the last 7 days you felt depressed.
 - i. 1 item; 5-point: Never (1) - Very often (5)

2. Loneliness

- a. During the last 7 days, how often did you feel that you lacked companionship?
- b. During the last 7 days, how often did you feel left out?
- c. During the last 7 days, how often did you feel isolated from others?
 - i. 3 items (simple average); 5-point: Never (1) - Always (5)

3. Negative Affect

- a. How much do you agree or disagree with the following statements?
- b. During the last 7 days, I felt negative most of the time.
- c. During the last 7 days, I experienced unhappy feelings most of the time.
- d. During the last 7 days, I felt bad most of the time.
 - i. 3 items (simple average); 5-point: Strongly disagree (1) - Strongly agree (5)

4. Positive Affect

- a. How much do you agree or disagree with the following statements?
- b. During the last 7 days, I felt positive most of the time.
- c. During the last 7 days, I felt happy most of the time.
- d. During the last 7 days, I felt good most of the time.
 - i. 3 items (simple average); 5-point: Strongly disagree (1) - Strongly agree (5)

5. Life Satisfaction

- a. How much do you agree or disagree with the following statements?
- b. During the last 7 days, in most ways my life has been close to my ideal.
- c. During the last 7 days, I have been satisfied with my life.
- d. During the last 7 days, my life has been going well.
 - i. 3 items (simple average); 5-point: Strongly disagree (1) - Strongly agree (5)

6. Social Support

- a. How much do you agree or disagree with the following statements?
- b. During the last 7 days, there were people I could depend on to help me.
- c. During the last 7 days, there were people who gave me support and encouragement.
- d. During the last 7 days, there were people who appreciated me as a person.
 - i. 3 items (simple average); 5-point: Strongly disagree (1) - Strongly agree (5)

7. Self-Esteem

- a. How much do you agree or disagree with the following statement?
- b. During the last 7 days, I had high self-esteem.
 - i. 1 item; 5-point: Strongly disagree (1) - Strongly agree (5)

8. Anxiety

- a. Below are some ways you might have felt during the last 7 days. Please tell us how often during the last 7 days you felt anxious.
 - i. 1 item; 5-point: Never (1) - Very often (5)

9. Social Comparison

- a. During the last 7 days, how often did you compare your own accomplishments to those of other people?
- b. During the last 7 days, how often did you feel worse about yourself after comparing yourself to someone else?
 - i. 2 items (simple average); 5-point: Never (1) - Very often (5)

Variables & Operationalization - Social Interactions

1. **Communication: Distant Friends/Family**
 - a. During the last 7 days, how often did you communicate with people from the following groups? By "communicate," we mean having interactions that are in person, online, or through calling or messaging.
 - b. Friends and family who live far away
 - i. Binary coding; 5-point: Not at all in the last 7 days (0), Only once in the last 7 days, A few times in the last 7 days, Once per day, A few times per day (1)
2. **Communication: Community/Group Members**
 - a. During the last 7 days, how often did you communicate with people from the following groups? By "communicate," we mean having interactions that are in person, online, or through calling or messaging.
 - b. Community members/Group members
 - i. Binary coding; 5-point: Not at all in the last 7 days (0), Only once in the last 7 days, A few times in the last 7 days, Once per day, A few times per day (1)
3. **Relative Activity: Television**
 - a. During the last 7 days, did you spend more or less time than you usually do doing the following activities?
 - b. Watching TV shows or movies
 - i. Trinary coding; 5-point: I never do this, A lot less time, A little less time (-1), Neither more nor less time (0), A little more time, A lot more time (1)
4. **Relative Activity: Exercise**
 - a. During the last 7 days, did you spend more or less time than you usually do doing the following activities?
 - b. Exercising, working out, or playing sports
 - i. Trinary coding; 5-point: I never do this, A lot less time, A little less time (-1), Neither more nor less time (0), A little more time, A lot more time (1)
5. **Relative Activity: Friend/Family Hangout**
 - a. During the last 7 days, did you spend more or less time than you usually do doing the following activities?
 - b. Hanging out with friends and family
 - i. Trinary coding; 5-point: I never do this, A lot less time, A little less time (-1), Neither more nor less time (0), A little more time, A lot more time (1)
6. **Meaningful Interactions**
 - a. During the last 7 days, how meaningful were your interactions with people?
 - i. 1 item; 5-point: Not at all meaningful (1) - Extremely meaningful (5)

Variables & Operationalization - Polarization & News

1. Affective Polarization

- a. How do you feel about people who support the Democratic Party?
- b. How do you feel about people who support the Republican Party?
 - i. Difference of 2 items; 5-point: very negative (1) - very positive (5); scaled according to party affiliation/lean

2. Ideological Polarization

- a. There has been some discussion about abortion during recent years. Which one of the opinions below best agrees with your view?
- b. In general, do you support or oppose same-sex marriage?
- c. Do you think the federal government should make it more difficult for people to buy a gun than it is now, make it easier for people to buy a gun, or keep these rules about the same as they are now?
- d. Which is more important: reducing the federal budget deficit, even if the unemployment rate remains high, or reducing the unemployment rate, even if the federal budget deficit remains high?
- e. Do you think the number of immigrants from foreign countries who are permitted to come to the United States to live should be <decreased/increased>?
 - i. 5 items (abortion, marriage, guns, employment, immigration): custom 4-point or 5-point scales, coded to liberal or conservative position answers; average of absolute value difference between liberal positions and conservative positions

3. News Knowledge

- a. News knowledge questions (only baseline examples shown below)
 - i. President Trump recently pulled US troops from which of the following countries?
 - ii. Abhijit Banerjee, Esther Duflo, and Michael Kremer received the 2020 Nobel Prize in economics for their contributions to combating which of the following issues?
 - iv. Last week, the CEO of which of the following companies passed away?
 - v. The White House announced that the 2020 meeting of the G-7 countries will take place at which venue?
 - vi. NASA made history last week for which of the following?
 - vii. Rick Perry announced his plans to resign as secretary from which of the following departments?
 - ix. Which of the following musicians fell off stage while performing last week?
 1. 7 items (baseline: troops, Nobel, CEO, G7, NASA, Rick Perry, Lady Gaga; endline: justice prize, fires, quantum, impeachment, prime minister, affair, Uluru): 4 unique answers; dichotomize correct/incorrect answers and sum

Primes

Politics Prime:

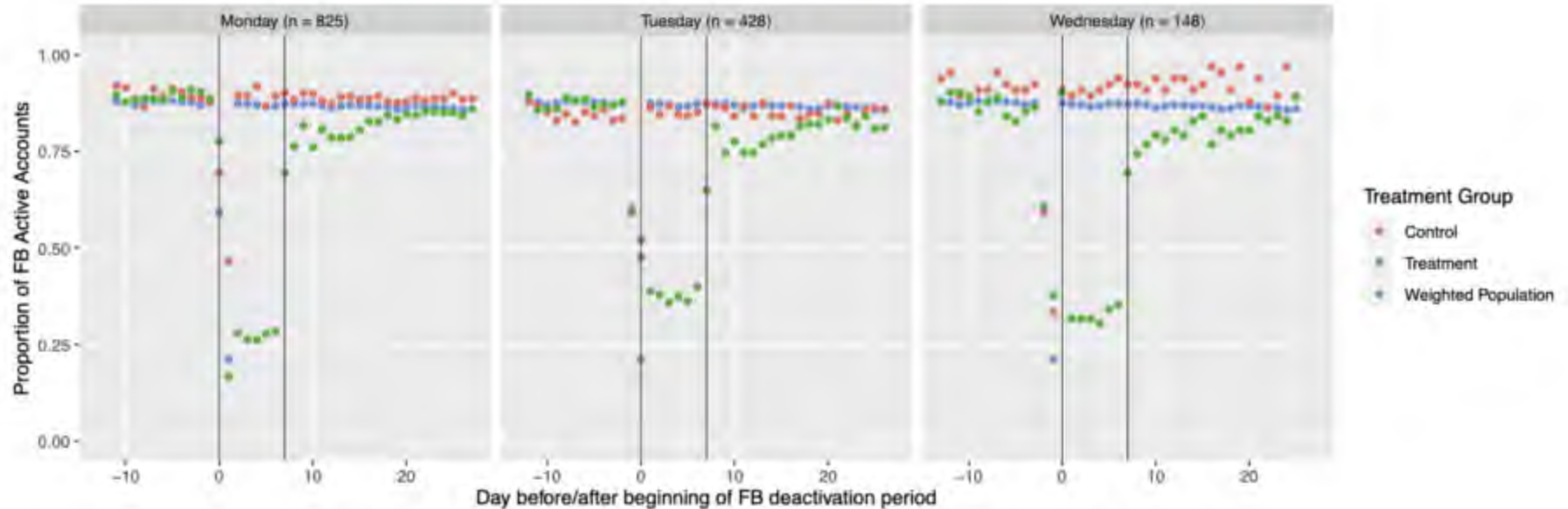
Facebook reduces political polarization	Facebook amplifies political polarization
Some research finds Facebook users are exposed to diverse political views, which makes people less extreme in their political views and more understanding of others.	Some research finds Facebook users are only exposed to their own political views, which makes people more extreme in their political views and less understanding of others.

Well-Being Prime:

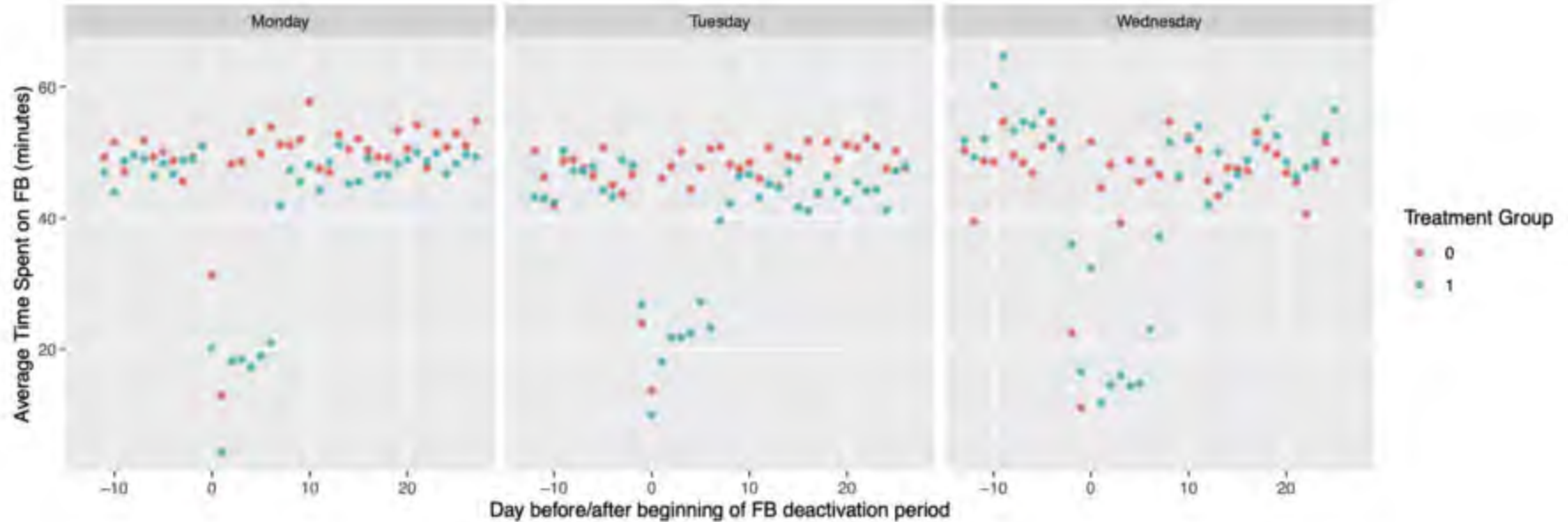
Facebook is good for well-being	Facebook is bad for well-being
Some research finds Facebook users have more meaningful interactions with people, which makes them feel more happy and more connected to others.	Some research finds Facebook users have less meaningful interactions with people, which makes them feel less happy and less connected to others.

The order of the columns was randomized in the survey.

About 70% of people who were invited to deactivate their account did in fact do so their during the 1-week period of the study.



Participants in the treatment group experienced a significant decrease in FB time spent during the 1-week deactivation period.



CUT (keeping for now just in
case)

CUT....

We want to understand our impact on society and be net positive on people's lives. The most feasible way to understand Facebook's causal impact is through an experiment, allowing us to understand how people feel when it is gone, how they substitute their time, as well as the core values of our product to help inspire future directions, and areas of prioritization.

1. Add title to slides [REDACTED]
2. % beliefs breakdown [REDACTED]
3. Evidence of weak primes plots [REDACTED] with [REDACTED]
4. Push compliance plots to the appendix [REDACTED]
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stats to add

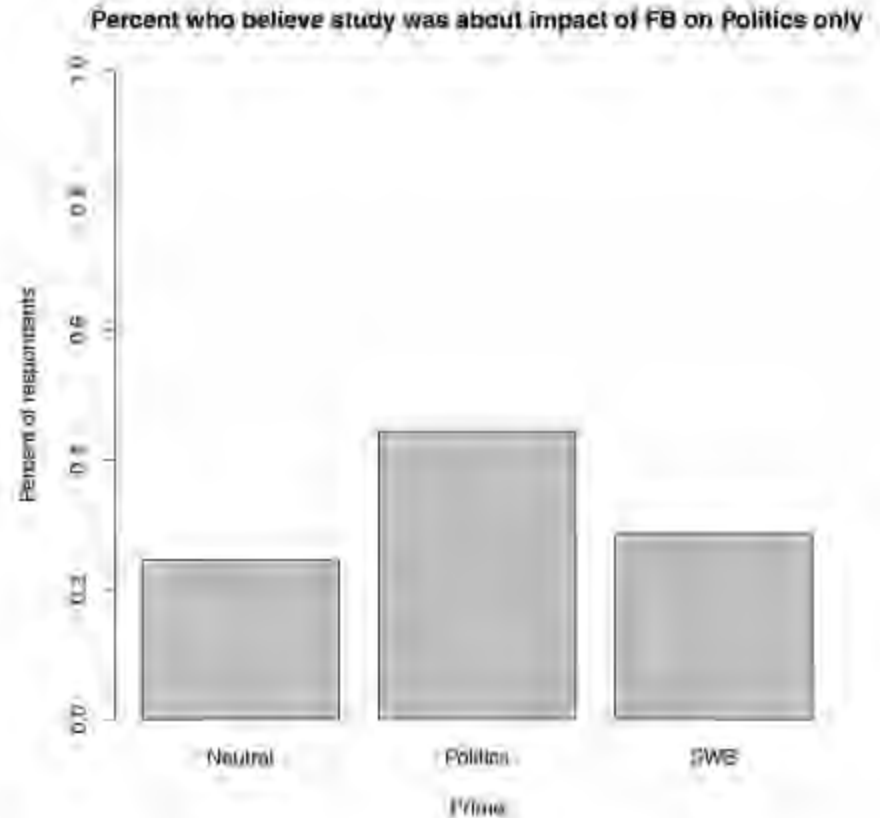
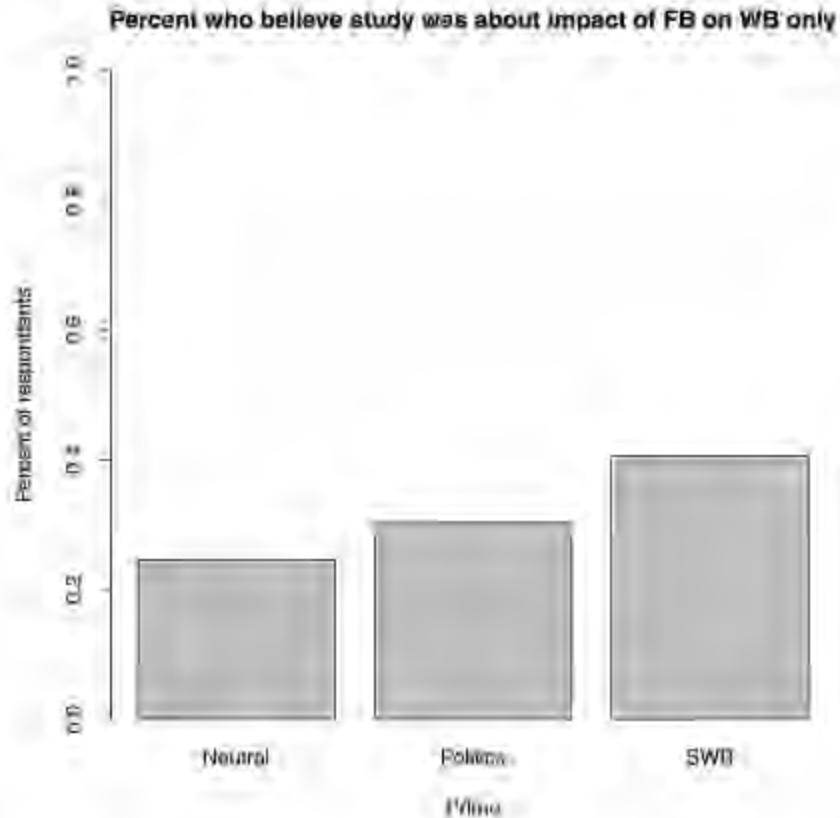
Compliance

- 67% compliance rate across both waves, conditional on completing the endline survey (68% for W1, 67% for W2)
- Among users who think FB is bad for their well-being, the compliance rate is 74%. Among users who think FB is good for their well-being, the compliance rate is 58%.

Beliefs

- 1267 respondents (23%) believe FB hurts their well-being a little or a lot
- 1430 respondents (26%) believe that FB improves their well-being a little or a lot
- 2637 (47%) believe that FB neither hurts nor improves their well-being
- 524 respondents (9%) believe that FB makes them a lot or a little less extreme
- 3922 respondents (71%) believe that FB makes them neither more nor less extreme
- 1108 respondents (20%) believe that FB makes them more extreme

Primes did influence the proportion of people who believe the study was only about WB or politics, but it was a relatively small subset regardless



Survey primes to overcome the role of beliefs in assessing the impact of FB

- **We use prompts to distract respondents about the goal of the study**, so that they do not inject their beliefs when responding to survey questions on a particular topic.
 - Two thirds of respondents were shown a prompt summarizing research on FB's impact on a well-being or political polarization before starting the endline survey.
 - **Distraction Prime.** When studying the impact of FB deactivation on well-being (polarization) we expect the most accurate answers to be those of respondents who were told the study is about political polarization (well-being).
 - **Amplifying Prime.** When studying the impact of FB deactivation on well-being (polarization) we expect that the least accurate answers to be those of respondents who were told the study is about well-being (polarization).
- **We find that primes do not have an impact on the effect of FB deactivation.** Treatment effects are on average the same across all prime groups.
- **Why are primes ineffective?** Two possibilities: (1) People are able to judge what is good or bad for them or (2) primes are not very strong. The analysis of mobile data provides suggestive evidence consistent with the second alternative: people do not change overall time spent on mobile, but report higher amount time spent with friends following deactivation.

tl;dr

In an effort to understand Facebook's impact on people's lives, we ran two 1-week consented experiments in which some people stopped using Facebook, and others continued to use Facebook.

We found that those who stopped using Facebook for a week **reported lower feelings of depression, anxiety, loneliness, and social comparison.**

We also find **no effects of FB deactivation on political polarization. Finally, we find that the beliefs people have about FB's impact on them predict the observed effects we find in the data.**